

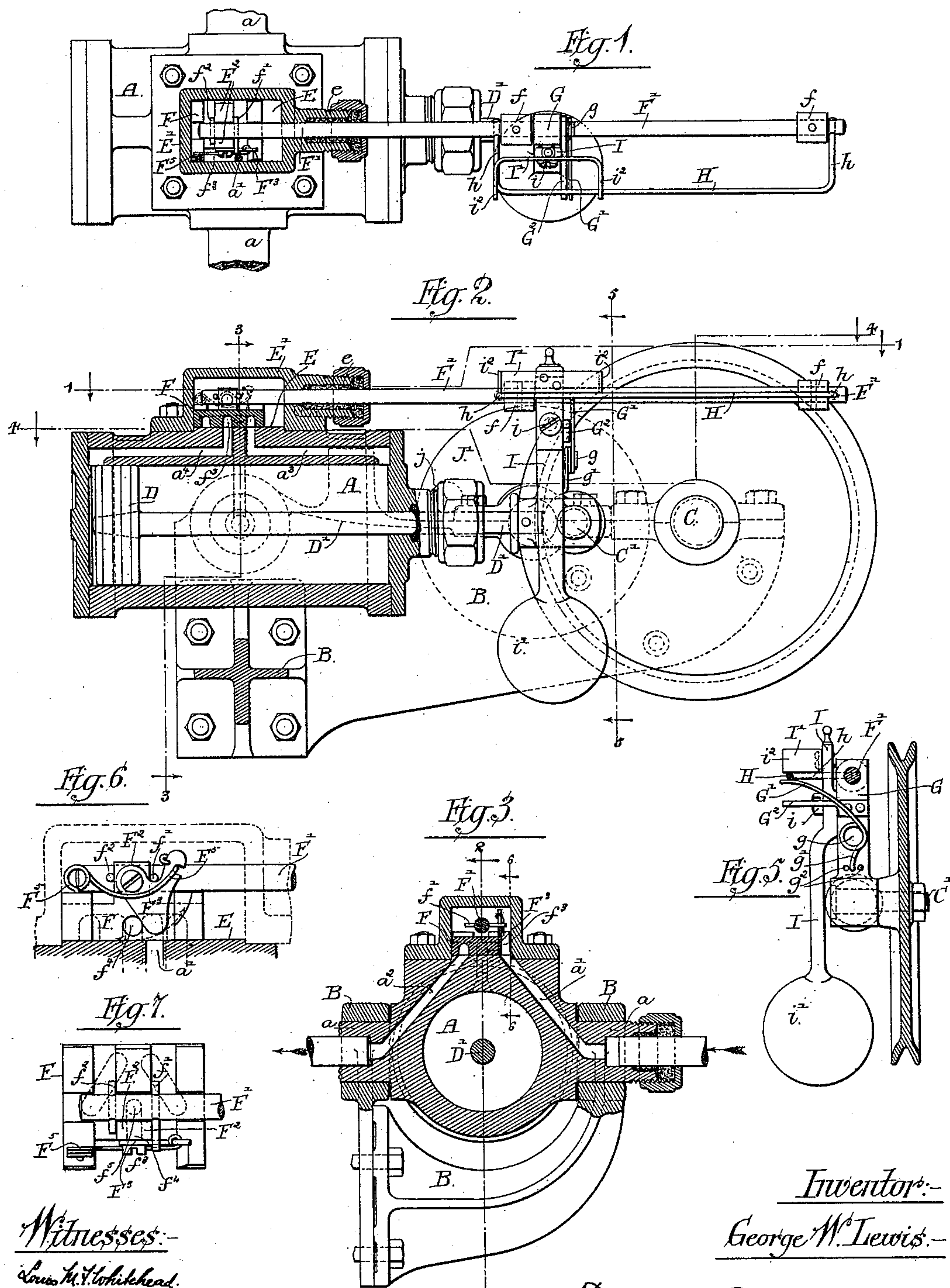
(No Model.)

