

(No Model.)

F. R. ESTLOW.

DEVICE FOR CHANGING RECIPROCATING INTO ROTARY MOTION.

No. 367,281.

Patented July 26, 1887.

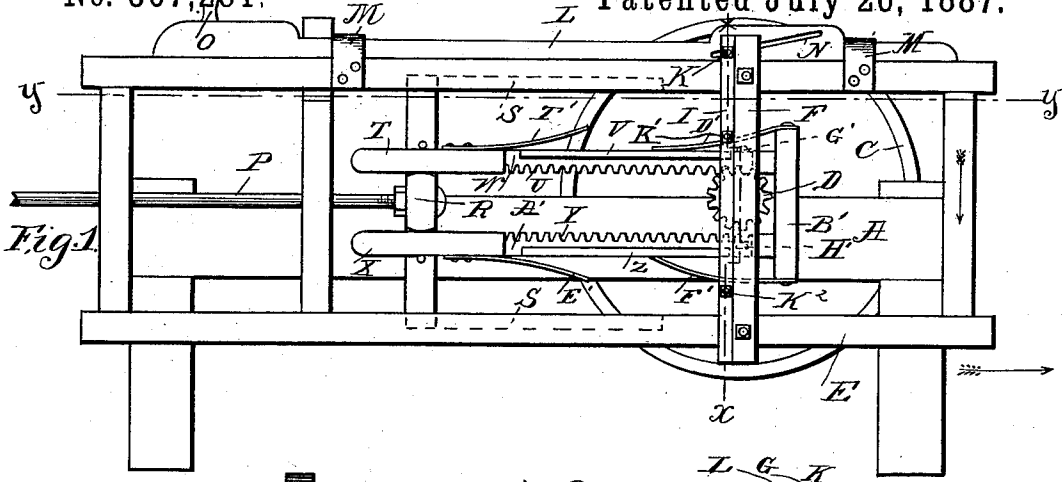


Fig. 1.

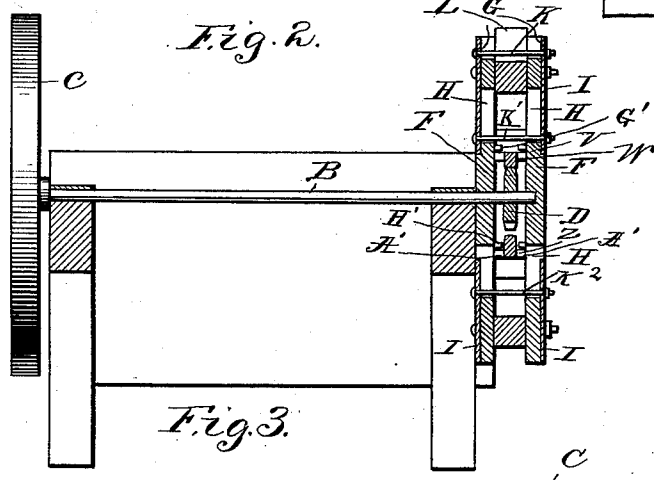


Fig. 2.

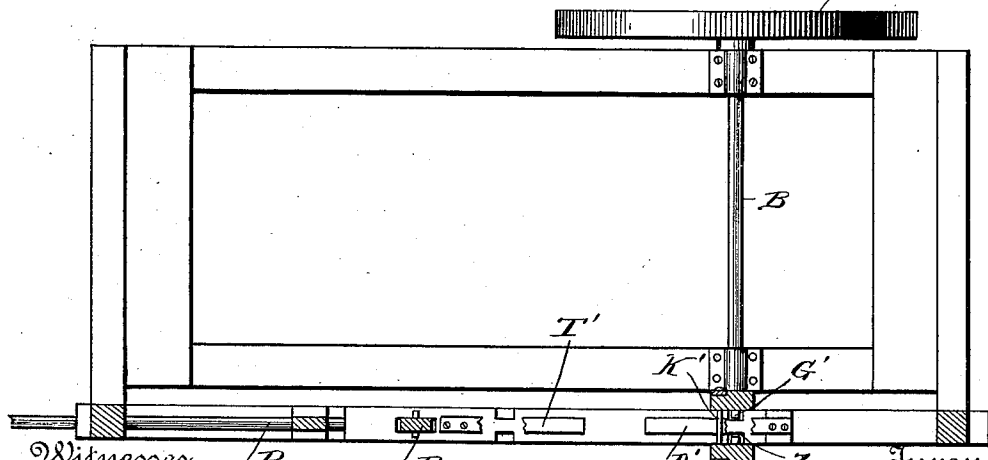


Fig. 3.

