(No Model.)

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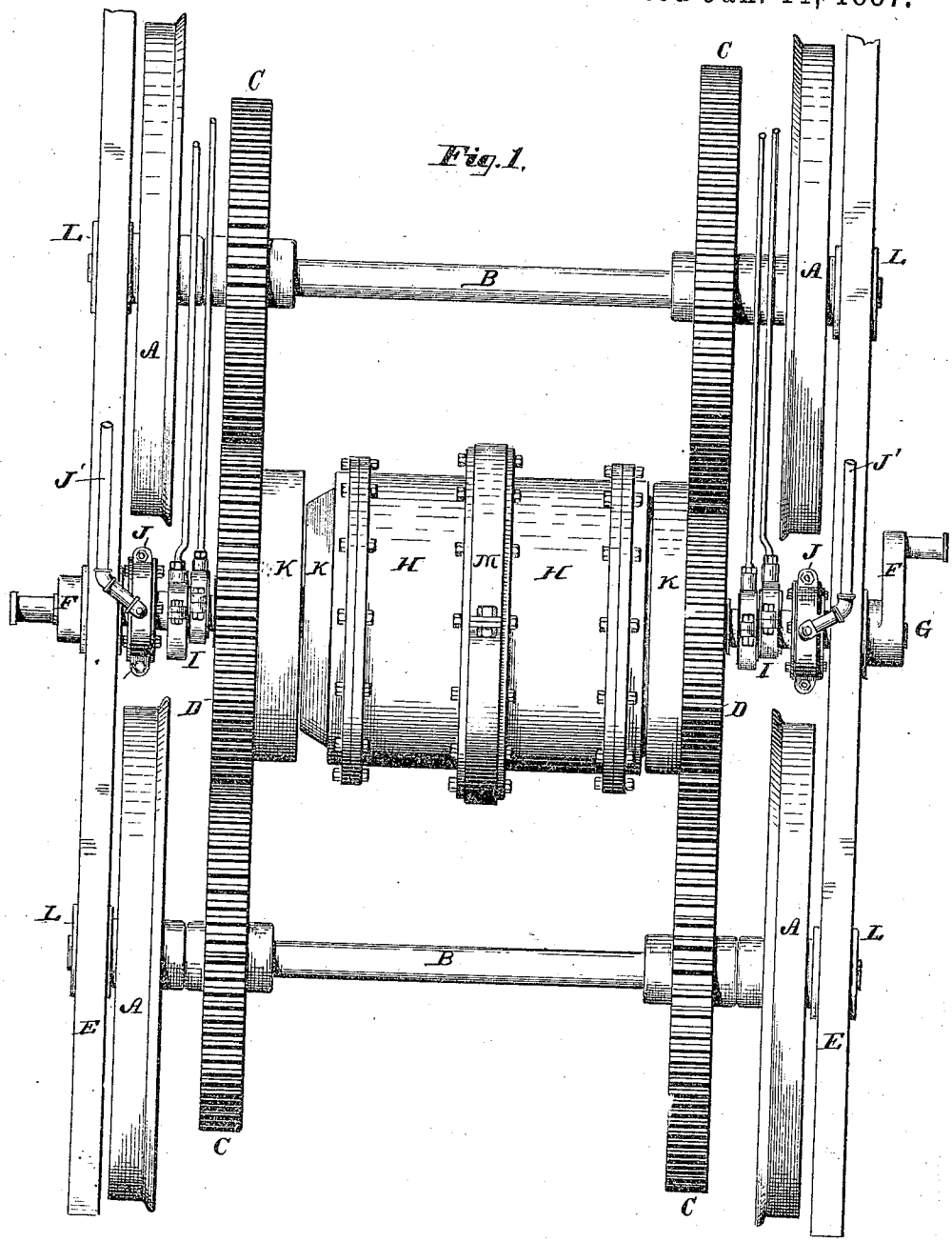
T. T. WOODRUFF.

LOCOMOTIVE ENGINE.

No. 356,085

Patented Jan. 11, 1887.

Fig. 1.



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David H. Mead.

INVENTOR

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By R. G. Dyrenforth,

his Attorney

(No Model.)