2 Sheets—Sheet 1.

G. W. LEWIS.
STEAM ENGINE.

No. 408,490.

Patented Aug. 6, 1889.



Witnesses:

Louis M. Whitehead.

Wm. J. Hemming.

Inventor:

George W. Lewis.

by: Dayton, Poole & Brown

Attorneys.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 4.

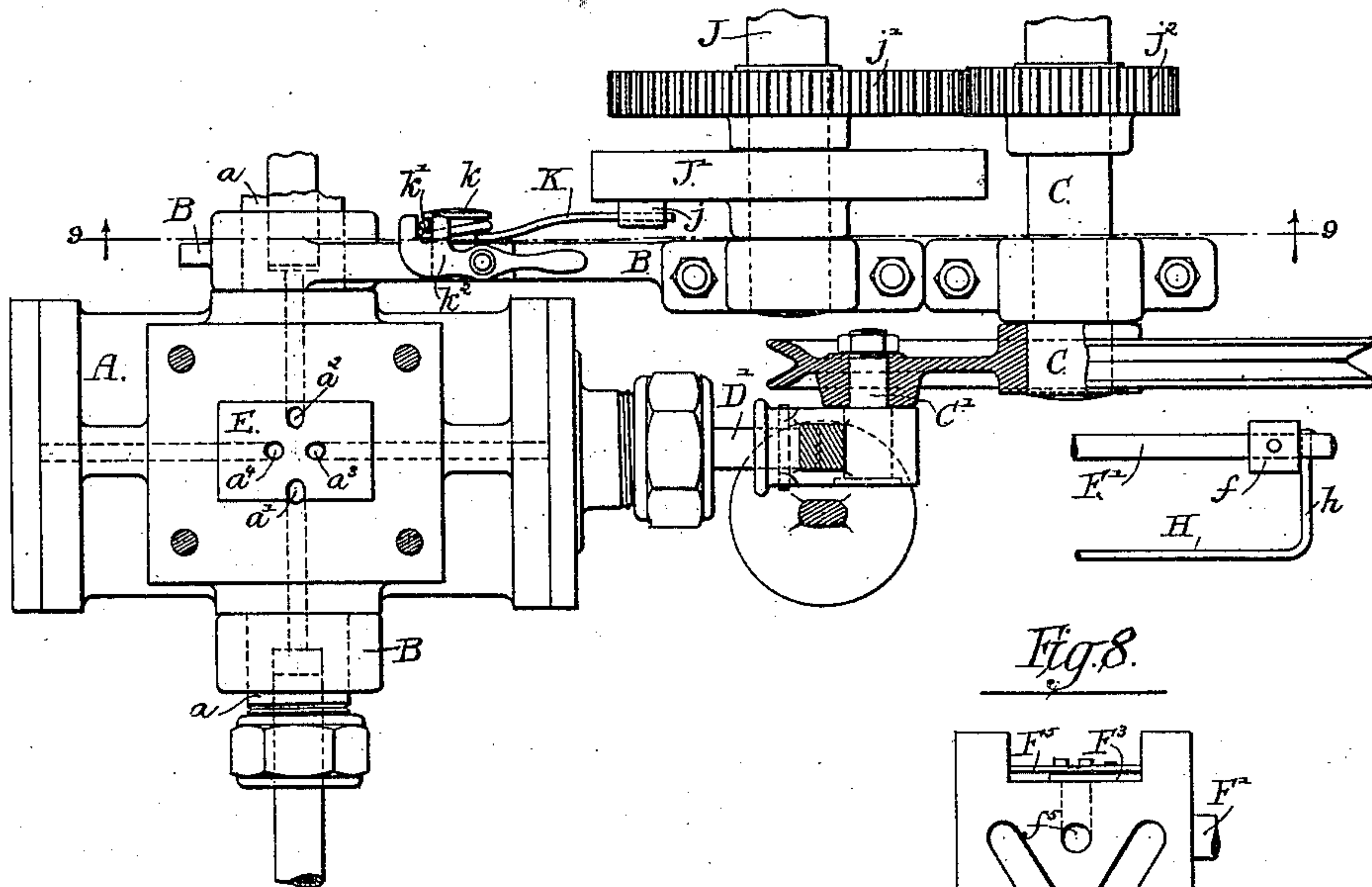


Fig. 8.

