(No Model.)

G. AAB.

DUPLEX STEAM ENGINE.

No. 249,567. Patented Nov. 15, 1881.

Fig. 1.

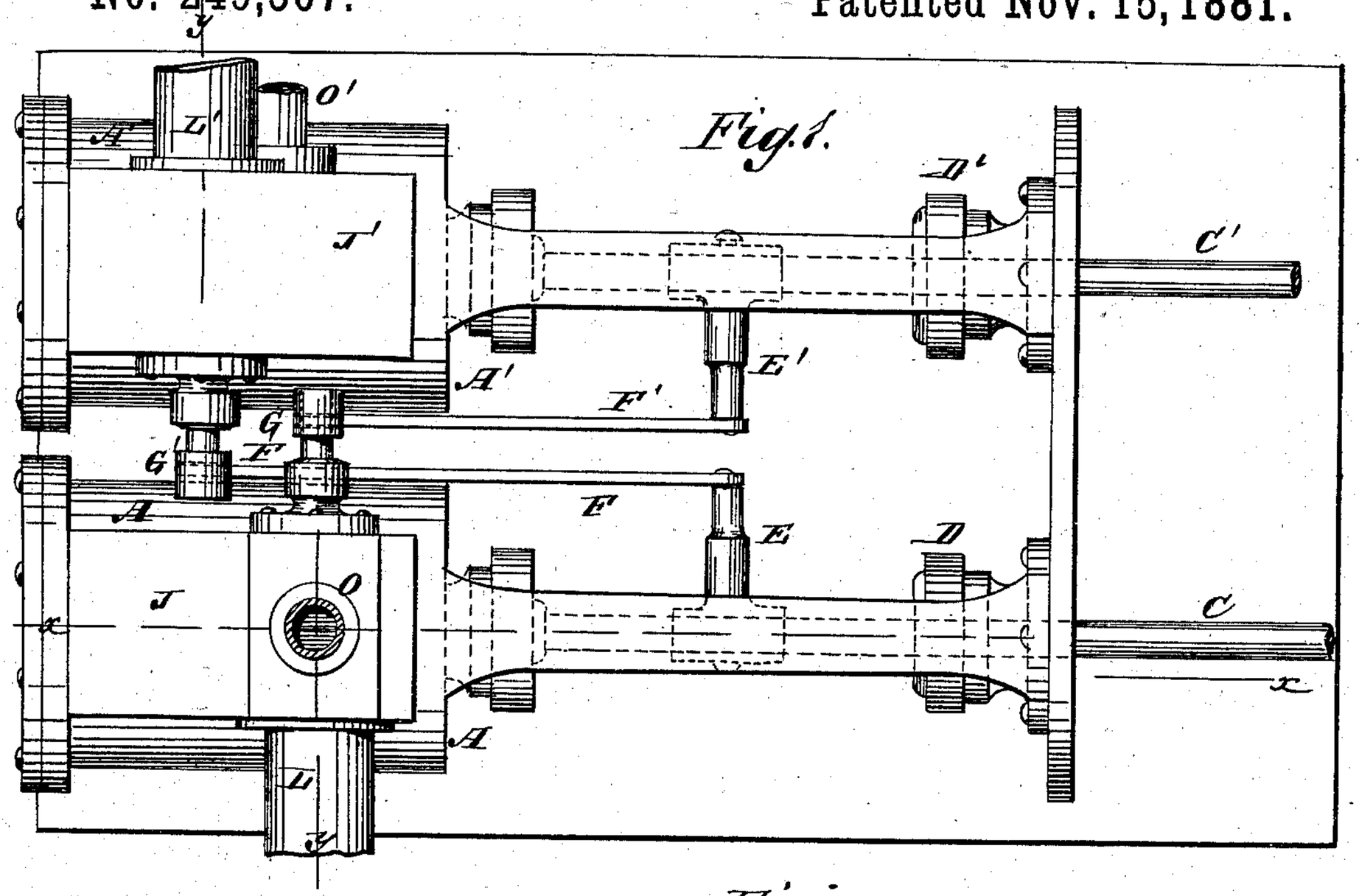


Fig. 4.

