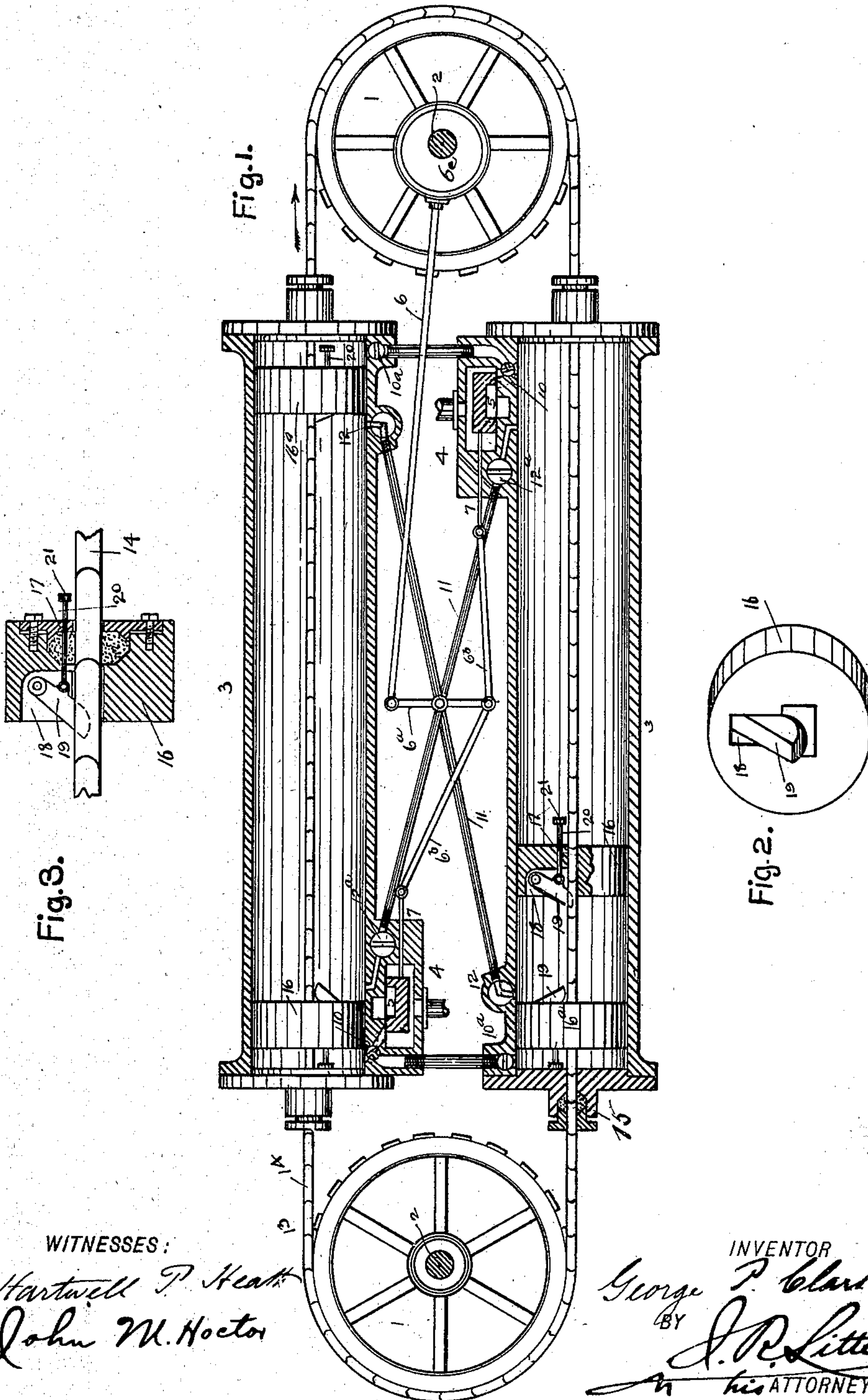


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PATENTED JUNE 23, 1903.