Witnesses  
*Wm. Rheem*  
*E. Siggel*

Inventor  
*Francis R. Estlow*  
 By his Attorneys,  
*C. A. Howells*

# UNITED STATES PATENT OFFICE.

FRANCIS ROBNO ESTLOW, OF BARNEGAT, NEW JERSEY.

## DEVICE FOR CHANGING RECIPROCATING INTO ROTARY MOTION.

SPECIFICATION forming part of Letters Patent No. 367,281, dated July 26, 1887.

Application filed April 26, 1887. Serial No. 236,213. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS ROBNO ESTLOW, a citizen of the United States, residing at Barne-  
gat, in the county of Ocean and State of New  
Jersey, have invented a new and useful Im-  
provement in Machines for Changing Recipro-  
cating into Rotary Motion, of which the fol-  
lowing is a specification.

My invention relates to an improvement in  
machines for changing reciprocating into ro-  
tary motion; and it consists in the peculiar  
construction and combination of devices, that  
will be more fully set forth hereinafter, and par-  
ticularly pointed out in the claims.

In the drawings, Figure 1 is a side elevation  
of a machine embodying my improvements.  
Fig. 2 is a vertical transverse sectional view  
of the same, taken on the line  $xx$  of Fig. 1.  
Fig. 3 is a top plan view on the line  $yy$  of  
Fig. 1.

A represents a supporting frame, on which  
is journaled a transverse shaft, B. To one end  
of the said shaft is secured a fly-wheel, C, and  
to the other end thereof is secured a spur-  
wheel, D.

E represents a longitudinal frame which is  
secured on one side of the frame A. The said  
frame E is provided on opposite sides with  
vertical guide-bars F, which are provided with  
vertical grooves G and slots H.

I represents a pair of bars which fit in the  
grooves G and are connected together by means  
of transverse rods K, that extend through the  
slots H, and thereby enable the bars I to be  
vertically adjusted.

On the upper side of the frame E is arranged  
a longitudinally-movable slide-bar, L, which  
is guided in keepers M and is provided with  
an inclined slot, N, through which the upper  
transverse rod K extends. The slide-bar L  
is provided at one end with a handle, O, by  
means of which it may be moved longitudi-  
nally.

P represents a reciprocating rod which is  
adapted to be connected to the piston-rod of a  
steam-engine or other motor. To the inner  
end of this rod P is attached a vertical cross-  
head, R, the ends of which work in longitudi-  
nal grooves S, that are made in the opposing  
sides of the frame E.

T represents a bar which has one end piv-

oted to the cross-head above the rod P, and is  
provided on its under side for a suitable dis-  
tance with rack-teeth U, adapted to engage  
the upper side of the gear-wheel D. The up-  
per side of this rack-bar is provided with lat-  
erally-projecting horizontal flanges V, at the  
ends of which are openings or notches W.

X represents a bar which has one end piv-  
oted to the cross-head at a point below the rod  
T. The said bar is provided on its upper side  
for a suitable distance throughout its length  
with a series of rack-teeth, Y, which are adapted  
to engage the under side of the gear-wheel D;  
and the said rack-bar X is provided on its  
lower side with laterally-projecting longitu-  
dinal flanges Z, and has vertical openings or  
notches A' formed at the end of the said flanges.

B' represents a vertical bar which connects  
the outer end of the rack-bars T and X to-  
gether, and the ends of the said vertical bar  
project above and below the ends of the rack-  
bars, as shown. On the upper side of the rack-  
bar T, at the inner end thereof, is secured an  
upwardly-inclined spring-arm, T'.

D' represents a spring-arm which is con-  
nected to the upper end of the bar B' and in-  
clines downward and rearward to the rack-bar  
T, and is arranged at the same inclination with  
the spring-arm T'.

E' represents a forwardly and downwardly  
inclined spring-arm which has one end se-  
cured to the under side of the rack-bar X,  
near the rear end of the latter, and F' repre-  
sents a similarly-inclined spring-arm which  
is attached to the lower end of the bar B' and  
bears against the under side of the rack-bar X.

From the opposing sides of the vertical bars  
F project horizontal inwardly-extending studs  
G', and at a suitable distance below the studs  
G' are similar studs, H'.