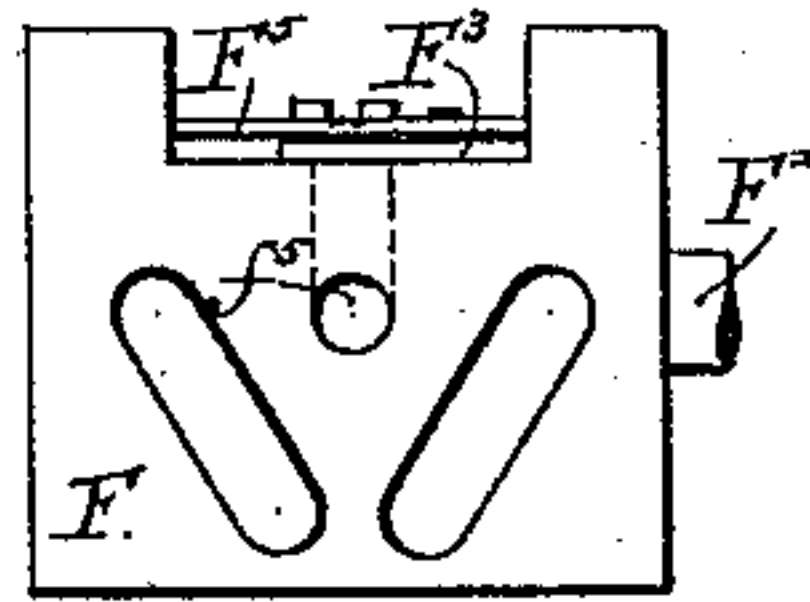
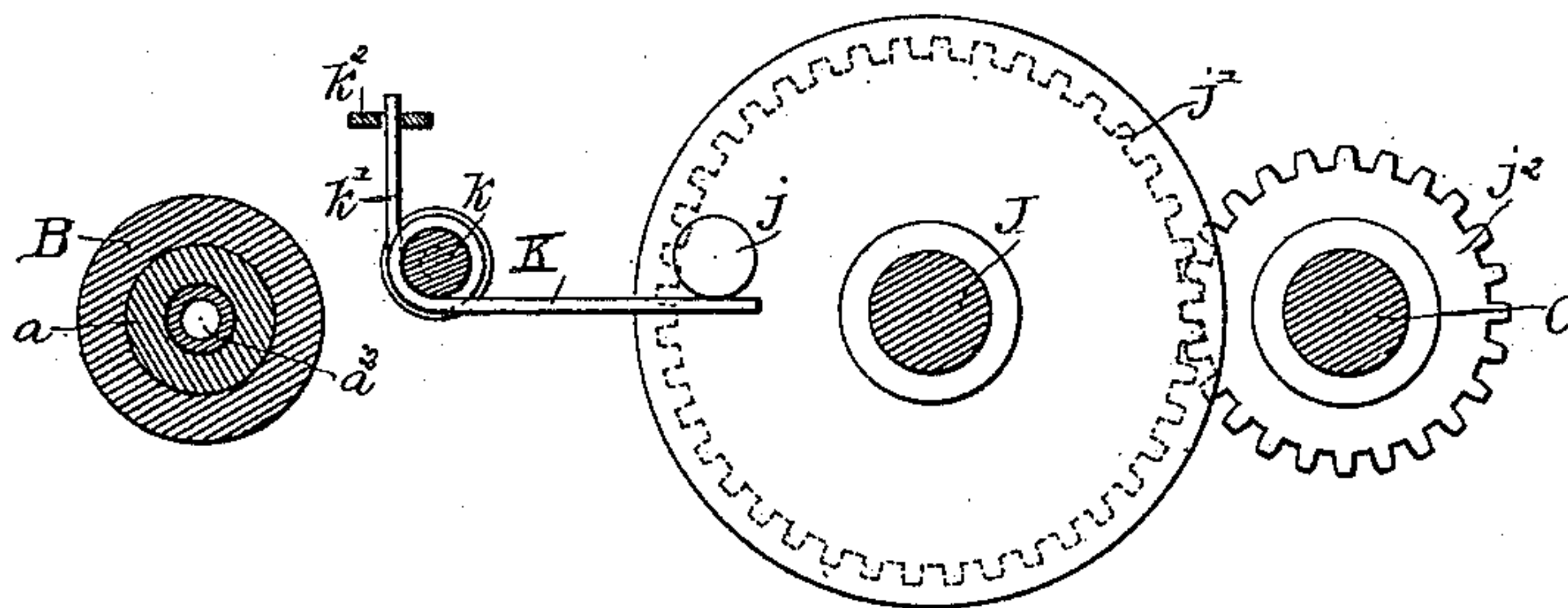