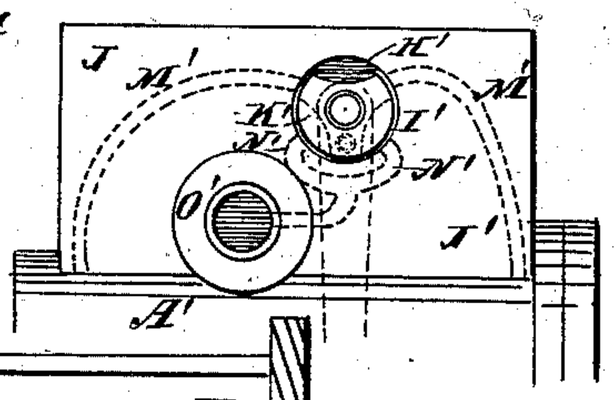


Fig. 2.

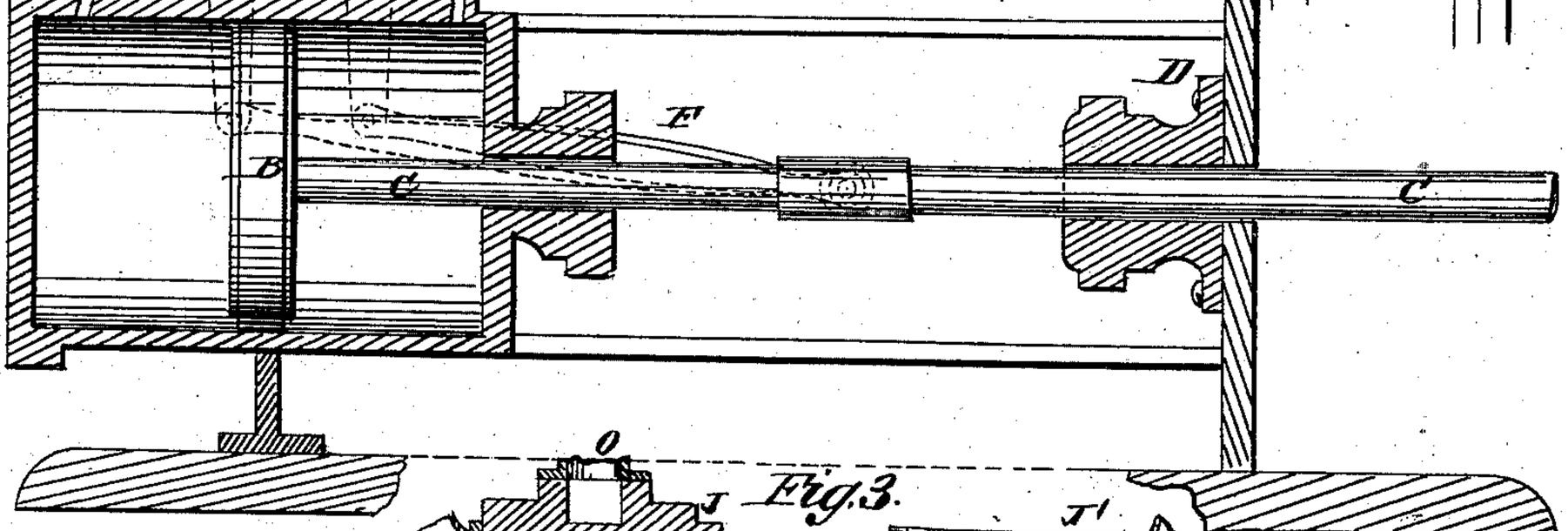
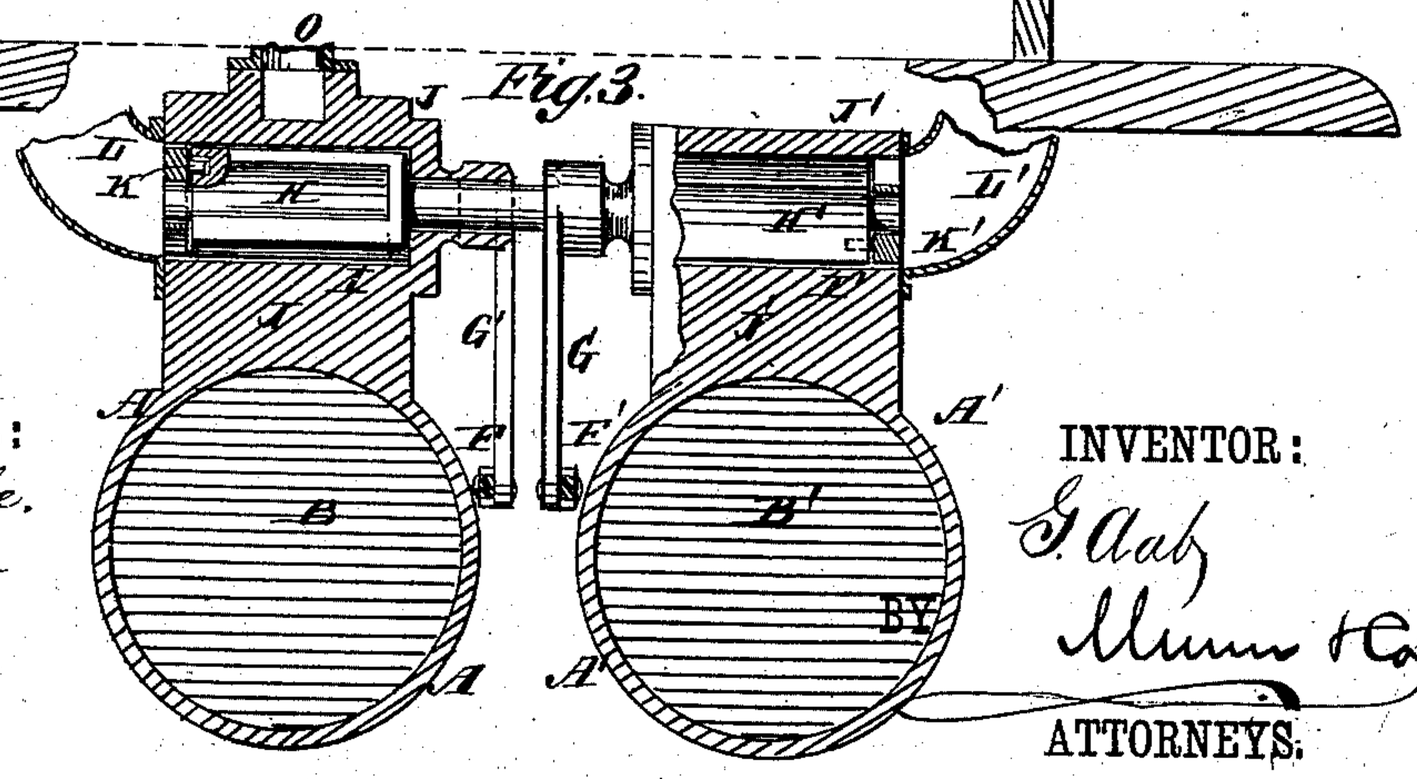


