

(No Model.)

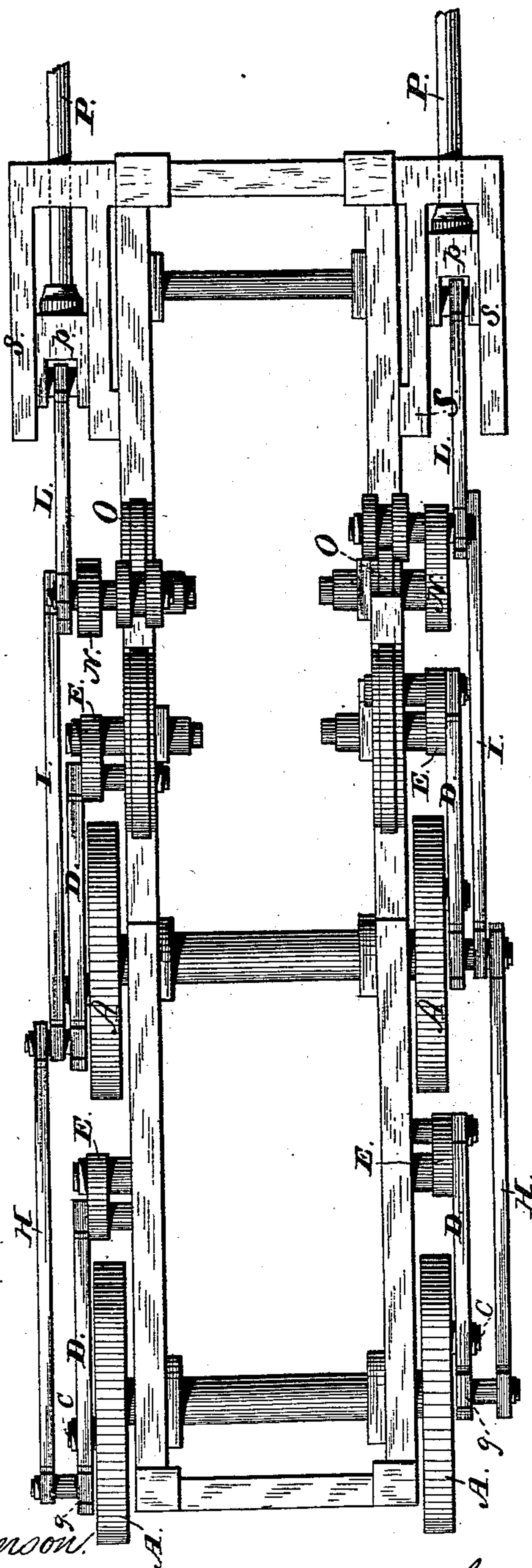
2 Sheets—Sheet 2.

A. DONATO.
Locomotive-Engine.

No. 226,290.

Patented April 6, 1880.

Fig. 3.



WITNESSES-

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UNITED STATES PATENT OFFICE.

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LOCOMOTIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 226,290, dated April 6, 1880.

Application filed March 13, 1880. (No model.)

To all whom it may concern:

Be it known that I, ANDREW DONATO, a subject of the King of Italy, but have made declaration of intention to become a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Locomotive-Engines, of which the following is a specification.

This invention relates to an improvement in the running-gear of locomotives, its object being to augment the power with which the pistons of the steam-cylinders act upon the driving-wheels to increase the speed of travel and to counteract the loss of power resulting from the dead-center position of the cranks or wrist-pins on both sets of driving-wheels.

Upon locomotives as heretofore constructed the pitman and connecting-rods have been connected to the wrist-pins or cranks in such manner as to utilize only the simple crank movement—that is, to gain and lose effective force alternately on the quarter-revolution, and lose their power entirely twice in each revolution. For this reason it has been customary to set the cranks or wrist-pins of one set of driving-wheels, or those on one side of the engine, at right angles to those of the wheels on the other side, in order that one set may gain while the other is losing power, and that the two sets may help each other, in addition to the aid of momentum, to pass the dead-center points. Still it is obvious that the aggregate power applied to drive the locomotive by this arrangement is vastly less than it would be were the drive-wheels driven with a uniform maximum power—that is, not increasing and decreasing on the quarter-revolutions and so the aggregate motive power of the drive-wheels will be greater as the number of points is diminished at which the effective power applied thereto decreases or varies. This is the main principle of my invention.

An increase of motive power on the drive-wheel gives a capacity for increased speed.

With the above-named objects and principles in view, my invention consists, mainly, in the combination, with the driving-wheels, pistons, and pitmen of a locomotive, of systems of intermediate connecting-rods arranged to

overcome or counteract the loss of effective force from that applied to the wrist-pins of the driving-wheels as they approach one of their dead-center points, whereby the motive power and capacity for speed of the wheels is increased, as will be fully hereinafter explained.

It also consists in the combination, with a driving-wheel, piston, and pitman of a locomotive, of an intermediate system of connecting-rods arranged to apply power to said wheel at an angle to the dead-center line thereof when the wrist-pin is on said line, whereby the wheel is moved beyond the dead-center, as will be more fully hereinafter described.

In the accompanying drawings, Figure 1 is a side elevation of the running-gear on one side of a locomotive, constructed according to my invention. Fig. 2 is a view of the running-gear on the opposite side in a corresponding position. Fig. 3 is a plan view.