5 Sheets—Sheet 2.

T. T. WOODRUFF.

LOCOMOTIVE ENGINE.

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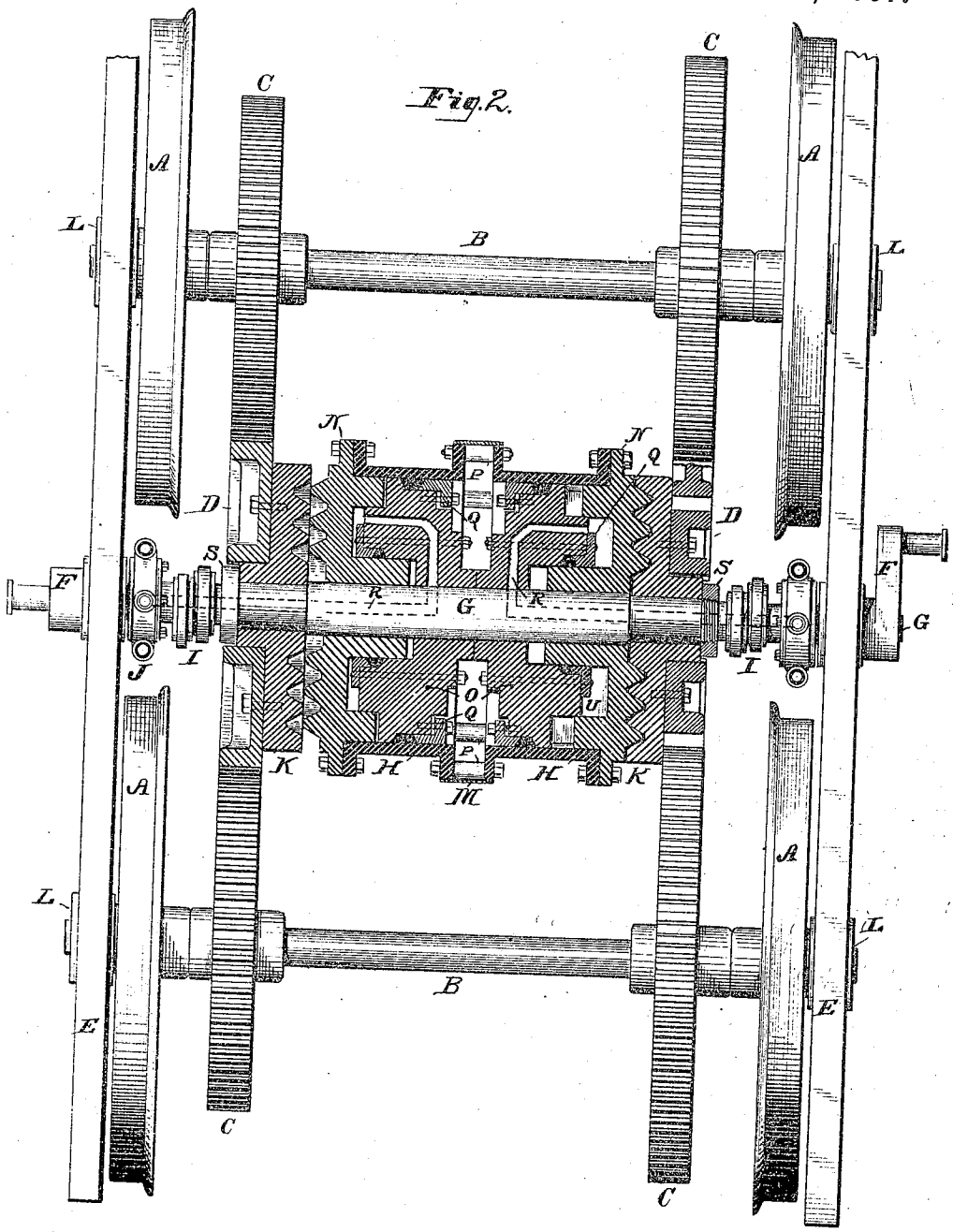
Fig. 2.



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5 Sheets—Sheet 3.

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Fig. 8.

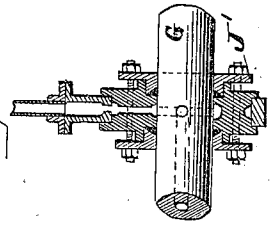


Fig. 6.

