

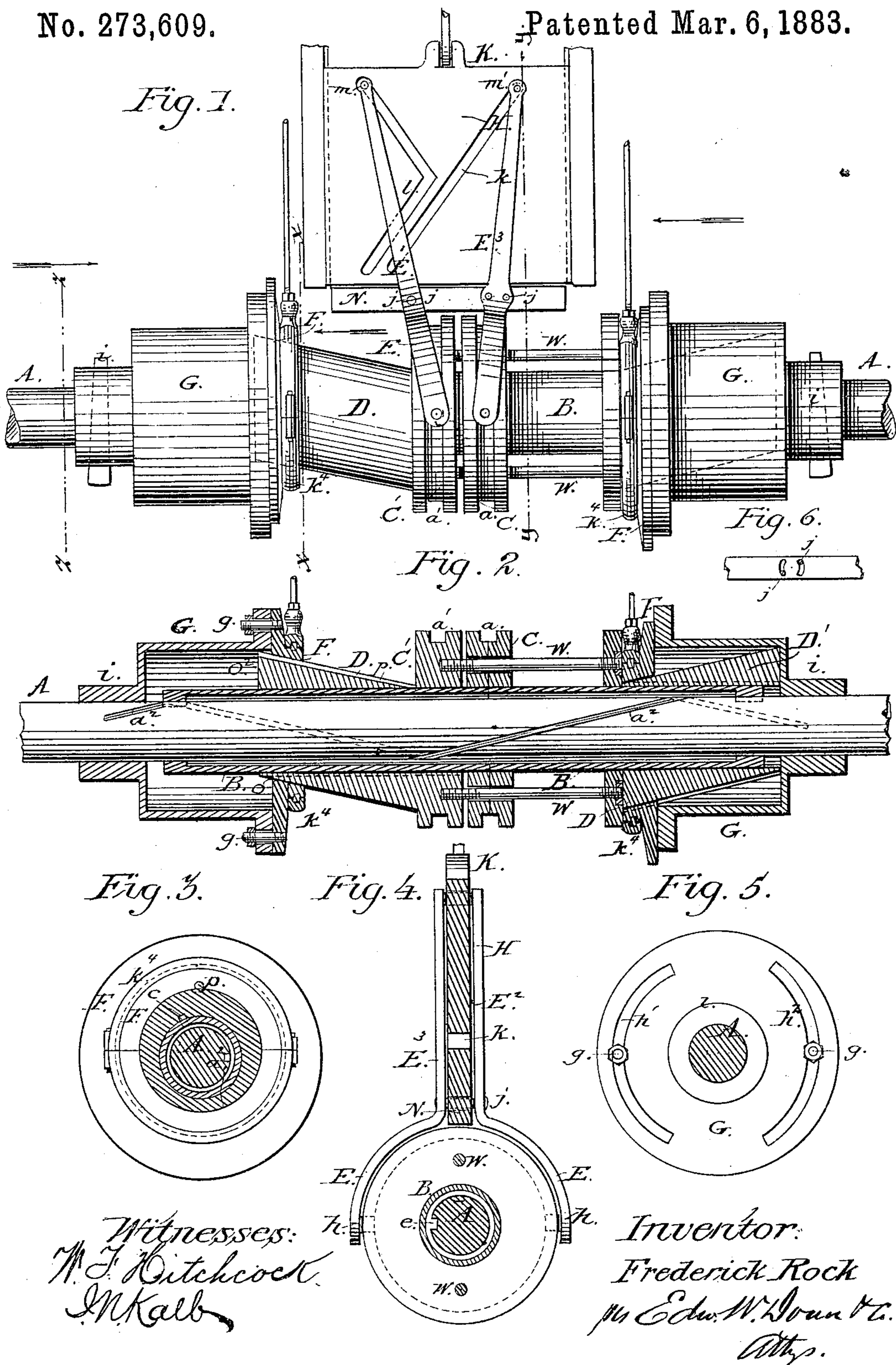
(No Model.)

F. ROCK.

REVERSING GEAR FOR STEAM ENGINES.

No. 273,609.

Patented Mar. 6, 1883.



