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F. C. WEIR & E. W. HARDEN.

VALVE GEAR.

No. 490,331. Patented Jan. 24, 1893.

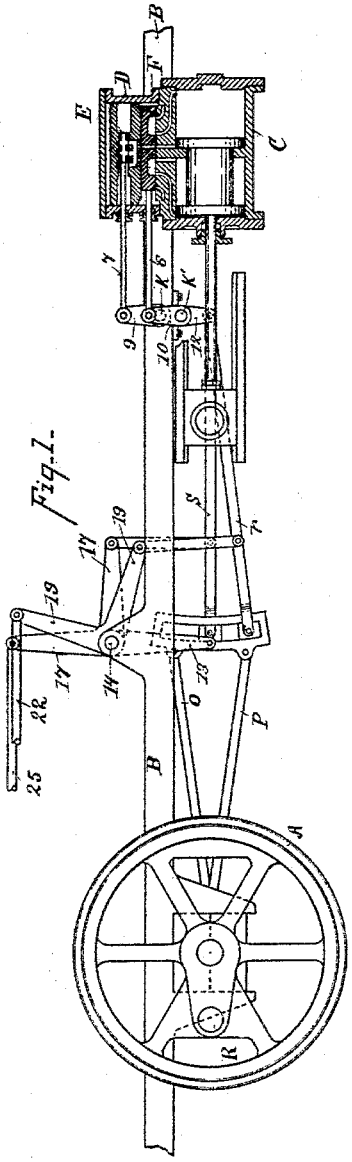

Fig. 1.

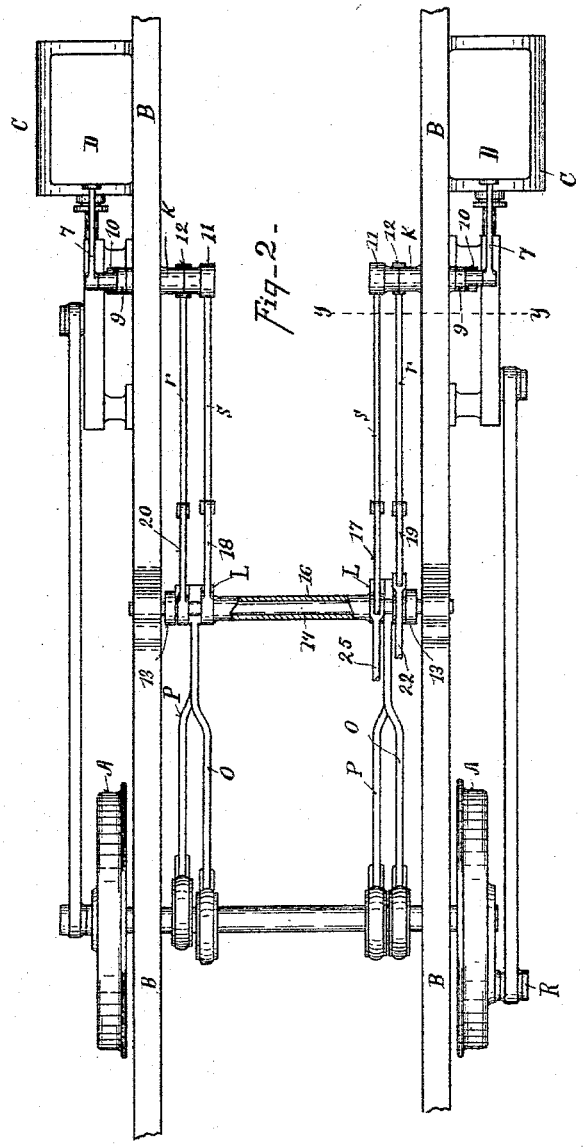

Fig. 2.