G. P. CLARK.
LOW SPEED STEAM ENGINE.
APPLICATION FILED OCT. 3, 1901.

NO MODEL.



WITNESSES:

Hartwell P. Heath
John M. Hoctor

INVENTOR

George P. Clark,
BY J. R. Littell,
his ATTORNEY.

UNITED STATES PATENT OFFICE.

GEORGE P. CLARK, OF ALEXANDRIA, VIRGINIA, ASSIGNOR OF ONE-HALF
TO E. MANN VYNNE, OF NEW YORK, N. Y.

LOW-SPEED STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 731,664, dated June 23, 1903.

Application filed October 3, 1901. Serial No. 77,346. (No model.)

To all whom it may concern:

Be it known that I, GEORGE P. CLARK, a citizen of the United States, residing at Alexandria, in the county of Alexandria and State of Virginia, have invented certain new and useful Improvements in Low-Speed Steam-Engines, of which the following is a specification.

This invention relates to engines, and particularly to steam and analogous engines of the low-speed type, and has for its object to provide an improved steam-engine of the class described in which pistons and cross-heads are dispensed with and in which there is a direct continuous exertion of the power in line with the periphery of the driving-wheels, whereby the loss of power is reduced to a minimum.

Another object of my invention is to provide an improved steam-engine of the class described in which there is no dead-center.

In the drawings, Figure 1 is a side elevation of an engine, showing the cylinder in central longitudinal section. Fig. 2 is a detail perspective view of one of the driving-heads. Fig. 3 is a detail perspective view showing the stuffing-box on the driving-heads.

Corresponding parts in all the figures are denoted by the same reference characters.

My improved engine comprises in general two driving-wheels or one driving-wheel and one idler; two cylinders located between said wheels and parallel to each other, each of said cylinders being provided at each end with inlet and exhaust valves and with a valve communicating through suitable connections with a similar valve at the opposite end of the other cylinder; a belt mounted on said wheels and extending through said cylinders; a pair of driving-heads mounted in each cylinder and adapted to clamp said belt when one moves toward the other and to move freely on said belt when one moves away from the other, one head in each cylinder being operative to drive the engine in each direction, and means for operating said valves. The organization of the parts is such that when steam is admitted to one of the cylinders at one end the head at that end is driven toward the other head at the other end, clamping the belt and carrying it with it. When such head has moved about two-thirds of the length of the cylinder, the steam is cut off from its cylinder, and when

the end of the stroke is reached the exhaust is opened. At the same time the inlet-valve at the opposite end of the other cylinder is opened and simultaneously the valve at the opposite end of such cylinder, communicating with the valve at the opposite end of the first cylinder, and such latter valve are both open. The driving-head in such second cylinder is driven in the opposite direction to that in which the first head moved, clamping and carrying the belt with it and forcing the air through the communication between the two cylinders. This air drives the first head back to the end of the cylinder, such head moving freely in this direction on the belt. When the second head has moved about two-thirds of the length of its cylinder, the steam is cut off, and when the end of the stroke is reached the exhaust is opened and the head is returned to the other end of its cylinder by the operation previously described in connection with the other cylinder. To reverse the engine, the steam is admitted to the opposite end of the first cylinder in the first instance, and the corresponding working head in the other cylinder will be operated in a similar manner to that described for the first head, but in the opposite direction.

In the form shown in the drawings, and which, if desired, may be the preferred form, my improved engine comprises two driving-wheels 1 or one driving-wheel and one idler, which may be of any suitable construction, herein shown as sprocket-wheels. Such wheels 1 are carried by suitable shafts 2. Between such wheels 1 two cylinders 3 are mounted parallel to each other and with the distance between their centers substantially equal to the outside diameter of the wheels 1. Each of the said cylinders 3 is provided at one end with a steam-chest 4, which has the usual connections with a suitable source of supply. (Not shown.) In each of said steam-chests 4 there is an inlet and exhaust valve 5, communicating with said cylinders 3. Suitable cut-off valves 10 and 10^a are provided in such communications with the cylinders 3. Such valve 5 may be of any suitable form, herein shown as an ordinary slide-valve, and may be operated in any suitable manner, herein shown as an eccentric rod 6, connected

with an eccentric 6^c, mounted on the shaft 2 and operating through the pivoted arm 6^a and rods 6^b, provided with suitable stuffing-boxes 7. The organization is such that the inlet-valve 5 in one cylinder 3 will be closed when the driving-head 16 in such cylinder has moved about two-thirds of the length of such cylinder and the exhaust opened when the stroke is completed, and at the same time the inlet-valve 5 in the other cylinder 3 will be opened.