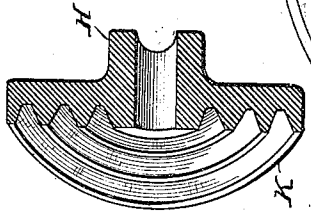


Fig. 5.

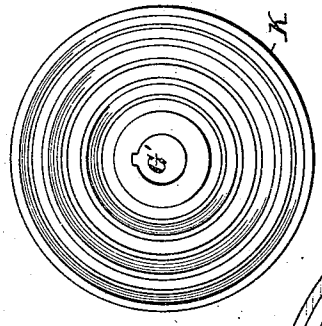
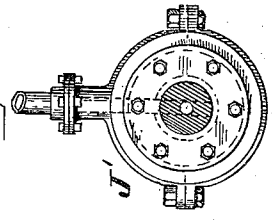


Fig. 7.



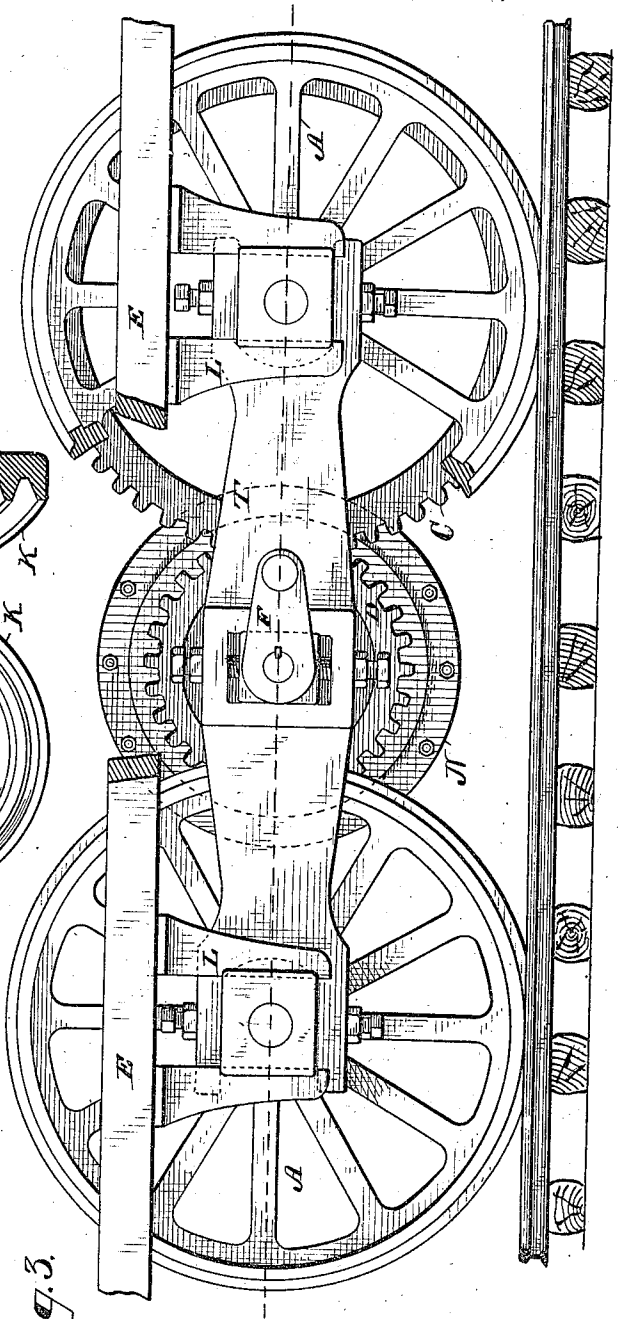


Fig. 3.