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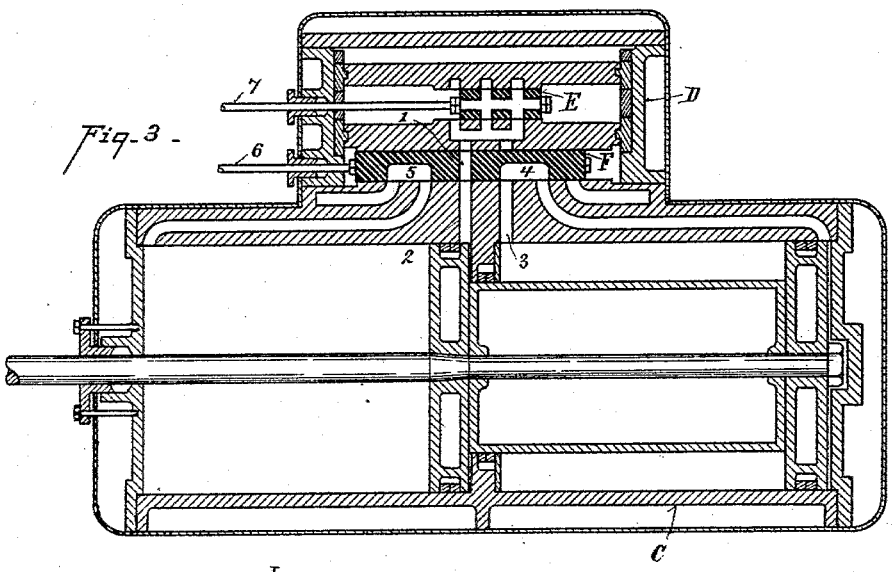
Fig. 3.



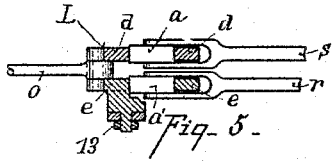


Fig. 5.

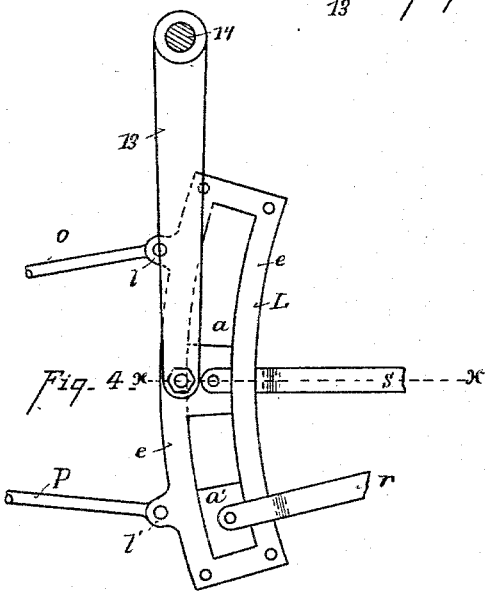


Fig. 4.

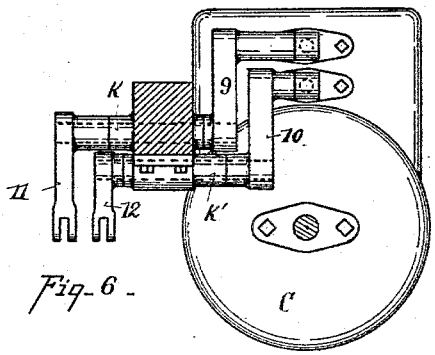


Fig. 6.

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F. C. WEIR & E. W. HARDEN.

VALVE GEAR.

No. 490,331. Patented Jan. 24, 1893.

