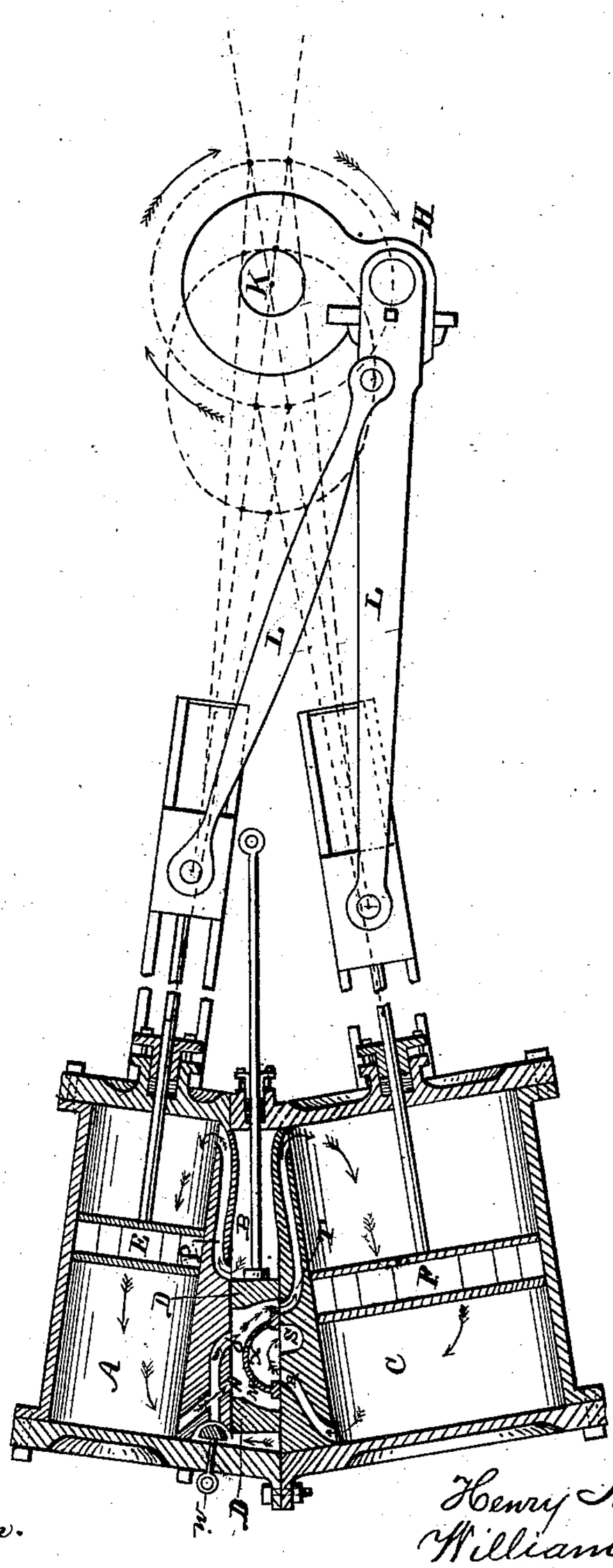
(Model.)

H. &. W. MONK.

STEAM ENGINE.

No. 273,126. Patented Feb. 27, 1883.



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HENRY MONK AND WILLIAM MONK, OF HADLOW, QUEBEC, ASSIGNORS OF ONE-SIXTH TO JOHN A. SEWARD DUNSCOMB, OF QUEBEC, CANADA.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 273,126, dated February 27, 1883.

Application filed April 4, 1882. (Model.)

To all whom it may concern:

Be it known that we, HENRY MONK and WILLIAM MONK, citizens of Canada, residing at Hadlow, in the county of Levis, in the Province of Quebec, subjects to Her Majesty Queen Victoria, have invented certain new and useful Improvements in Double-Cylinder Steam-Engines, of which the following is a specification.

Our invention relates to that class of engines known as "high and low pressure engines," where the exhaust-steam of a small cylinder is conducted by the valve to a second or larger cylinder and compelled to drive the piston of the latter.

The object of our invention is to have the cylinders and steam-chest so combined that there will be very little space for radiation and unnecessary expansion of the steam, also to have as little reciprocating motion as possible, and to reduce the valve friction to a minimum, and to have the connecting-rods so arranged and constructed as to couple both pistons to one crank, also to have the valve so constructed and the ports arranged so as to operate high-pressure steam in the low-pressure cylinder, so that the engine can be made to start up with full power, for the present high and low pressure engine cannot start with full power, as it has to make several revolutions before the exhaust-steam of the high-pressure cylinder exerts any power on the low-pressure piston. Our object to start up the engine quickly is to have the cylinders so constructed as to be adapted to locomotives, for locomotive-engines have to start up quickly, and they are required to have cylinders that will give a great variation of power, according to the size of the train the engine is hauling.

