W. JOHNSON.

VALVE-GEAR.

No. 186,135. Patented Jan. 9, 1877.

Fig. 1.

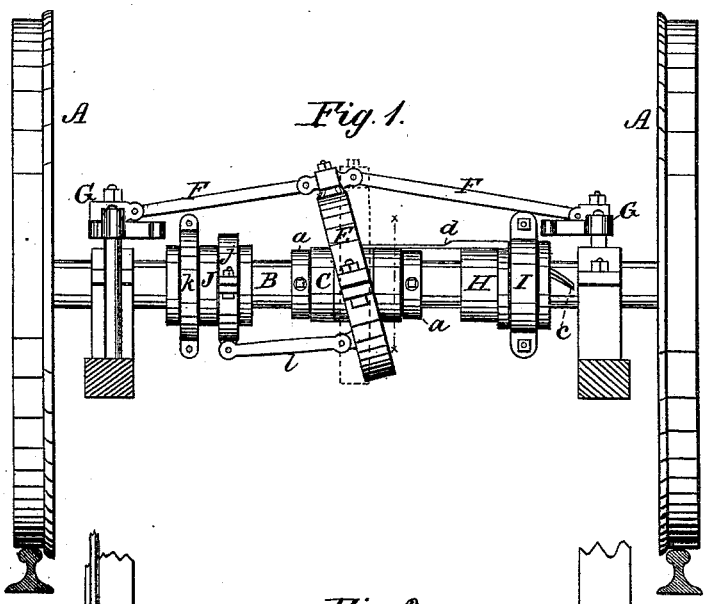


Fig. 2.

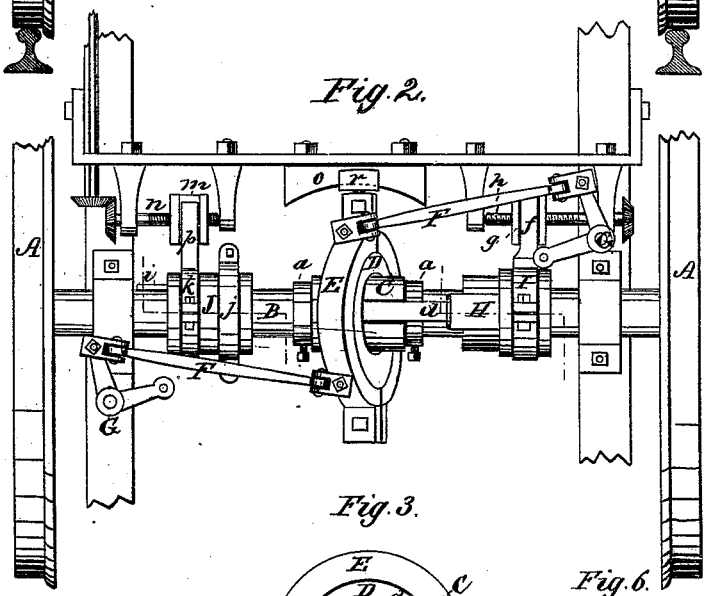
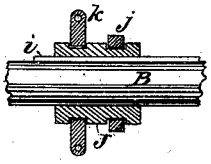


Fig. 3.

Fig. 4



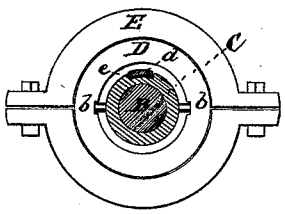


Fig. 6.

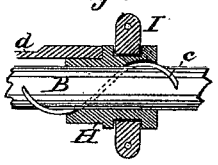
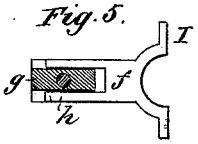


Fig. 5.



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WILBERFORCE JOHNSON, OF CAMDEN, NEW JERSEY.

IMPROVEMENT IN VALVE-GEARS.

Specification forming part of Letters Patent No. **186,135**, dated January 9, 1877; application filed November 3, 1876.

To all whom it may concern:

Be it known that I, WILBERFORCE JOHNSON, of the city and county of Camden, and State of New Jersey, have invented a new and Improved Variable Valve-Gear; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming part of this specification, in which—

Figure 1 is a side view of the valve-gear applied to the axle of a locomotive. Fig. 2 is a plan; Fig. 3, a transverse section through line *x x* of Fig. 1. Figs. 4, 5, and 6 are details of the several parts of the device.

The object of my invention is to provide a simple, effective, and variable valve-gear, which shall be regulated, at will, alike for the admission of steam to the cylinders, the stopping and the reversing of the engine, and which shall have separate devices for controlling the "lead," or, in other words, the time of the steam-admissions, for greater or less speed.

To this end my devices are located upon a drive-shaft which may be either a part of the running mechanism of a stationary or marine engine, or the axle of the wheels when applied to a locomotive.

These devices consist, in the main, of a central loose sleeve encompassing the shaft, and connected by diametrical pivots to a transverse encompassing-collar. This collar is geared to the shaft, and made to revolve through the devices for controlling the "lead," and is oscillated by a pitman arranged longitudinally with the drive-shaft, and jointed to the revolving collar loosely at one end, and to a sliding collar upon a fixed sleeve at the other. This oscillation is imparted to a rim which slides upon the periphery of the revolving collar, and imparts the proper motion to the valves through connecting-rods, as hereinafter more fully described.

In the accompanying drawing, my devices are shown applied to the axle of the wheels of a locomotive, in which A A represent the wheels resting upon the railway-track, and B the axle connecting the same, which here operates as the drive-shaft, to supply the necessary motion for the operation of the devices about to be described.