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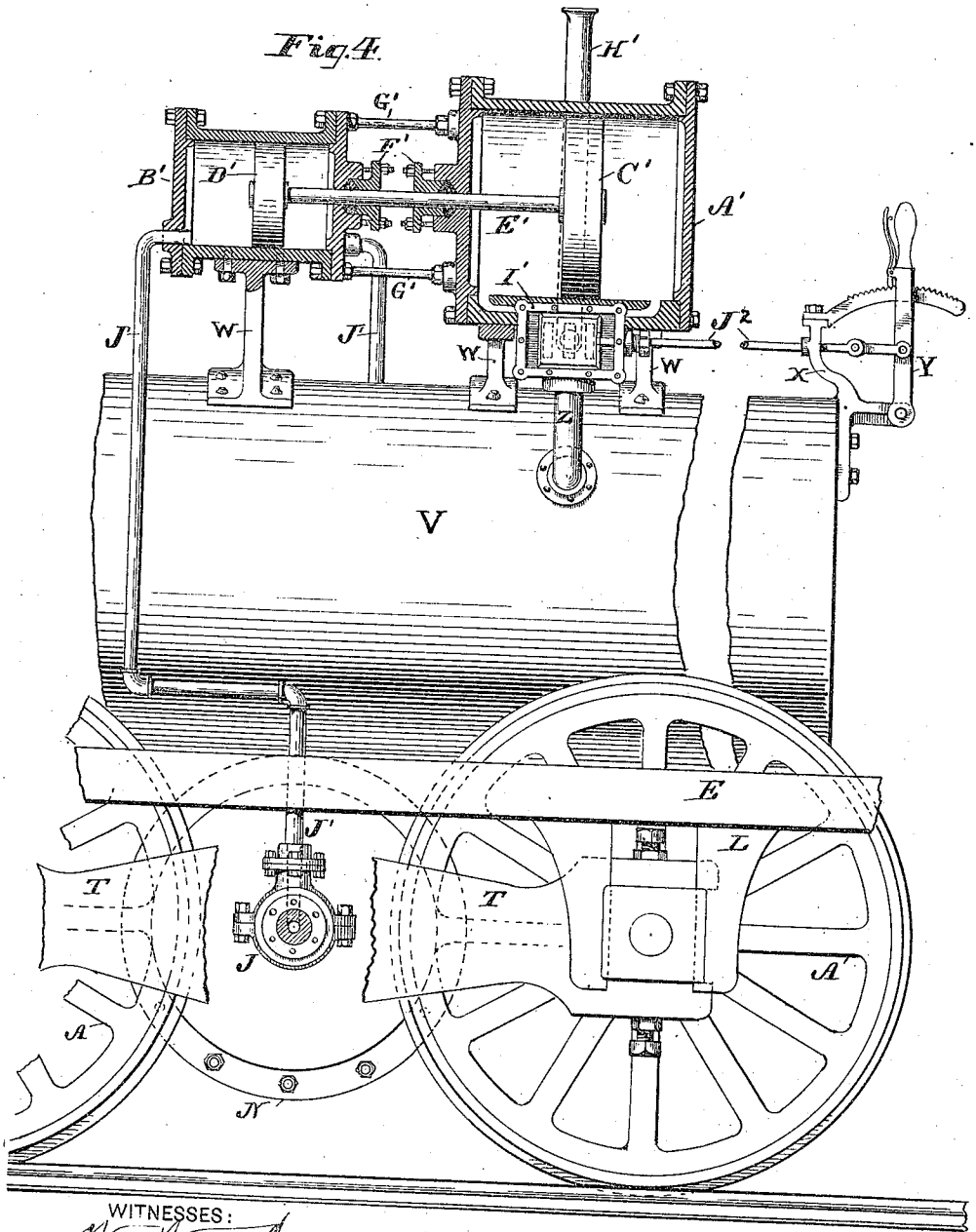
T. T. WOODRUFF.

LOCOMOTIVE ENGINE.

No. 356,085. Patented Jan. 11, 1887.

Fig. 4.



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T. T. WOODRUFF.

LOCOMOTIVE ENGINE.

No. 356,085. Patented Jan. 11, 1887.

Fig. 14.

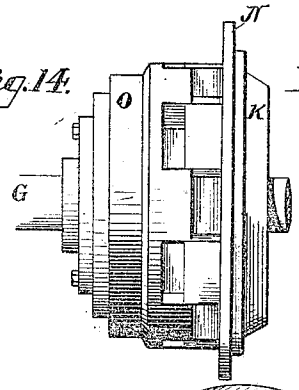

Fig. 13.