The operation of my invention is as follows:  
When it is designed to rotate the wheel C in  
the direction indicated by the arrow in Fig. 1,  
the slide-bar L is moved forward, so that the  
rod or bolt K, at the upper end of the bar I,  
will move to the lower end of the slot N, and  
thereby the said bars I will be lowered, so as  
to bring the cross rod or bolt K' into the path  
of the springs T' and D', and the cross bar or  
rod K<sup>2</sup> will be lowered out of the path of the  
springs E' and F'. When the piston-rod is at

the reverse end of its stroke, the openings W and A' at the front end of the rack-bars are in vertical line with the studs G' and H', and the spring-arm D' bears under the bolt K', and thereby forces the rack-bar T into engagement with the upper side of the spur-wheel, and the rack-bar X is lowered out of engagement with the under side of the spur-wheel, the studs G' are above the upper side of the flanges V of the rack-bar T, and the studs H' are just above the upper side of the flanges Z of the rack-bar X. When the rod P is moved forward, forward motion is imparted to the cross-head R, and thereby the rack-bars are urged forward. Inasmuch as the upper rack-bar, T, is in engagement with the upper sides of the spur-wheel, the latter, the shaft, and the wheel C are caused to turn in the direction indicated by the arrow in Fig. 1. As the rack-bars move forward the spring D' is moved beyond and disengages the bolt or rod K', and when the rod T has nearly completed a stroke the spring-arm T is caused to engage the upper side of the said cross bar or bolt K', and by the time that the rod has completed its stroke the tension of the spring-arm T' is so great that when the notches W and A' at the rear ends of the rack-bars align with the studs G' and H' the said spring C moves the rack-bar X upward, so as to disengage its teeth from the upper side of the spur-wheel, and the lower rack-bar, X, is also moved upward, so as to bring its teeth in engagement with the lower side of the spur-wheel, both rack-bars having their inner ends raised sufficiently to cause the rear notches W and A' to pass above the studs G' and H', and thereby cause the said studs to align with the lower sides of the rack-bar. On the reverse stroke it will be seen that the lower rack-bar, by engaging the lower side of the gear-wheel, keeps the same rotating in the same direction, and thus continuous rotary motion is imparted to the shaft by both the forward and backward stroke of the rod P. When the rod completes its rearward stroke, the spring D', by bearing under the cross rod or bolt K', depresses the outer ends of the rack-bars to their initial position previously described. If it is desired to reverse the rotation of the shaft, this may be accomplished by drawing the slide-bar L rearward and thereby causing the inclined slot thereof to raise the

bars G, so as to move the bolt K' above the path of the spring-arms T' and D' and raise the cross rod or bolt K<sup>2</sup> into the path of the springs E' and F', in which position the under side of the spur-wheel will be engaged by the lower rack-bar at the forward stroke, and the upper side thereof will be engaged by the upper rack-bar at the reverse stroke, and thus the shaft will be caused to rotate in the opposite direction to that indicated by the arrow in Fig. 1, as will be very readily understood.

Having thus described my invention, I claim—

1. The combination of the shaft having the spur-wheel, the reciprocating cross-head having the rack-bars T and X, adapted to engage the upper and lower sides of the spur-wheels successively at each alternate stroke of the cross-head, the cross-pin K', and the spring-arms attached to one of the rack-bars and adapted to engage the said pin or bolt at the ends of the stroke, the said spring-arms being inclined in the same direction, and thereby adapted to alternately engage opposite sides of the pin or bolt and raise and lower the rack-bars, for the purpose set forth, substantially as described.

2. The combination of the shaft having the spur-wheel, the reciprocating cross-head, the rack-bars pivoted thereto and having the rack-teeth on their opposing sides adapted to alternately engage the upper and lower sides of the spur-wheel, the bar B', connecting the outer ends of the rack-bars, the springs T' and D', inclined upwardly and forwardly and arranged on the upper side of the upper rack-bar, at the ends thereof, the springs E' and F', inclined downwardly and forwardly and arranged on the lower side of the lower rack-bar, at the ends thereof, and the vertical movable frame I, having the bolt or pins K' and K<sup>2</sup>, and the slide-rod to operate the said vertical frame, for the purpose set forth, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

FRANCIS ROBNO ESTLOW.

Witnesses:

JOSEPH L. HIGGINS,  
HORACE G. ERRICKSON.