The letter A indicates the driving-wheels, having their axles mounted in an ordinary form of boxes supported by the frame-sills B. The wrist-pins C of these driving-wheels are connected to arms d, projecting downwardly from points near but not at the ends of connecting-rods D, the other ends of which are connected to the wrist-pins e of cranks E, which are mounted in bearings under the sills. The wrist-pins e extend through the ends of the cranks E, and into segmental guides f, arranged upon the upper surfaces of said sills.

At the ends of the connecting-rods D opposite the cranks are arms g, provided with wrist-pins, which are connected by a connecting-rod, H, the forward wrist-pin being connected by a rod, I, to a similar pin on an arm, K, projecting downwardly from near the outer end of the pitman L. At the extreme outer end of this pitman an arm, m, projects upwardly and is connected with the wrist-pin n of a crank, N, the shaft of which is mounted upon a bearing upon the sill B. The pin n passes through and projects inwardly from the upper end of the crank, and carries a grooved guide-roller, which straddles and rides upon a suitably-supported arc-shaped guide, O. The pitman L is connected to the cross-head p of the piston P in the ordinary manner, said cross-head being

provided with splines or ribs *g*, which move in horizontal guide-slots *r*, formed in the supporting-bars *S*.

The running-gear and connections are precisely alike on both sides of the locomotive; but the wrist-pins of one set of driving-wheels are directly opposite or at angles of one hundred and eighty degrees from those of the other set, and consequently the pistons reciprocate alternately.

In Fig. 1 the piston *P* is represented as at the limit of outward stroke, and the wrist-pins *C* of the driving-wheels are at the points corresponding to the rearward center of an ordinary crank movement; but as these pins reached this position the arms *g* of the connecting-rods *D* were carried upward, as shown, beyond the dead-center line, and the leverage gained, as indicated by the dotted lines *x x*, so that immediately the piston commences its inward stroke the wrist-pins are moved upward and forward by the connecting-rods *H* and *I*, which are connected with the pitman, and as they reach the position corresponding to the forward dead-center of a simple crank, as shown in Fig. 2, the direction of the connecting-rods or the wheels ceases momentarily; but the arms *d* of the connecting-rods on the opposite side are in their rearmost elevated position, and the rods *H I* and the pitman on that side pull the wrist-pins of the wheels to which they are connected forward, and as all the wheels are fixed upon their axles the wheels which have reached the forward dead-center are helped over the same, partly by the wheels upon the opposite side and partly by momentum.

Thus it will be seen that the wheels of each set have but one real dead-center point, while the ordinary crank movement has two.

When the wrist-pins leave their forward or dead point and approach the directly-opposite rear position, the arms *d* and rods *H* and *I*, moving toward their rearmost elevated positions, increase the leverage and augment their capacity for applying power, so that there is no decrease in the power applied to the wheels, except toward the front position of the wrist-pins, while in the old and simple form of crank movement the power applied is lost as the wrist-pin approaches both its forward and rearward positions. With respect to the common crank, I thus increase the effective power applied to the wheels, and give the locomotive capacity for equally-increased speed—that is, the speed is doubled by the mechanism alone, and as the increased power applied tends to increase the momentum, a further increase of speed is thus gained, giving an entire increase to about three times that attained by the ordinary crank-connection.

The separate cranks *E*, *E*, and *N* and the

guides *f* and *O* give a very steady motion to the connecting-rods and pitman, and the cranks support the said rods in the proper relative positions.

I of course do not confine myself to the exact construction and arrangement of the various parts, as they may be varied without departing from the principle of my invention.

What I claim is—

1. The combination, with the driving-wheels, pistons, and pitmen of a locomotive, of systems of intermediate connecting-rods arranged to overcome or counteract the loss of the effective force from that applied to the wrist-pins of the driving-wheels as they approach one of their dead-center points, substantially as described.

2. The combination, with a driving-wheel, pitman, and piston of locomotive, of an intermediate system of connecting-rods arranged to apply power to said wheel at an angle to the dead-center line thereof when the wrist-pin is on said line, whereby the wrist-pin is moved beyond the dead-center, substantially as described.

3. The combination, with a driving-wheel of a locomotive, of the connecting-rod *D*, connected to the wrist-pin thereof and crank *E*, the rod *H*, connected to said rod *D* at a point to the rear of and in a lateral direction from the wrist-pin connection, and intermediate connections between said rod *H* and the piston *P*, substantially as described.

4. The combination, with the driving-wheels, of the rods *D*, connected to cranks *E* and the wrist-pins of said driving-wheels, and provided with the upward-projecting arms connected by rod *H*, the rod *I*, connected with said rod *H*, the pitman, connected with said rod *I*, and the piston of a steam-cylinder connected with said pitman, substantially as and for the purpose set forth.

5. The combination, with the connecting-rods *D*, connected to the driving-wheels, and by intermediate connections from their rear ends with the pitman, of the supporting-cranks *E*, and guides *f*, arranged to steady said cranks, substantially as described.

6. The combination, with the pitman *L*, of the grooved friction-roller mounted thereon, and the arc-shaped guide supporting and entering the groove of said roller, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ANDREW DONATO.

Witnesses:

JOSEPH DONATO,
JAMES A. RUTHERFORD.