Fig. 9.



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UNITED STATES PATENT OFFICE.

GEORGE W. LEWIS, OF LA SALLE, ILLINOIS, ASSIGNOR OF ONE-HALF TO
CHARLES BRUNNER, OF SAME PLACE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 408,490, dated August 6, 1889.

Application filed February 26, 1889. Serial No. 301,200. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. LEWIS, of La Salle, in the county of La Salle and State of Illinois, have invented certain new and useful Improvements in Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to a novel construction in the valve mechanism of oscillating engines, and has for a primary object to provide an automatic cut-off in such engines.

Another object of the invention is to provide for an automatic reversal of the engine, and still another object is to provide a construction by which either a full or a partial rotation of the driven shaft may be obtained.

The nature of the invention will be understood from the following description of the accompanying drawings, in which—

Figure 1 is a plan view of the engine, with the top of the chest taken away, in the line 1 1 of Fig. 2. Fig. 2 is a central vertical section of the cylinder, valve-chest, and subjacent part of the frame and a side view of the remaining parts, the sectional line being indicated by the line 2 2 of Fig. 3. Fig. 3 is a transverse vertical section of the cylinder and valve-chest in the line 3 3 of Fig. 2. Fig. 4 is a plan view of the engine in part of the section, taken on the line 4 4 of Fig. 2. Fig. 5 is a vertical section in the line 5 5 of Fig. 2. Fig. 6 is a side view of the valve and its immediate connections, shown resting upon the valve-seat indicated in central vertical section. Fig. 7 is a top view of the valve. Fig. 8 is a bottom view of the valve. Fig. 9 is a vertical section in the line 9 9 of Fig. 4.

A represents the cylinder, having central opposite hollow trunnions a , mounted in suitable bearings in the frame B, as well shown in Fig. 3. Steam is admitted through one of the trunnions and discharged through the other, as indicated by the arrows in Fig. 3, a' and a^2 being, respectively, the supply and exhaust ports leading from the trunnion-pipes to opposite sides of the valve-seat, and a^3 a^4 being the cylinder-ports.

C is a shaft mounted rotatably in the frame B, and having thereon a crank or disk, the wrist-pin of which is shown at C'.

D is the piston, and D' the rod connecting the piston with the wrist-pin.

E is the valve-seat arranged on the top of the oscillating cylinder A, and E' is the valve-chest covering the seat.

F is a slide-valve operated by the rod F', which projects through a suitable stuffing-box e on the valve-chest and extends parallel with the piston-rod, say, as far as the outer extremity of the stroke of said piston-rod. From the piston-rod, at or near its outer end, rises an arm G, through the upper end of which the valve-rod F' slides and by which it is guided, as illustrated in Fig. 5.