The drawing shows a sectional side elevation of our improved steam-engine.

A is the high-pressure cylinder. B is the steam-chest. C is the low-pressure cylinder. D is the slide-valve. E is the high-pressure piston. F is the low-pressure piston. H is the crank. L L is the fork connecting-rod. K is the main shaft. M is the passage in the valve D. X is the exhaust-cavity, also in valve D. N O P R S T are the steam-ports. W is the check-valve.

To form a correct idea of the working of this engine, it is to be supposed that check-valve W is closed, and then the steam would be working expansively.

All mechanical engineers know the expansive force of steam and the economy obtained by expanding it, and they will understand why a larger cylinder is employed to expand the steam after it has done its work in the high-pressure cylinder. Now, suppose the steam is admitted into the steam-chest B, and, as seen by the drawing, the valve D is moved backward and steam-port P is open, the steam rushes against high-pressure piston E and exerts its full power to push piston E to the other end of the cylinder. At the same time the steam is exhausting from the opposite end of the same cylinder through steam-port N and steam-passage M into steam-port T. The exhaust-steam of the high-pressure cylinder is thus compelled to push the low-pressure piston F to the other end of the cylinder at the same time the steam is escaping from the opposite side of the piston F, thus giving free play to the advancing piston, the escaping steam passing through steam-port R into the exhaust-cavity X, and then into the exhaust-port S. Thus the steam has completed its work and then escapes into the atmosphere or condenser. The action of the steam is brought into play as the crank turns the center and the pistons commence their outward stroke, and so on during the working of the engine, except, when the check-valve W is opened, the steam rushes into steam-port O. Then the low-pressure cylinder works high-pressure steam, thus giving the engine a great power, as the low-pressure cylinder is four times the area of the high-pressure cylinder; so it will be seen that the engine can exert a great power when it is required, or when starting the engine. It is only necessary to open check-valve W to warm up the low-pressure cylinder to the temperature of steam.

It must also be understood that when the check-valve W is opened the high-pressure cylinder A acts only as a steam-chest, as its piston E exerts no power.

As will be seen by the drawing, the cylinders are angled, so that the center of each is

in direct line with the center of the main shaft K, and that both pistons are coupled to a fork-connecting-rod, L L, which connects them to one crank, H, and, although both pistons are connected to one crank, it is impossible to put the engine on a dead point or center.

As the engines now in use which have one crank can be centered or put on a point where it will not start, the reason why our engine will not center is due to the angle of the cylinders, for when one piston is in direct line with the crank the other is not.

Another advantage gained by this style of engine is the reduction of back-pressure on the high-pressure piston. This is caused by the low-pressure piston being always in advance of the high-pressure piston, thereby taking away a great amount of exhaust-steam from the latter piston before it commences its stroke. Also, the valve D can be so constructed as to cut off the steam from the high-pressure cylinder earlier in the stroke, and still let the exhaust-steam escape from the latter cylinder to supply the low-pressure cylinder for the full length of the stroke. This is another advantage in this class of engines operated by one valve, as it further expands the steam.

One cause which makes the low-pressure piston travel always in advance of the high-pressure piston, when the crank is turning in the direction of arrows, is, that the centers of both the cylinders are never in direct line with the crank at the same time; another cause is that, when the crank is turning in the direction named above, the low-pressure cylinder is nearer to the crank than the high-pressure cylinder, thus causing the low-pressure piston to be farther advanced in the inward stroke than the high-pressure piston, and if the crank were in the position indicated by the dotted line the high-pressure cylinder would be nearer to the crank than the low-pressure cylinder, thus causing the piston of the latter to be farther advanced on the outward stroke, and so on during the whole revolution, and the strains and sudden shocks which are common in the present single-crank engine when turning past the center are greatly reduced by the use of this fork connecting-rod L L.

We are aware that prior to our invention high and low pressure engines were operated by one valve. We therefore do not claim such a combination, broadly; but

What we do claim as our invention, and desire to secure by Letters Patent, is as follows:

1. The combination of the high and the low pressure cylinders having their centers in direct line with the main shaft, the rods connecting both piston-rods with the same crank, and the slide-valve, located between the cylinders and having means for converting the low-pressure into a high-pressure cylinder at will, substantially as shown and described.

2. The combination of the high and the low pressure cylinders A C, the steam-chest B, the slide-valve D, having passage M and cavity X, the ports N O P R S T, and the check-valve W, substantially as shown and described.

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