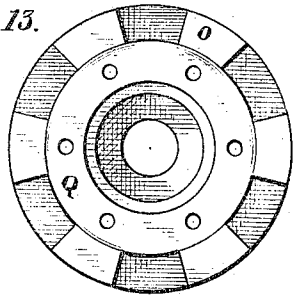

Fig. 12.

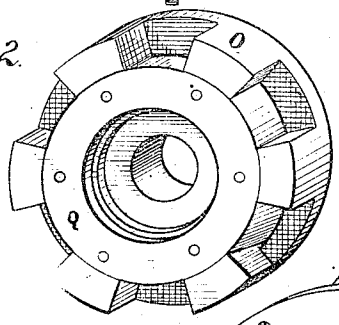

Fig. 11.

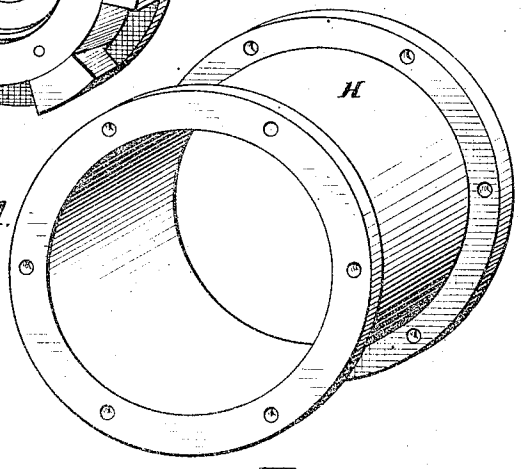

Fig. 9.

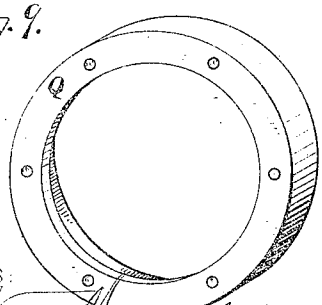

Fig. 10.

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UNITED STATES PATENT OFFICE.

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LOCOMOTIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 356,085, dated January 11, 1887.

Application filed May 1, 1886. Serial No. 200,781. (No model.)

To all whom it may concern:

Be it known that I, THEODORE T. WOODRUFF, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Locomotive-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to locomotives, and particularly to the driving mechanism thereof.

The object of the invention is to produce a driving mechanism whereby an equal number of foot-pounds of steam can be applied to the driving-wheels either at the minimum or at the maximum speed of the locomotive. Furthermore, the object is to produce a reliable driving mechanism whereby the driving-wheels receive motion in such manner as to lessen the danger of slipping and to render their respective speeds equal without the use of parallel rods. Furthermore, the object is to produce a device for imparting motion to the drive-wheels, which shall be so constructed as to render the change from a slow to a fast motion easily accomplished.

With these objects in view my invention consists, essentially, in a driving-gear for locomotives, comprising drive-wheels having their axles provided with toothed wheels, a driving-shaft mounted between the drive-wheels and provided with pinions meshing with the said toothed wheels, the pinions upon opposite sides being of different diameter and number of their cogs, and mechanism for applying the friction-coupling of the driving-shaft to the pinion upon it, which will transmit motion to the driving-wheels of the motor.

I have illustrated the invention in the accompanying drawings, in which—

Figure 1 is a plan view of my driving mechanism. Fig. 2 is a horizontal section thereof. Fig. 3 is a side elevation showing the driving mechanism, with the boiler, &c., of the engine removed. Fig. 4 is a side elevation, partly in section, showing the drive-wheels, the boiler, and a part of the mechanism whereby the shifting of the driving-gear is accomplished. Figs. 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14 represent details of construction.

In the accompanying drawings, A represents the driving-wheels of a locomotive-engine, and B represents the axles thereof.

E represents a frame provided with depending portions L, which rest upon the boxes of the driving-wheels. Upon each of the axles are placed two gear-wheels, C C, of different diameters and numbers of cogs.