H is a rod or bar connected by arms h with the valve-rod F', and arranged at one side of, in substantially the same horizontal plane, and parallel with the main valve-rod F'. The valve-rod F' is provided with adjustable stops or tappets f f , between which the guiding-standard G works, and which it strikes to throw the valve.

On the same side of the standard G as the parallel rod H is pivoted on a horizontal pin i a pendulum-rod I, provided with a ball or weight i' at its lower end, which will swing in the direction of the piston-rod. The pendulum-rod I extends above the rod H, and at its upper end is provided with a cross-bar I', from the ends of which project over the rod H two arms i^2 i^2 at equal distances from the central vertical line of the pendulum-pivot. The valve-rod F' is rotatably connected with the valve F, and reciprocates the valve by engagement of two pins f' f^2 , arranged on opposite sides of the raised cross-rib F³ on the top of the valve. In the reciprocation of the piston, therefore, the pendulum will be vibrated with the effect of causing the arms i^2 of the cross-bar I' to bear downwardly successively on the parallel rod H and to thereby partially rotate the valve-rod F'. A spring G', attached at g to the standard G and arranged to bear against the lower surface of the parallel rod H, will operate to lift said parallel rod, and thereby to rotate the valve-rod F' back again whenever pressure on its upper surface from the pendulum is removed.

In the reciprocation of the piston, therefore, the valve-rod F' will be oscillated in its supports to an extent due to the range of vibration of the pendulum I . This oscillation of the valve-rod is utilized as a means for controlling the proposed cut-off for the steam-supply, and for this purpose the valve F is provided with an auxiliary valve F^3 . The main valve F is cut away on that side at which the parallel rod H is placed, as indicated at f^3 in Figs. 1, 3, 6, and 7. The steam-inlet port a' , delivering into the steam-chest at a central point at the same side as this recess f^3 , is by said recess left constantly open. From the recess f^3 a horizontal passage f^4 is formed in the main valve F , connecting with a vertical continuation thereof, (shown at f^5 in Figs. 2, 6, and 7.) At a point above this steam-supply port f^4 of the valve, and to the end of the cross-rib F^2 , is pivoted the auxiliary valve, consisting, as shown, of a plate F^3 , the lower end of which bears against the vertical face of the recess f^3 and may slide back and forth over the port f^4 . The pin f' , which is shown as passing through the valve-rod F' , is arranged to engage this pivoted valve-plate F^3 , so that on the depression of the parallel rod H and consequent partial rotation of the valve-rod F' the valve-plate F^3 is vibrated into position to more or less cover the steam-valve port f^4 .

F^5 is a spring suitably arranged to retract the valve-plate F^3 , so as to uncover the port f^4 as the pin f' rises in the back rotation of the valve-rod. This auxiliary valve is shown enlarged in Figs. 6 and 7. This spring may do the work of the spring G' ; but the latter is more readily accessible for adjustment.

An arm G^2 , secured to the standard G and extending outward beneath the parallel rod H at a suitable distance below the valve-rod F' , serves to form a limit to the rotation of the valve-rod beyond an extent necessary to allow the valve-plate F^3 to entirely close the steam-port f^4 .

From the construction described it is manifest that the higher the speed of the engine the greater the retardation of the pendulum i' by its inertia in the first part of the stroke either way, and the quicker will it therefore effect the partial rotation of the valve-rod and the cutting off of steam.

By shifting the position of the stops f on the valve-rod F' the valve F may be shifted before the crank has made a full half-revolution, and in that case the shaft C will be oscillated instead of rotated by the engine.

The valve F being made symmetrical, the engine is capable of running equally well either way, and in order that it may automatically change the direction of rotation of the shaft C , I have provided devices illustrated in Figs. 4 and 9. Of these J is a shaft, on which is mounted a disk or arm J' , having a projection j .

j' j^2 are gear-wheels, by which the shaft J is rotated from the shaft C .