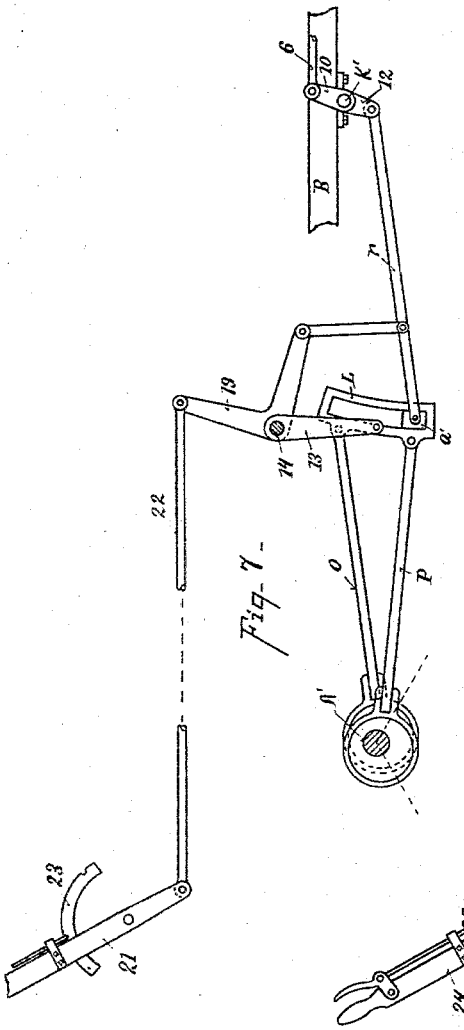

Fig. 7.

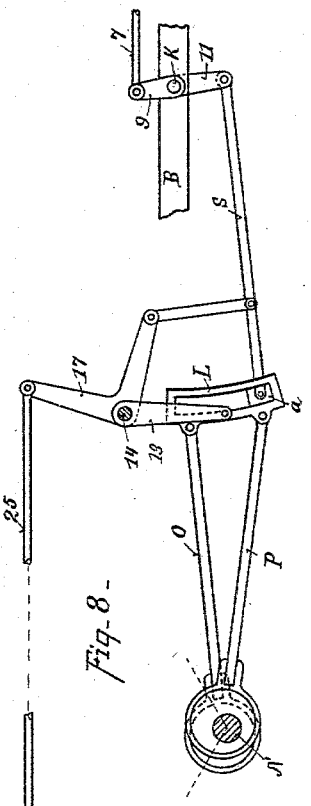

Fig. 8.

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VALVE GEAR.

No. 490,331. atented Jan. 24, 1893.