UNITED STATES PATENT OFFICE.

FREDERICK ROCK, OF HOMER, NEW YORK, ASSIGNOR OF ONE-HALF TO
WILLIAM F. HITCHCOCK, OF SAME PLACE.

REVERSING-GEAR FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 273,609, dated March 6, 1883.

Application filed December 6, 1882. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK ROCK, a citizen of the United States of America, residing at Homer, in the county of Cortland and State of New York, have invented certain new and useful Improvements in Reversing-Gear for Locomotive and other Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention is an improvement in what is known as "reversing-gear" for locomotive and other engines, and its object is to supersede the link-motion or other devices used for reversing or shortening the travel of the valve to cut off steam at different parts of the stroke of the piston, in order that the steam may be used expansively at any time when the full stroke is unnecessary.

It consists essentially of a spirally-grooved driving-shaft, a cylindrical sleeve adapted to engage the groove of the former, and an oblique cam-sleeve adapted to engage the first-mentioned clutch and act upon the incline-plane or wedge principle and convert a concentric collar into an eccentric, the combined parts mentioned having the function, under the influence of the operator, through the agency of a grooved rack and certain levers, all of which will be fully described hereinafter, to arbitrarily affect the valve and give to the same the required throw.

In my drawings, Figure 1 is a plan view, showing the various parts composing my improvement. Fig. 2 is a longitudinal sectional view of the same. Fig. 3 is a transverse section on line *x x* of Fig. 1. Fig. 4 is a transverse section on line *y y* of Fig. 1. Fig. 5 is a transverse section on line *z z* of Fig. 1. Fig. 6 is a detail showing the double fulcrum.

Similar reference-letters denote like parts in all of the figures.

Referring to the drawings, A is the driving-shaft of a locomotive-engine, provided with a spiral groove, *a*², which runs about its contour.

B is a cylindrical sleeve, which fits upon the shaft A, provided with a spline within, adapted to fit in the groove *a*² of the shaft A. This clutch has also a feathered key, *b*, adapted to

fit a key within a groove or key-seat, *c*, provided in a second sleeve, D, which serves the purpose of a cam. The sleeve B has a collar, C, provided with an annular groove, *a*, adapted to receive the lugs *h* of the lever E'. 55

D is a second sleeve, preferably cylindrical in general form and oblique to the axis of the spirally-grooved shaft when in position over the latter. It is provided with a collar, C', having an annular groove, *a'*, also adapted, like the sleeve B, to receive lugs *h* in the yoke of a lever, E³. 60

F is an eccentric, formed with a flange, *f*, which, when in place, rests against a flange on an eccentric-guide, to be described. In the flange *f* are secured bolts *g*, intended to pass through certain slots provided in said eccentric guide to secure the corresponding flanges together. The eccentric F is provided with an oblique opening, *o*, to receive the oblique portion of the clutch D, for a purpose to be hereinafter mentioned. 65 70

G is a hollow cup-shaped wheel or housing, provided with a flange, *f'*, and a hub, *i*, all cylindrical in form, which, when in position, fits over the shaft A, to which it is keyed, and forms a hollow space for the reception of the sleeves D and B when it is desirable to reverse or shorten the stroke of the valve. 75

H is a flat piece of metal, which I call a "rack," adapted to fit loosely and move between the divided arms of the levers E' E³. It is provided on its longitudinal edges with V-shaped grooves, adapted to move in ways with edges correspondingly shaped, and rendered in some suitable manner adjustable, to provide against frictional wear. This rack has formed through its body slots *k l*, to receive the rollers fixed in the ends of the levers E' E³. One of these slots is straight and oblique, preferably, to the longitudinal axis of the said rack, and the other V-shaped, preferably. As shown in the drawings, one arm of the slot *l* is nearly parallel to the slot *k*, and the other inclines in an equal angle in the opposite direction; but this is not essential, as their relative forms with relation to the longitudinal axis of the rack may be varied to suit circumstances. 80 85 90 95