Fig. 3.



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DUPLEX STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 249,567, dated November 15, 1881.

Application filed July 23, 1881. (No model.)

To all whom it may concern:

Be it known that I, GEORGE AAB, of Brooklyn, Kings county, New York, have invented a new and useful Improvement in Duplex Steam-Engines, of which the following is a specification.

Figure 1 is a plan view of my improvement. Fig. 2 is a sectional side elevation of the same, taken through the line *x x*, Fig. 1. Fig. 3 is a sectional end elevation taken through the line *y y*, Fig. 1; and Fig. 4 is a side elevation of a part of the same, showing in dotted lines the arrangement of the ports.

The object of this invention is to simplify the construction of duplex steam-engines and facilitate the controlling of the steam.

The invention consists in constructing a duplex steam-engine with the piston-rod of the one cylinder connected with the valve of the other cylinder by an arm, a connecting-rod, and a crank-arm, whereby the movement of the piston-rod of each cylinder will shift the valve of the other cylinder; and also in the combination, with each steam-cylinder, of the block having a cylindrical valve-seat, two inlet or live-steam ports, and two outlet or exhaust-steam ports, and the three-winged valve, whereby the admission of the live steam and the escape of the exhaust-steam can be readily controlled, as will be hereinafter fully described.

A A′ represent two steam-cylinders, placed side by side, mounted upon suitable beds or supports, and provided with pistons B B′ and piston-rods C C′ in the ordinary manner. The piston-rods C C′ are made to move in straight lines by passing through guide-bearings D D′ attached to suitable supports.