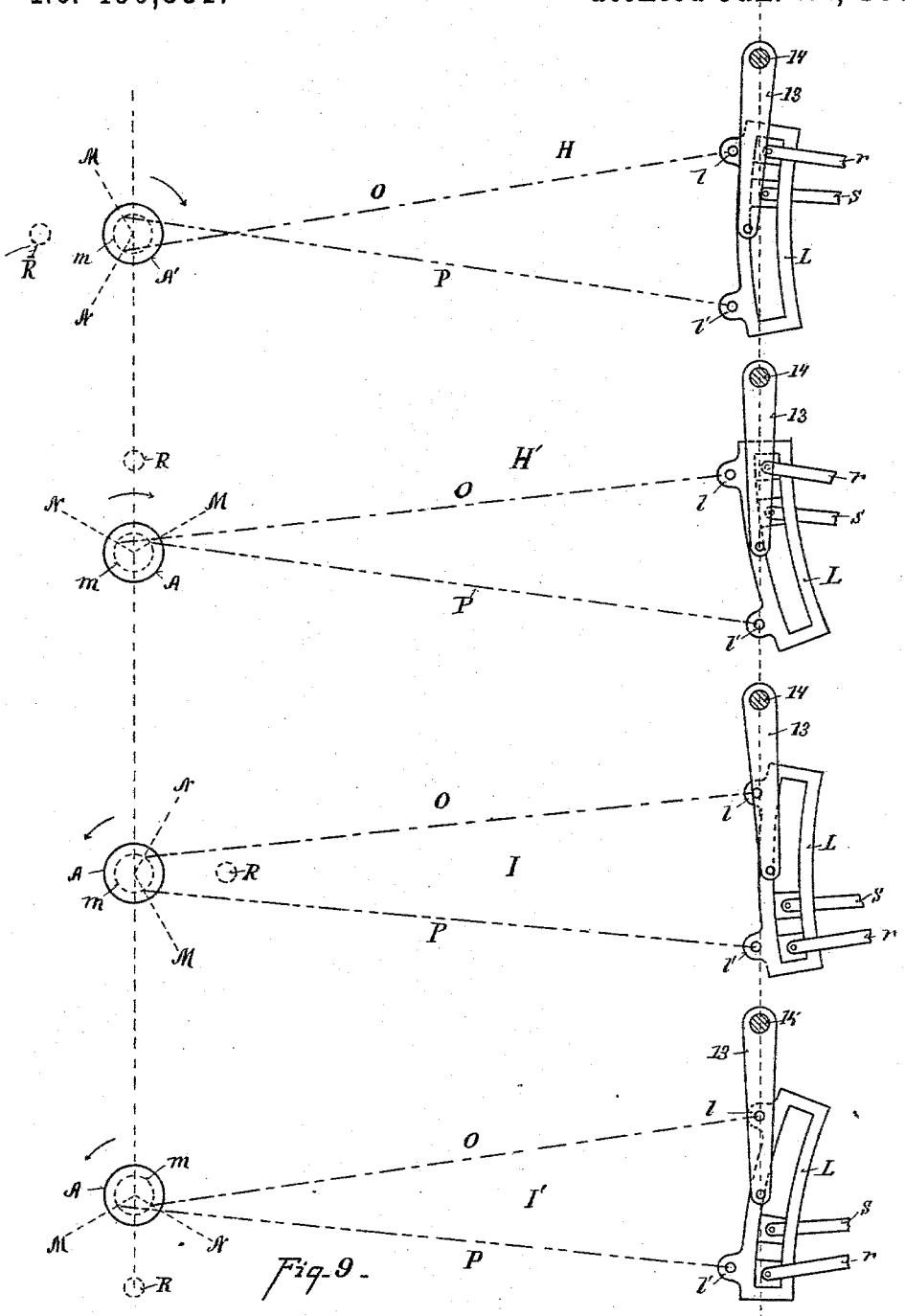

Fig. 9.

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UNITED STATES PATENT OFFICE.

FREDERIC C. WEIR AND EDWARD W. HARDEN, OF CINCINNATI, OHIO; SAID HARDEN ASSIGNOR TO SAID WEIR.

VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 490,331, dated January 24, 1893.

Application filed April 15, 1892. Serial No. 429,353. (No model.)

To all whom it may concern:

Be it known that we, FREDERIC C. WEIR and EDWARD W. HARDEN, citizens of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Valve-Gear for Reversing-Engines, of which the following is a specification.

Our invention relates to that type of compound engines shown in the application of Edward W. Harden, Serial No. 421,034, filed February 10, 1892.

The object of our invention is to provide valve moving devices adapted to operate the engine by means of main and auxiliary valves. In the preferred type we use but a single main valve instead of two main valves as shown in the said former application of Mr. Harden; but the two valves may be employed so far as the valve motion herein shown and described is concerned without affecting the operation.

The principal object of our invention is to provide valve moving devices by means of which the auxiliary valve may be used as a regulating and cut off valve, and the main valve may also be used as a throttling and a reversing valve; so that either valve may be independently operated from one pair of eccentrics to control the engine.

The various features of our invention are fully set forth in the description of the accompanying drawings making a part of this specification, in which—

Figure 1 is a side elevation of our improvements attached to the frame work of a locomotive. Fig. 2 is a top plan view of the same. Fig. 3 is an enlarged longitudinal sectional elevation of the cylinder, piston, steam chest and valve. Fig. 4 is an enlarged side elevation of my improved compound link. Fig. 5 is a section on line x, x, Fig. 4. Fig. 6 is a sectional elevation on line y, y, Fig. 2. Fig. 7 is an elevation of the main valve moving devices. Fig. 8 is a similar view of the auxiliary valve moving device. Fig. 9 is a diagram illustrating the different positions of the link suspended on the pendulous arm, and valve connecting rod in different positions of operation.