From a short distance from each end of each cylinder 3 suitable means of connection, herein shown as a pipe 11, extends to the opposite end of the companion cylinder 3, such pipes 11 being provided at each end with suitable valves, herein shown as ordinary cut-off valves 12 and 12^a. Such valves 12 and 12^a at the opposite ends of each of the pipes 11 are organized to be operated simultaneously in a timed relation to the inlet-valves, as hereinafter described.

Suitable driving means are provided for the wheels 1. Such means are herein shown as a sprocket-chain 13, provided with substantially square or rectangular links 14 so organized that when the chain 13 is straightened out it will present a solid surface. This chain 13 passes through the cylinders 3, suitable stuffing-boxes 15 being provided at each end of each cylinder 3.

Instead of the sprocket-wheels 1 and the sprocket-chain 13 ordinary wheels with a smooth periphery and a friction-belt may be used when the power required is small.

A pair of suitable driving-heads 16 and 16^a is provided in each cylinder 3, one of which normally rests near each end of each of the cylinders 3. Such heads 16 and 16^a are adapted to receive the chain 13 and are provided with suitable stuffing-boxes 17 and are provided with suitable means for gripping the chain 13 when moving forward in the cylinders 3, which means are inoperative when said heads 16 and 16^a are moving back to their normal positions. A convenient form of such gripping means is herein shown and consists of a recess 18 in the forward face of each of said heads 16 and 16^a, in which recess 18 a dog 19 is pivotally mounted, said dog 19 being normally inclined forward and resting on the chain 13. When the head 16 moves forward, the dog 19 presses the chain 13 against the opposite wall of said recess 18 and grips it so that it is carried along with the head 16. When the head 16 commences to move backward, it is evident that the dog 19 will swing forward and the chain 13 move freely through the head 16. To insure a positive release of the chain 13, a pin 20 may be slidably mounted in each head 16 and extend through said head 16, one end bearing against the inner surface of said dog 19 near its free end, and its other end, which, if desired, may be provided with a head 21, normally projecting beyond the rear surface of such head 16, so that when such head 16 moves back toward the end of the cyl-

inder 3 the projecting end of the pin 20 will come in contact with the inner wall of such end of the cylinder 3 and the pin 20 be pushed forward, pressing the dog 19 away from the chain 13.

Instead of the dogs 19 the heads 16 and 16^a may be provided with rollers and inclined surfaces, which will operate to grip the chain 13 when the heads 16 and 16^a move forward and to release the chain 13 and permit it to pass freely through said heads 16 and 16^a when they move backward.

The operation and advantages of my invention will be readily understood and appreciated. The steam-chests 4 being connected with a suitable steam-supply, the lever is turned to open the valves 10 and 12, the inlet-valve 5 at one end of one of the cylinders 3 being open. The steam enters such cylinder and causes one of the heads 16 to move forward, gripping and carrying the chain 13 with it. When the head 16 has moved about two-thirds of the length of the cylinder 3, the inlet-valve is closed, and when the stroke is completed the exhaust-valve is opened and at the same time the inlet-valve at the other end of the companion cylinder 3 is opened. The steam enters the second cylinder 3, causes the head 16 to move forward, gripping and carrying the chain 13 with it and forcing the air in front of said head 16 in the cylinder 3 through said pipe 11, the valves 12, and against the first head 16, which is forced back toward its normal position near the end of the cylinder 3, in which movement it slides freely on the chain 13. To reverse the engine, the lever is turned in the opposite direction, opening the valves 10^a and 12^a. This admits the steam first to the opposite end of the first cylinder and forces the head 16^a forward. When the head 16^a has moved about two-thirds of the length of its cylinder, the steam is cut off, and when the stroke is completed the exhaust is opened, when the operation as described as to the heads 16 is repeated as to the heads 16^a, except that the heads 16^a move in the opposite direction and the valves 10^a and 12^a take the place of the valves 10 and 12. It is evident that one of the heads 16 or 16^a in one of the two cylinders 3 pulls continuously on the chain 13 in the same direction and in line with the outside periphery of the driving-wheels 1 while moving in the same direction. Hence there can be no dead-center and the power must be exerted to its maximum extent directly and positively upon the driving-wheels 1.

