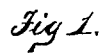


**Patented Aug. 5, 1879.**



George A. Gray Jr *INVENTOR*  
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G. A. GRAY, Jr.  
Steam-Engine.

No. 218,171.

Patented Aug. 5, 1879.

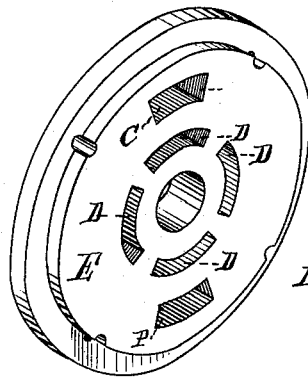


Fig 2

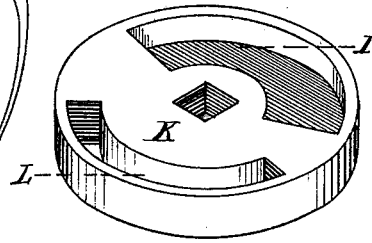


Fig 3

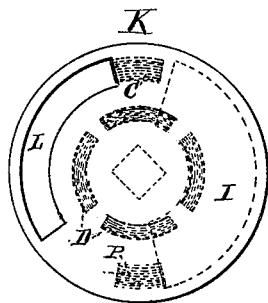


Fig 4

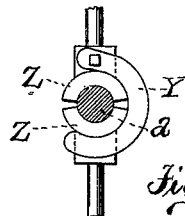


Fig 6

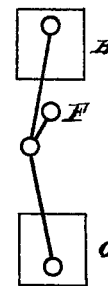


Fig 5

WITNESSES:

Geo P. Tangueman  
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# UNITED STATES PATENT OFFICE

GEORGE A. GRAY, JR., OF COVINGTON, KENTUCKY.

## IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. **218,171**, dated August 5, 1879; application filed May 6, 1879.

### *To all whom it may concern:*

Be it known that I, GEORGE A. GRAY, JR., of Covington, Kenton county, Kentucky, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

The object of my invention is to provide a steam-engine which, by reason of its requiring no attention in the way of adjustment, packing, or lubrication, can be satisfactorily operated by unskilled persons, and which, by reason of its low first cost, can be more readily adapted to the wants of such persons.

My invention consists of an arrangement of two single-acting cylinders, cast separately, and united by a central transverse flanged joint, the main-shaft bearings being formed in the joint of separation; of a novel arrangement of the crank-shaft, whereby it is caused to project into the steam-chest and into the driving-socket of a disk-valve, thus serving to drive the valve, while at the same time the valve effectually prevents the passage of live steam to the journal upon the steam-chest side of the engine; of a false valve-seat covering the joint of separation crossing the valve-seat proper, and of a novel duplex crank-box.

In the accompanying drawings, Figure 1 is a vertical section of the engine; Fig. 2, a perspective view of the false seat for the valve; Fig. 3, a perspective view of the valve; Fig. 4, an elevation of the valve; Fig. 5, an elemental diagram of the main motion-work, and Fig. 6 a side view of the crank-box.

As shown in Fig. 2, the two cylinders R and S are bolted together with their inner open ends facing each other and their axes in the same line. The cylinders are placed some distance apart, and the inclosed space W between them forms the exhaust-chamber, and is provided with the outlet M. The main shaft F passes centrally across this chamber and runs in boxes formed in the chamber-walls. One end of the shaft projects to receive wheels, &c. Each of the cylinders has a piston, which is connected to a mutual crank by a connecting-rod. The connecting-rod boxes are made of that peculiar composition of copper and tin which is lubricated by steam.

It will be seen that the crank-boxes, in addition to being self-lubricating, are subjected to

force in but one direction, and that lost motion will not result in knocking.

The connecting-rod boxes need no caps, and only require that accidental displacement be guarded against.

Fig. 6 shows the construction of the connecting-rod boxes. Each rod carries a half-box bearing upon the whole length of the crank-pin. The outside of the boxes are turned to receive and fit the ring-clasp Y, which is bolted to one box. This clasp is a safeguard, and is not subject to much wear. This construction allows me to utilize to the utmost the full length of the crank-pin to resist the wearing action. No system of bifurcation of bearings would allow this to be done. It is almost impossible for this motion-work to get out of repair during the life-time of the engine, even in case it never receives the slightest attention. It does not depend on the attendant's keeping it in adjustment or lubricated, and no soft packing is required about any of the parts.

The outer end of one of the main-shaft bearings has its outside greatly enlarged to form the base for the valve-seat. The face of this enlargement might serve as the valve-seat; but the line of juncture formed by the joint between the cylinders is not desirable upon a valve-seat, and I avoid it by placing against the main seat the false seat E. A steam-chest, H, having an inlet, J, fits against the seat, and with it is bolted to the main seat or base.

The false seat is shown in Fig. 2. It is provided with the ports C and P, reaching to the outer ends of the cylinders, and with the annular port D, which leads to the exhaust-chamber between the cylinders.

The main shaft projects slightly through the false seat E, and this projection is squared or otherwise shaped to directly engage with and operate the disk-valve K. This valve has through it the mortise L, in such position and of such length that during its rotation it will allow steam to enter the cylinders alternately at and during the proper time, being subject to the same considerations of lead and cut-off as apply to common slide-valves.

The valve has in its face the pocket I, in such position and of such length that it will allow the steam, at and during the proper time, to pass from the cylinders alternately

through the annular port D to the exhaust-chamber W, being subject to the same considerations of release and compression as apply to common slide-valves. The pocket I is always in communication with the annular port D.

If desired, the driving-socket may be adjustable within the valve, so as to render the lead, &c., adjustable; but I prefer to arrange for the proper results when I construct the engine, and thus put it beyond the power of the ignorant or wise to alter that which has proved best.

The engine is shown as vertical; but it may be inclined or horizontal, if desired.

While all my preferences point to the use of the central chamber W as an exhaust-chamber, I do not insist upon it as essential. The annular port D may have a side outlet to the air, if desired, and the entrance to the chamber may be closed. In such case the self-lubricating qualities of the engine are destroyed, and provision must be made for oiling as usual. This is to be done by leaving the chamber open at places, so as to render the interior accessible.

I wish to mention that the terminal end of the mortise L in the valve may be shortened, and thus hasten the cut-off and prolong the expansion, and that this point of cut-off is independent of the exhaust, and may thus be lo-

cated at any point of the stroke. In this respect the valve varies greatly from the common slide-valve, which will not allow the cut-off to occur before a certain time in the stroke without deranging the release.

I claim as my invention—

1. In a steam-engine, the two cylinders, formed in separate pieces and united by a central flanged joint, as set forth, and having the main-shaft bearings formed in the joint of separation, substantially as specified.

2. In a double-cylinder engine, the crank-shaft lying in bearings upon each side of the crank, one end of said crank projecting through one of said bearings into the steam-chest, and there capped by the driving-socket of a disk-valve, substantially as specified.

3. In an engine having a transverse joint of separation between two cylinders and across the valve-seat, as set forth, the combination, with a disk-valve, of a false valve seat and a steam chest, substantially as specified.

4. The combination of the crank-pin with the half connecting-rod boxes and the clasp for retaining the half-boxes, substantially as specified.

GEORGE A. GRAY, JR.

Witnesses:

M. M. BENTON,  
W. K. BENTON.