A represents one of the driving wheels. A′ the eccentrics or cams on the axle. R the crank pin.

B represents the frame of a locomotive.

C represents a cylinder; said cylinder is constructed in all respects as shown in the said former application, and need not be more fully described. The steam ports and passages being the same in construction.

D represents the steam chest. E the auxiliary valve, and F the main valve. The main valve F is preferably formed integral with the central steam port 1 to admit the live steam alternately through the passages 2, 3, onto the smaller area pistons.

4, 5, represent the ports on the under side of the main valve which are alternately employed for directing the steam onto the larger area of the pistons and on the next movement exhausting the steam therefrom; each side of the valve being the counterpart of the other and operated by the single valve stem 6.

7 represents the valve stem of the auxiliary valve E.

The locomotive of course is provided with an engine upon each side thereof, each one being the counterpart of the other, with duplicate valve moving device, and one engine set in advance of the other in the usual manner.

The valve operating devices are constructed so that a single lever will operate the auxiliary valves, and another lever operate the main valves; either set of valves may be operated independent of the other to perform specific offices so that each valve may make its appropriate throw no matter in what position the parts are set we accomplish this by means of radii valve rods, each one connected with and operating its respective valve, one set operating the main, and the other the auxiliary valve, and supported upon slides moving in parallel arcs of a link L. The preferred form of construction of this link is shown in section Fig. 5; that is, each respective segmental guide d, e, is separated from the other so that the radii valve rods r, s, may fork to engage the slides a, a'. These slides a, a' may be of any desired form; we have shown the block form as there is less wear and lost motion to such form of construction.

The valve rods 6 and 7, see Figs. 1 and 2,

are connected severally to the crank arms 9, 10, secured to rock shafts K K'; the opposite ends of said rock shafts are provided with crank arms 11, 12, to which are pivoted the radii valve rods r, s, of the other engine, these being supported at their rear end by similar slide blocks a, a'. The link L is hung upon the pendulous arm 13, which is loosely journaled upon the shaft 14 supported upon the pillow block 15.

16 represents a sleeve shaft journaled upon its co-axial shaft 14. It will be observed that these shafts 14 and 16 extend across the frame of the locomotive and the valve moving devices of the two engines are operated from either side thereof in the following manner:

17 represents a bellcrank lever keyed upon, say the right hand end of said sleeve shaft 16; and 18 represents a crank arm connected to the opposite end of said sleeve, and parallel to the lower arm of bellcrank on the other side.

19 represents a bellcrank lever keyed upon shaft 14 outside of the sleeve shaft 16; and 20 represents a crank arm keyed upon the opposite end of said sleeve shaft and parallel to the lower arm of bellcrank on the other side.

21 represents the operating lever which is connected to bellcrank lever 19, by means of the connecting rod 22.

23 shows the ordinary quadrant for setting the lever in the desired positions. 24 represents a similar setting lever connected by connecting rod 25 to the bellcrank lever 17. The movement of lever 21 rocks the central shaft 14 raising and lowering in unison the radial valve rods r, on each side of the locomotive, thereby operating the main valves F of the two engines. The movement of the lever 24 rocks the bellcrank lever 17, thereby oscillating the sleeve shaft 16 which raises and lowers in unison the radial valve rods s, thereby operating the cut off valves E of the locomotive simultaneously.