My invention is especially adapted to automobiles or motor vehicles and is not confined to steam-engines, but may be applied to any vapor-engine or machine requiring the use of rotary motion.

I do not desire to be understood as limiting myself to the details of construction and arrangement as herein described and illustrated, as it is manifest that variations and modifications may be made in the features of construction and arrangement in the adapta-

tion of the device to various conditions of use without departing from the spirit and scope of my invention and improvements. I therefore reserve the right to all such variation and modification as properly fall within the scope of my invention and the terms of the following claims.

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

1. The combination with motor mechanism, of cylinders; a drive-belt passing through said cylinders, and means operable in said cylinders for clutching and carrying forward said drive-belt continuously during the operation of said mechanism.
2. The combination with motor mechanism, of cylinders; a drive-belt passing through said cylinders, and means operable in said cylinders, comprising heads adapted to clutch said drive-belt and carry it forward continuously during the operation of the mechanism.
3. The combination with motor mechanism, of cylinders; a drive-belt passing through said cylinders; and a plurality of friction-clutches operable in said cylinders and adapted alternately to clutch and carry the drive-belt forward continuously during the operation of the mechanism.
4. The combination with motor mechanism, of cylinders; and a duplicate series of friction-clutches operable in said cylinders, and adapted one set to clutch and carry the drive-belt forward continuously when the mechanism operates in one direction and the other set when the mechanism is reversed.
5. The combination with motor mechanism, of a pair of wheels, cylinders between said wheels, a drive-belt passing through said cylinders; and heads operable in said cylinders and adapted to clutch and carry said belt forward continuously during the operation of said mechanism.
6. The combination with motor mechanism, of a pair of drive-wheels; a pair of cylinders located between said wheels; a drive-belt passing through one of said cylinders on each passage from one wheel to the other; and a

head operable in each of said cylinders and adapted alternately to clutch and carry said belt forward continuously during the operation of the mechanism.

7. The combination with mechanism, embodying a pair of drive-wheels, of a pair of cylinders located between said wheels, a drive-belt passing through one cylinder in going and through the other in returning between said wheels; and a duplicate series of heads operable in said cylinder and adapted to clutch and carry said belt forward continuously during the operation of said mechanism, one series when going in one direction and the other series when going in the opposite direction.

8. The combination with motor mechanism of a pair of drive-wheels; a pair of cylinders located between said wheels; a drive-belt passing through one of said cylinders on each passage from one wheel to the other; a movable head operable in each of said cylinders and adapted alternately to clutch and carry said belt continuously forward during the operation; and means for returning such movable heads to the opposite end of their respective cylinders after having carried the drive-belt forward through the space in which they move.

9. The combination with motor mechanism, of a pair of cylinders positioned parallel to each other, an endless driving-belt passing through each of said cylinders, and a pair of movable heads operable in each of said cylinders from opposite ends and adapted to clutch and carry forward the belt, the head at one end of one cylinder alternating with the head at the other end of the other cylinder going one way and the other pair of heads alternating when the motion is reversed.

In testimony whereof I have signed my name in the presence of the subscribing witnesses.

GEORGE P. CLARK.

Witnesses:

HARTWELL P. HEATH,
JOHN M. HOCTOR.