To the piston-rods C C′ are attached arms E E′, which project inward or toward each other, and to their inner ends are pivoted the ends of two connecting-rods, F F′. The other ends of the connecting-rods F F′ are pivoted to the lower ends of crank-arms G′ G, the upper ends of which are rigidly attached to the projecting ends or stems of the valve-plugs H′ H, the piston-rod of the cylinder A being connected with the valve-plug of the cylinder A′, and the piston-rod of the cylinder A′ being connected with the valve-plug of the cylinder A, so that the valve-plug of each cylinder will be operated by the movements of the piston-rod of the other cylinder. The valve-plugs H H′ are made in the form of three-winged shafts, and fit and work in tubular seats I I′ in blocks J J′ attached to or formed upon the upper sides of the cylinders A A′. The inner ends or stems of the valve-plugs H H′ work steam-tight in stuffing-boxes attached to the inner sides of the blocks J J′. The outer ends of the valve-seats I I′ are closed by plates K K′ formed upon or attached to the outer ends of the valve-plugs H H′. The plate K, attached to the outer end of the valve-plug H, is surrounded by the end of the steam-pipe L, attached to the outer side of the block J, and has an opening in its lower part, as shown in Fig. 3, through which steam from the pipe L enters the lower part of the valve seat I, from which it passes through one or the other of the ports M, leading to the end ports of the cylinder A. The plate K′, attached to the end of the valve-plug H′, is surrounded by the end of the steam-pipe L′, attached to the outer side of the block J′, and has an opening in its upper part, through which steam from the pipe L′ enters the upper part of the valve-seat I′, from which it passes through one or the other of the ports M′, leading to the end ports of the cylinder A′.

From the upper part of the valve-seat I two exhaust-ports, N, lead to the exhaust-pipe O, attached to the top of the block J, as shown in Fig. 2. From the lower part of the valve-seat I′ two exhaust-ports, N′, lead to the exhaust-pipe O′, attached to the side of the block J′, as shown in Fig. 4. This arrangement of the inlet-ports M M′ and the exhaust-ports N N′ is necessary to enable me to properly control the steam from the movements of the piston-rods C C′.

It will be observed that the live steam is controlled by the movements of two of the wings of the valve-plugs H H′, and the exhaust-steam is controlled by the movements of the third wing of the said valve-plugs H H′.

With this construction, when the valve-plugs H H′ are in the positions shown in Figs. 2 and 4, the ports M M′ are all closed and the pistons B B′ are in the centers of the cylinders A A′. If, now, the piston-rod C′ is moved forward, the valve-plug H will be turned and steam admitted through the forward part, M,

into the forward part of the cylinder A, forcing the piston B and the piston-rod C to the rearward. The rearward movement of the piston-rod C turns the valve-plug H′ and admits steam through the forward port, M′, into the forward end of the cylinder A′, forcing the piston B′ and piston-rod C′ to the rearward. The rearward movement of the piston-rod C′ turns the valve-plug H to the rearward and admits steam into the rear end of the cylinder A and forces the piston B and piston-rod C forward, and so on. The movement of either piston-rod in either direction shifts the valve-plug of the other cylinder and admits steam into the end of the said other cylinder to drive its piston and piston-rod in the other direction.

It will be observed that by the use of the two exhaust-ports N N′ the exhaust-wing of the valve-plug H H′ is always exposed to the pressure of exhaust-steam, so as to always keep the said valve-plugs balanced.

It will also be observed that the exhaust-wings of the valve-plugs cover the ports through which the exhaust-steam is escaping before the piston has reached the end of its stroke, so that a quantity of exhaust-steam will always be left in the cylinders to cushion the pistons at the end of the stroke, and that the live steam is cut off before the pistons have reached the end of their stroke, so that the said pistons will be driven through the latter part of the stroke by the expansion of the steam.

By adjusting the positions of the arms E E′ upon the piston-rods C C′ the live steam and the exhaust-steam can be cut off at any desired point of the stroke, and by adjusting the position of the rear ends of the connecting-rods F F′ upon the crank-arms G′ G the amount of movement of the valve-plugs H H′ can be regulated as required.

I am aware that it is not new to arrange two cylinders side by side and connect the piston-rod of one cylinder with the valve of the other, so that the valve of one cylinder will be shifted by the movement of the piston-rod of the other; and I am also aware that three-winged valves are not, broadly, new, and I therefore do not claim such; but

What I do claim, and desire to secure by Letters Patent, is—

1. In a duplex steam-engine, the combination, with the three-winged valve-plugs H H′, operated by the piston-rod of the adjacent cylinder, of the valve-seats I I′, provided with the two exhaust-ports N N′, whereby the exhaust-wings of the said valve-plugs are always kept exposed to the pressure of the exhaust-steam, substantially as and for the purpose set forth.

2. In a duplex steam-engine, the combination, with the block J, provided with the inlet-ports M and outlet-ports N, the block J′, provided with the inlet-ports M′ and exhaust-ports N′, and the steam-pipes L L′, of the three-winged valve-plugs H H′, provided with plates K K′, having openings respectively in the lower and upper parts, and operated by the piston-rod of the adjacent cylinder, substantially as and for the purpose set forth.

GEORGE AAB.

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