G represents a driving-shaft, which is placed centrally between the drive-wheels, and is provided with a crank, F, at each end, through which motion is imparted to the drive-shaft from the pistons of the cylinders, which are not shown. There are two cog-wheels, D D, which are termed "pinions," placed upon the driving-shaft, one near each end, and so arranged as to gear with the cogged wheels upon the axles of the drive-wheels. The pinions are fitted to revolve freely upon their local sections against the collar S on the drive-shaft. Each of the pinions is so arranged relative to the cogged wheels upon the axles of the drive-wheels as to gear with the cogged wheels with each of the axles; and inasmuch as the diameter of the cogged wheels on different sides of the locomotive are different, the speed of the drive-wheels may be regulated by gearing the driving mechanism with different sides, and in order that the speed may be changed readily and at will, I provide means, which will be hereinafter clearly described, for coupling one of the pinions to a driving-shaft and for uncoupling the other pinion; or both may be uncoupled at the same time.

The pinions are fitted to revolve freely against their respective collars, S, upon the driving-shaft, and they are provided with means of rigidly coupling either one of the said pinions D D to the driving-shaft G, so that when the crank or driving shaft is forced to revolve either of the pinions which may be coupled to the said crank or driving shaft will transmit force and motion to its fellow spur-wheels C and C, which are made rigidly fast to each of their respective axles, B and B.

Upon the driving-shaft G there is placed a sliding friction-coupling cylinder, H H. The annular shell thereof and the piston O are made

in two sections. The two sections of the piston, with their hemp packing-rings Q upon them, are placed centrally between the two pinions D D, upon the driving-shaft, where the two sections O are made firmly and rigidly fast to the driving-shaft and become as one piston, which must revolve with the said driving-shaft G. The two sections H H of the said cylinder will be coupled together over the piston by a series of bolts, as at P P. The two heads N and N of the cylinder are fitted to their local places upon the driving-shaft, that they can readily slide back and forth on the same. The hubs of the cylinder-heads extend into a recess in the piston upon their respective sides of the piston, each of which are provided with hemp packing-rings Q, by which the said hemp packing will be set and held in its place by a series of bolts through the flanges of the said packing-rings Q.

Each of the two cylinder-heads N and N are coupled to the piston on their respective sides by a series of alternate projections and recesses upon the disks of the cylinder-heads and upon the disks of the piston. The projections and recesses are arranged concentric with the driving-shaft G, each of which occupy alternate spaces between lines radiating from the center of their revolving motion, so that the projections upon one of the parts will correspond with and enter into the recess of its fellow, and in this way coupling the two heads to the piston so far as relates to rotary motion. By the above described means the coupling of the said cylinder H and H with all of its parts is made to revolve with the said crank or driving shaft, and at the same time is allowed to slide longitudinally upon its piston and upon the driving-shaft without uncoupling either of the cylinder-heads from the piston. The annular opening between the two sections of the piston and cylinder is for the purpose of reaching the packing-bolts.

On each of the two heads of the cylinder H and H there is a series of V-shaped annular grooves and flanges, which are set concentric with the driving-shaft, and upon each of the said pinions D and D there are corresponding grooves and flanges, so that the annular flanges upon one of the pieces will correspond with the grooves of its fellow coupling. Thus when the two pieces are brought together the surfaces of the flanges of one piece will correspond with and fit to the surface of the grooves of their fellow couplings. When force is applied, the annular flanges and grooves will be wedged one into the other, and constitute a firm revolving coupling. The crank-shaft G is supported and held in position by a truss-hanger, T, at each end thereof, the ends of the hanger being adjusted to rest upon the journal-boxes of the axles at L.

Upon the steam-boiler V there is mounted a steam oil-pump, with its cylinders A' and B' resting upon their supports W, which are secured to the boiler, the cylinders being cut through longitudinally on a vertical plane of their centers. The steam and oil cylinders are each rigidly coupled to the other by a series of bolts, G'. The two pistons C' and D' are each upon the same rod E', and the piston-rod is provided with the ordinary stuffing-boxes, at F', as shown. The steam-cylinder is provided with the ordinary sliding-valve steam-chest I', with valve-rod J^2, with valve-rod support X, and valve-lever Y, steam-induction pipe Z, and steam-exhaust pipe H'.