Upon the shaft, in central position, is located a loose sleeve, C, which is held in position against lateral movement upon the shaft by means of the collars *a a*, secured to the shaft upon each side by binding-screws. This sleeve is geared with the shaft through the instrumentality of the devices for controlling the "lead," as hereafter described, and is connected with a transverse encompassing-collar, D, by means of the diametrical pivots *b b*. This collar carries upon its periphery a sliding rim, E, which is made in two sections, and bolted together thereupon; and this rim is connected, through pitmen F F upon opposite sides of the center, with cranks G G, which communicate with and operate the valves. (Not shown in the drawing.)

The devices for controlling the "lead" will now be described.

It will be understood that in accelerating the speed of an engine the steam-admission through the ports, and also the exhaust, must be made a little in advance of the usual time, in order to secure the best effect of the impact upon the piston, and in doing this the steam is admitted to one side of the cylinder, and the exhaust opened from the other before the piston has finished its stroke. This is technically called the "lead," and a reliable independent arrangement for controlling the same has always been a desideratum which it is the purpose of my invention to supply.

Upon the shaft B I form a spiral feather, *c*, and upon this portion of the shaft I locate a sleeve, H, having upon its inner periphery a groove corresponding to and covering said feather. Said sleeve is provided with a projecting tongue, *d*, arranged longitudinally with the shaft, and fitting in a groove, *e*, of the central loose sleeve C, the said tongue being made long enough to permit of the adjustment of the sleeve H on the shaft, and still preserve its engagement with the sleeve C.

Upon a recess on the outer surface of the sleeve is arranged a sectional sliding collar, I, one side of which is extended to form an

arm, *f*, which is slotted, and made to embrace a nut, *g*, through which passes an adjusting-screw, *h*. Now, motion being imparted to the drive-shaft, it will be seen that the sleeve H must also revolve, for the reason that it is connected with the shaft by the feather, and longitudinal motion on the shaft is prevented by the collar I, held by the adjusting-screw. It therefore revolves, and, as its tongue *d* is in groove *e* of the central loose sleeve C, the latter is also made to revolve, and in its revolution it carries with it its pivoted encompassing-collar. The revolution of the collar I is therefore effected through the "lead" devices, the operation of which latter will be explained farther on.

To regulate the valves for their degree of movement, or for stopping or starting the engine, a separate set of devices upon the opposite side of the central collar is employed. A straight feather or spline, *i*, is formed upon the shaft, and a sleeve, J, is made to slide thereon with a corresponding groove. Encompassing this sleeve, in suitable recesses, are two loose sliding sectional collars, *j* and *k*. The first of these, *j*, is connected with the side of the collar D by means of the pitman *l*, to effect the oscillation of the said collar D upon its pivots, and the consequent movement of the valves, while the second collar, *k*, is extended to form an arm, *p*, slotted so as to encompass a nut, *m*, through which passes the adjusting-screw *n*.

The conjoint operation of the devices is as follows: The collar D being deflected upon its pivots, as in Fig. 1, by the advance of the sleeve J from the action of the adjusting-screw, and motion being imparted to the drive-shaft, the "lead" devices cause the collar D to revolve in the angular position which it is made to assume by pitman *l*, and in thus rotating oscillates its encompassing-rim, which is connected to and operates the valves, the rim being guided in its oscillation by an extension, *r*, and curved guide *o*, to prevent strain upon the connecting-rods.

When it is desired to stop the engine the sleeve J and pitman *l* are drawn back by the adjusting-screw until the collar I and its rim are at right angles to the shaft, as shown in dotted lines in Fig. 1, in which position the collar simply slides in its rim without oscillating the latter.

To reverse the engine the sleeve J and pitman *l* are withdrawn still farther from the center by the adjusting-screw, until the angle of obliquity of the collar D and its rim is reversed, when it is obvious that the steam admission and exhaust will also be reversed.

To control the "lead" the sleeve H is advanced or retracted upon the shaft by its set-screw, and in this movement turns axially, by reason of the spiral feather, and in thus turning axially turns also the collar D, which, with pitman *l* and collar *j*, is only loosely connected with the sleeve J and the shaft.

By this axial adjustment of the obliquely-arranged collar it will be seen that the steam-admissions are either hastened or retarded, as the case may require.

By making the arms connecting the collar with the set-screws slotted, a loose connection is secured, which accommodates the jar and vibration which the car-springs cause to exist between the body of the locomotive and the subjacent devices described.

Having thus described my invention, what I claim as new is—

1. The sleeve C, encompassing and geared with the drive-shaft, in combination with a diametrically-pivoted collar, a sliding peripheral rim connected with the valves, and an adjustable connection for regulating the obliquity of the said collar and rim, substantially as and for the purpose described.

2. The sleeve C, the diametrically-pivoted collar, and the oscillating sliding peripheral rim connected with the valves, in combination with an adjusting device, *j* and *l*, for regulating the obliquity of the collar and peripheral rim, and a longitudinal rotary connection, H, for adjusting the collar axially for controlling the "lead," substantially as and for the purpose described.

3. The combination, with the drive-shaft, of the loose sleeve C, diametrically-pivoted collar D, the sliding peripheral rim E, connected with the valves by pitmen F, the sleeve H, connected with the shaft by a spiral feather, and to the sleeve C by a sliding tongue, and adjusted longitudinally by a loose collar and a set-screw, the sleeve J, connected to the shaft by a feather and groove, the loose collar *j*, connected with collar D by a pitman, *l*, and the loose collar *k*, provided with a set-screw, substantially as and for the purpose described.

4. The rim E, sliding upon the periphery of a rotating obliquely-adjustable collar, combined with valves by connecting-rods, and having an extension moving in curved guide O, substantially as and for the purpose described.

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