K is a spring-arm attached to the frame B or other firm support and arranged to project in the path of the projection j , so as to strike the latter when the engine is on a dead-center. The arm K , made of proper strength, will arrest the disk J' , and through it the crank C' , and it will also at the same time start all these parts in the opposite direction by reason of its resiliency. The engine will thus be reversed in its motion, and it will continue to run in the reversed direction until the projection j is brought into contact with the opposite side of the spring-arm K , when it will again be reversed. By means of the change-gear j' j^2 , or suitable substitutes therefor, any desired number of revolutions may be given to the engine in either direction or between the points of reversal, and, manifestly, if the wheels j' j^2 be of equal size, or, what is the same thing, if the disk J' be attached directly to the shaft C , the engine will make but one revolution in each direction before reversal.

In order to enable the reversing devices to be disused at pleasure, the spring-arm K is illustrated as being mounted movably on a stud k and as having an arm k' , which may be at pleasure engaged with or disengaged from the pivoted latch k^2 .

The spring G' , which opposes the rotation of the valve-stem F' , may be adjustable as to its tension, and thus made to vary the action of the cut-off as effected by the pendulum I . As shown in the drawings, said spring G' is a coiled wire or rod having an eye which surrounds the stud g and a short arm g' , the end of which, to give adjustability, enters one of a series of holes (shown at g^2) located in the arc of a circle drawn from the center of the stud g . The pendulum-ball i' may of course be made adjustable on the pendulum-rod with the same effect.

I do not wish to be restricted to the precise construction herein illustrated, inasmuch as it may be varied in many particulars without departure from my invention.

I claim as my invention—

1. The combination, with the piston-cylinder and a steam cut-off valve operated by oscillation of the valve-rod, of a pendulum carried by the piston-rod and engaged with the valve-rod, whereby the latter is oscillated by the inertia of the pendulum.

2. The combination, with the piston-cylinder and its slide-valve provided with an auxiliary steam cut-off valve, of an oscillating valve-rod operating the auxiliary valve by its oscillating movement, a pendulum carried by the piston-rod and engaged with the valve-rod to partially rotate the latter by its inertia, and a spring arranged to rotate the valve-rod in an opposite direction.

3. The combination, with the piston-cylinder having a valve-seat provided with ports a' , a^2 , and a^3 and with a steam-inlet into the valve-chest, a slide-valve provided with a central steam-port and exhaust-ways, and an aux-

iliary valve for said steam-port of the main valve, of a prolonged oscillatory valve-rod provided with tappets and having actuating engagement with the auxiliary valve in its oscillating movement, a parallel rod H on the valve-rod, a standard G, carried by the piston-rod, a pendulum pivoted on the standard, the rod of which is provided with lateral arms i^2 , arranged to bear on the rod H, and a spring arranged to oppose the pressure of said pendulum-arms, substantially as described.

4. The combination, with the oscillating piston-cylinder provided with a slide-valve on the side thereof between the trunnions, of a prolonged valve-rod provided with tappets and a standard or arm on the piston arranged to strike the tappets for the reversal of the valve and constructed to guide the prolonged valve-rod, substantially as described.

5. The combination of the oscillating piston-cylinder provided with a valve-chest and with a valve and ports adapted to the running of the engine in either direction, a crank-shaft connected with the piston-rod, a prolonged valve-rod having adjustable tappets, and a standard on the piston-rod arranged to

strike the tappets, whereby the crank-shaft may be given an oscillatory movement, substantially as described.

6. The combination of the piston-cylinder provided with a valve-chest and with a valve and ports adapted to the running of the engine in either direction, a crank-shaft connected with the piston-rod, an arm or disk having an arm or projection driven by the crank-shaft, and a spring-stop arranged to strike and arrest the arm or projection when the crank-shaft is on or near a dead-center.

7. In combination, the piston-cylinder, its valve, the valve-actuating mechanism, the crank-shaft, the disk actuated by the crank-shaft and having a projection, and the spring-stop arm for engaging the projection on the disk, and mechanism for detachably locking the spring-arm, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

GEORGE W. LEWIS.

Witnesses:

F. E. HOBERG,
H. W. UNDERHILL.