Upon the crank-shaft is placed the ordinary valve-moving eccentrics, I. There are also two oil-pipe coupling-boxes, J and J, which adapted to the diameter of the shaft. The said boxes are coved out from the inside centrally between the two sides, so that there is an annular cove or chamber in the box around the shaft. It is also provided with stuffing-boxes and oil-pipe connections J' J', so that oil can pass through the pipes into the annular chamber in the said coupling-boxes, and thence through the oil-ports R and R into the coupling-cylinder. (See Figs. 2, 4, 7, and 8.) There will be a metallic wrapper, M, around the annular opening between the two sections of the pistons O and cylinder H and H.

Since I have so fully described the mechanism of my invention, I may make it more clearly understood by describing its operation.

The engineer, by a movement of the hand lever, Y, admits steam into the steam-pump cylinder A', which operates upon the oil-piston D', which is upon the same rod E', and forces the oil from one of the oil-chambers of the pump-cylinder out through one of the oil-pipes, J', and through its coupling-box J and oil-port R into one of the chambers of the sliding cylinder H H, and slides the cylinder longitudinally over the piston upon the drive-shaft and carries the annular flange and groove coupling into forced contiguity, which couples the drive shaft G to one of the pinions D, which then is the dominant or driving pinion, when the opposite pinion may run loosely upon the driving-shaft. To change the coupling from one driving-pinion to the other, the engineer will throw the valve-lever Y over and admit steam into the cylinder A' upon the opposite side of the piston C', which will reverse the oil-pump piston D' and force the oil from the other chamber of the pump-cylinder through its train of pipes into the chamber of the sliding cylinder, which will force the cylinder away from its first coupling into coupling with the other pinion upon the drive-shaft, when it becomes the dominant or driving pinion, all of which is produced by one thrust of the steam-pump, either when the motor is at a stand or running upon the rails. The oil or other fluid employed as the agent of force in the steamp-pump is in separate chambers, and is pumped back and forth upon their respective sides of the piston.

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

1. A driving mechanism for locomotives, comprising driving-wheels having gear-wheels placed upon them or upon their axles at each side and a power-shaft provided with pinions meshing with the gear-wheels, the said pinions being adjustable to revolve freely upon the shaft, whereby their couplings may be moved into or out of coupling with the driving-shaft, substantially as described.

2. A driving mechanism for locomotives, comprising two pairs of driving-wheels having gear-wheels placed upon them or upon their axles and a power-shaft provided with pinions at each end meshing with the gear-wheels of each pair of drive-wheels, substantially as described.

3. A driving mechanism for locomotives, comprising driving-wheels having gear-wheels placed upon them or upon their axles at each side, and a driving-shaft provided at each end with pinions meshing with the gear-wheels upon each pair of driving-wheels, the said pinions being of different diameter and number of cogs and fitted to revolve freely upon the shaft.

4. The combination of the sliding revolving coupling-cylinder with the piston and drive-shaft provided with the pinions and the axles having pinions gearing with those on the drive-shaft, substantially as described.

5. The annular flange and groove coupling, in combination with the sliding frictional coupling-cylinder and drive-shaft provided with the pinions and the axles having pinions gearing with those on the drive-shaft, substantially as described.

6. A sliding cylinder, in combination with a piston located upon a stationary or revolving shaft provided with the pinions and the axles having pinions gearing with those on the drive-shaft when the cylinder is made to slide longitudinally over the piston by a forced application of any fluid substance, as the agent of movement, for the purpose of transmitting motion and force by or from a movement of the cylinder over the piston, substantially as described.

7. A double-acting pump, with its projecting and inducting pipes and pipe-coupling boxes, in combination with a sliding cylinder, substantially as described.

8. A driving mechanism for locomotives, comprising two pairs of driving-wheels with their axles having two cogged spur-wheels of different diameters and number of cogs upon each of the axles or upon their respective drive-wheels, and a driving-shaft provided with two pinions adapted to revolve loosely or be coupled to the said driving-shaft and made to revolve with it, the said pinions also being adapted to gear into their fellow cogged spur-wheels upon each of the two pairs of axles of driving-wheels, all substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

THEODORE T. WOODRUFF.

Witnesses:
R. G. DYRENFORTH,
W. W. MORTIMER.