In order to illustrate the movement of the link L, we have shown four diagrams in Fig. 9, illustrating the different positions; diagram H represents the position of the pendulous arm 13 when the position of the radial valve rod r, which controls the main valve is at full throw, and the valve rod s which controls the auxiliary valves is depressed for a partial cut off. R represents the position of the crank pin when the center of one eccentric is at the intersection of the line M with the dotted line m, and the center of the other eccentric is at its intersection with line N. The cam rods O and P are indicated by dotted lines in Fig. 9, and they extend from the eccentrics or cams A' to the ears l, l' of link L. When the crank pin has moved forward ninety degrees the parts are in position shown by diagram H'. The diagrams I I' represent successively a further movement of ninety degrees, as indicated by the position of the crank pin R when the engine is reversed. The radial main valve rod r has been moved into the position shown by the diagrams I I', and the rod s is shifted to a relatlvely corresponding position upon the opposite side of the center of link L. It will be noticed in the diagram that when the engine is running in one direction the radial valve rods r, s, occupy positions in one half of the link L, getting their motion directly from the eccentric rod at that end of the link. And when the engine is running in the reverse direction the radial valve rods r, s, occupy the opposite half of link L getting their motion from the other eccentric through its eccentric rod. The operation is controlled by having a link, so that each radial valve rod is guided by said link, each being raised and lowered by independent mechanism, and yet both are operated by either forward or backward eccentric according to the position they are set in the link, whereby the auxiliary valve may be operated to control or cut off the steam when the main valve is making its full throw, or the main valve may be operated and cut off steam entirely without moving the auxiliary valve. It is desired to have the main valve only employed for reversing but it could be operated with variable cut offs the same as the auxiliary, but this would be objectionable because it is desired to have the main valve full throw so as to keep the parts open for compounding the steam.

It will be observed that the connecting rods 22, 25, for setting levers are parallel and the setting levers may be both mounted upon the same shaft and side by side in the cab; so that they can both move together if desired. When they are both moved together the engine will be reversed, or the engine may be reversed by moving the lever singly. When either the main valve or the auxiliary valve may be moved first as desired.

Having described our invention what we claim is—

1. In a steam engine, the combination with a supporting frame B, a cylinder C, a steam chest D, auxiliary and main valves E and F, cams A', cam rods O and P, and radial valve rods r and s, of the rock shafts K and K' mounted on the supporting frame and provided with crank arms 9 and 10 connected with the auxiliary and main valves and with crank arms 11 and 12 connected with the radial valve rods, substantially as described.

2. In a steam engine, the combination with a supporting frame B, a cylinder C, a steam chest D, auxiliary and main valves E and F, cams A', cam rods O and P, and radial valve rods r and s, of the rock shafts K and K' mounted on the supporting frame and provided with crank arms 9 and 10 connected with the auxiliary and main valves and with crank arms 11 and 12 connected with the radial valve rods, and the bell crank levers 17 and 19 pivoted to the supporting frame and connected with the radial valve rods, substantially as described.

3. In a locomotive, the combination with the eccentric rods P, O upon each side of the engine, of the link L on each side of the engine, each supporting the radial valve rods *r s*, the eccentric shafts 14 and 16, the bell crank levers 17 and 19, secured respectively to said shafts, the valve moving mechanism connected respectively to the radial valve rods upon each side of the engine, and the lever connecting mechanism for separately and simultaneously operating the said valve rods on each side of the engine by one set of levers, substantially as described.

4. In combination with the link L, supporting the radial valve rods *r*, *s*, the bellcrank levers 17, 19, secured respectively to the concentric shafts 14 and 16, and lever mechanism connected to said shafts respectively, whereby they may be simultaneously or separately operated, substantially as specified.

5. In a locomotive having an engine upon each side thereof, controlled by a main and auxiliary valve, a link L, supported upon a pendulous arm upon each side of said locomotive, the central shafts 14, the sleeve shaft 16 extending across the frame of the locomotive, the bellcrank 19, and crank arm 20 attached to each end of said shaft, and the bellcrank 17, and crank arm 18 attached to the sleeve shaft and severally connected to the radial valve rods supported in said compound links, and the levers 21, 24, connected respectively to said shafts 14 and 16, for operating the valves of the two engines simultaneously, substantially as specified.

It testimony whereof we have hereunto set our hands.

FREDERIC C. WEIR.
EDWARD W. HARDEN.

Witnesses:
T. SIMMONS,
C. W. MILES.