The lead given to the valves is determined by the shape of the slot *k* in the rack. This may 100

also be effected by making the spiral groove of the shaft serpentine, as well as spiral, in which case the long slot in the rack would remain straight, as shown. The connecting-bearing
 5 m of lever E' runs in the groove or slot l , while that of the one E^3 runs in the slot k . The levers E' E^3 , which are acted upon by the rack H , and which operate the clutches B and D , have each a yoke, E , provided with pivoted
 10 square bolts, or round bolts provided with anti-friction rollers, which run in their respective grooves in sleeves B and D . The bifurcated arms of levers E' E^3 are closed by bolts covered by anti-friction rollers m' m ,
 15 which take into their respective slots, as before stated. When the said bearings or rollers are at the near ends of the slots they give full stroke to the valves, and when at the middle points between the two ends the valves
 20 are on the centers of the engine. The cab-lever, within reach of the operator, is attached to the clevis K of the rack H .

N is a bar secured to the frame of the locomotive, which has formed in it segmental
 25 slots j' . Rivets j pass through these slots and connect the two limbs of the levers E' E^3 , to form changeable fulcrums, so that, if necessary, a slight play may be allowed to said levers to assist in keeping the friction-rollers of
 30 the yoke in the center of the shaft. In my drawings I show both forms of fulcrum—i. e., the fixed and the changeable—as either may be used, as preferred.

The bolts in the ends of the lever-arms
 35 traverse their respective slots as the rack H is moved back and forward, and cause the lugs in the yoke to follow or move longitudinally over the center of the shaft A .

The sleeve B is provided with a lug or
 40 spline, e , which engages the spiral slot a^2 of the shaft A , whereby the said clutch is caused to revolve with said shaft, carrying with it the eccentric to the desired point to reverse the engine.

45 The sleeves D are provided with keys to engage the key-seats of the eccentrics to prevent the latter from turning on said clutches.

The eccentric-guide G is provided on its front face with slots h' h^2 , through which bolts
 50 g run, the extremes of which slots arrest the motion of the eccentrics. When the bolts g are at the ends of the slots the valves may run at full stroke, and when so running said eccentrics are driven by the eccentric-guides, so
 55 that the sleeves B and D are relieved of the strain. When the bolts of the eccentrics move toward the centers of the slots to shorten the strokes of the valves the sleeves take up all lost motion before moving the eccentrics and
 60 bring the latter to the center, thereby taking up what lost motion there might be, so that the rim of the valve cannot be affected. The sleeves B and D when moved run into and out of opening o^2 of the eccentric-guide G .

65 The eccentric F is provided with an annular flange to receive the straps k^4 .

p p are the key-seats of the eccentric, in

which are run keys, which hold said eccentric from turning, as before mentioned.

The sleeves B and D , although shown in 70 drawings to be cylindrical in general form, may, if preferred, be square or angular exteriorly, and when so formed obviously the connecting-keys may be dispensed with.

The eccentric-guide G is fixed to the driv- 75 ing-shaft A by a suitable key, which passes through the hub i and said shaft. In the shaft A , I have shown a single spiral groove, whereas I may in practice use more than one.

The rack H , I have shown and described as 80 having slots which pass through it laterally; but I do not wish to be confined to this construction, as in practice I may find it advantageous to use surface-grooves; or said rack may be an open frame provided with bars of 85 the forms of the slots or grooves. When this form of rack is used the ends of the lever-arms will be provided with suitable devices to grasp the bars.

In the application of my invention to loco- 90 motive or other double engines I connect the opposite cam-clutches by rods W , although, if preferred, they may be connected by a suitable sleeve.

In order to work the valves for independent 95 lead, the rack H may be dispensed with, and bell-crank or other suitable levers may be substituted and attached to the levers E' E^3 , in which case the stroke of the valve may be shortened with one lever and the engines re- 100 versed with the other. For independent lead the eccentric-guide slots must be concentric and the connecting-bolts must move in radial grooves formed in the eccentric.

The movement of the mechanism composing 105 my invention may be briefly stated as follows: The rack H is moved by the operator who handles the cab-lever. The said rack influences the levers E' E^3 , which in turn by their yokes move the sleeves B and D in one and the same 110 direction in line with the axis of the driving-shaft, while at the same time by the engagement of the keys of the clutch B and the spiral groove in said shaft a rotary movement is given to the said sleeves. The cam-clutches 115 D in their axial movement convert the concentric collars into eccentrics, and as the former are united to the latter by splines or lugs they take the same rotary movement that is given to the said sleeves by the said groove in the 120 shaft. The sleeves D move into the eccentric-guides G , which latter remain stationary, being keyed to the grooved shaft, and their eccentric grooves or slots guide and limit the movement of the said eccentrics. The eccen- 125 trics are connected to the valves in the usual manner. When the driving-shaft of the engine moves, it rotates all of the parts placed about its axis.

Among the advantages that may be named 130 for my invention are the following: The first cost of the construction will not exceed that of the link devices, and, being comparatively free from wear, repair expenses will be much less

than attends the use of any link devices. There are no parts in motion while running, and consequently the durability of it is assured. It has few parts, and these are large and simple, consequently no special tools or machines are required. Direct connection being established with the valves, the least variation given in handling will be immediately felt, and the arrangement of the parts is such that no lost motion can effect the absolute perfection of the valve motion. The amount of lead given to any and all engines is optional with the builders and varied at the will of the engineer when driving loads of different weight; or the same lead may be made to follow the valve throughout its whole travel, whether long or short, and equally perfect upon the reverse or backward motion of the engine as the forward. Therefore, if the engine is for one class of labor only, the valve may be made to carry the same lead throughout, or lead may increase as may suit the fancy of the several builders. The engine doing labor of varying loads may be arranged to accommodate its valve-lead to the variation, at the will of the operator, if absolute lead is required, or if variable lead is required by my improvements, and each will be perfectly duplicated upon the reverse or backward motion of the engine. In short, the merits of my invention embrace simplicity, durability, economy, and absolute accuracy.

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

35 1. In an engine valve-gear, the actuating-rack H, adapted to move in suitable ways, provided with grooves or slots to give lateral movement to the sleeves through the medium of the levers described, and carry them in the direction of the axis of the engine driving-shaft, all of which are combined and arranged substantially as set forth.

45 2. The rack described, adapted to move longitudinally in suitable ways, provided with oblique slots, in combination with levers E' E³, pivoted to a fixed frame, and sleeves B and D, as and for the purpose set forth.

3. The co-operating sleeve B, provided with

a spline or feather, in combination with the sleeve D, adapted to move upon the said sleeve B, and the main shaft of an engine, provided with a spiral groove, as and for the purpose specified.

4. In a valve-gear, the sleeve D, having an exterior oblique to its axis, and arranged to slide axially upon sleeve B when moved by a suitable lever, and rotate with said sleeve upon the driving-shaft of an engine, as and for the purpose specified.

5. The combination, with the driving-shaft of an engine, of the sleeves B and D, the latter mounted upon the former, and suitable mechanism whereby a rotary and axial movement is given to said sleeves, as and for the purpose set forth.

6. The combination of sleeve B, provided with a suitable spline, and sleeve D with the main shaft of a steam or other engine, substantially as specified.

7. The eccentric F, formed with an oblique opening, and adapted to engage with sleeve D directly and indirectly with sleeve B, by which latter said eccentric receives a rotary motion, as and for the purpose specified.

8. The combination, with the sleeve B, of the sleeve D, having an inclined exterior, the eccentric F, and the actuating-levers E' E³, substantially as set forth.

9. The combination, with the eccentric F, of the eccentric-guide G, the shaft A, and the intermediate and co-operating sleeves, B and D, as and for the purpose set forth.

10. The lever E³, provided with a double fulcrum composed of pins or rivets *j* and slots *j'*, formed in the fixed bar N, as specified.

11. The combination, with the cab-lever, of the rack H, levers E' E³, sleeves B D, eccentric-guide G, and the spirally-grooved shaft A, substantially as and for the purpose set forth.

In testimony whereof I affix my signature, in presence of two witnesses, this 30th day of November, 1882.

FREDERICK ROCK. [L. S.]

Witnesses:

FRANK PIERCE,
CHAS. H. STEVENS.