

(No Model.)

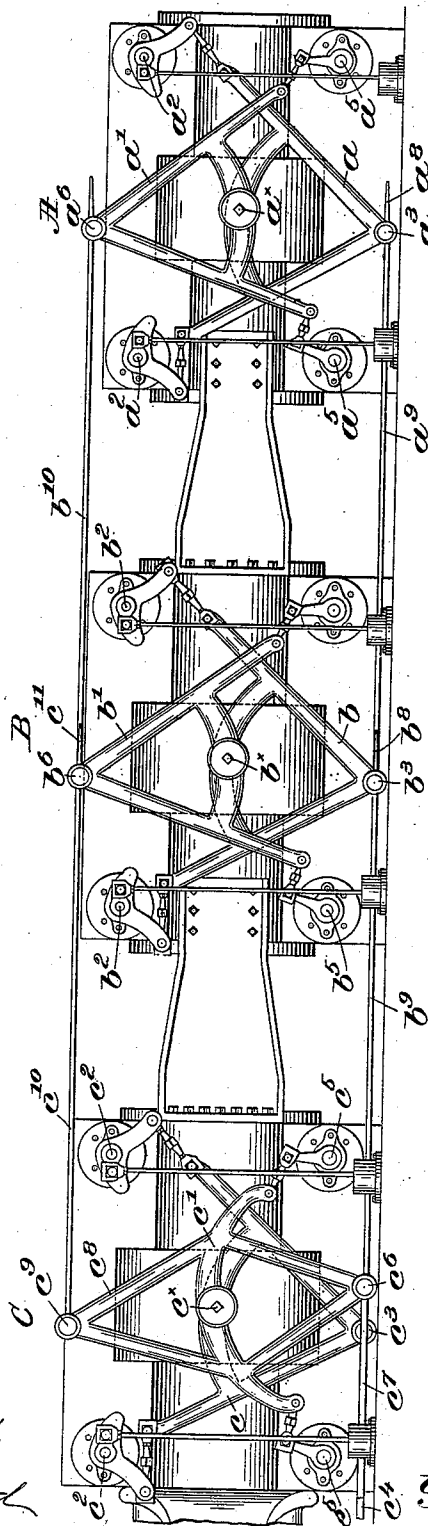
2 Sheets—Sheet 1.

J. KILBURN.
CUT-OFF VALVE GEAR.

No. 532,970.

Patented Jan. 22, 1895.

Fig. 1.



witnesses.
Fred S. Greenleaf.
Thomas A. Drummond.

Inventor
John Kilburn
by Crosby & Gregory, attys.

UNITED STATES PATENT OFFICE.

JOHN KILBURN, OF BELMONT, MASSACHUSETTS.

CUT-OFF-VALVE GEAR.

SPECIFICATION forming part of Letters Patent No. 532,970, dated January 22, 1895.

Application filed November 19, 1894. Serial No. 529,266. (No model.)

To all whom it may concern:

Be it known that I, JOHN KILBURN, of Belmont, county of Middlesex, State of Massachusetts, have invented an Improvement in Automatic Cut-Off-Valve-Gear Steam-Engines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to compound, triple or quadruple expansion steam engines of the "Corliss" type, wherein each cylinder is provided with two steam and two exhaust ports, and independently movable valves for each.

My invention has particular reference to engines wherein the cylinders are arranged tandem.

In the original tandem "Corliss" type engine, each cylinder was provided, at one side, with a pivoted wrist plate, connected with and to rock the four valves of its cylinder, the several wrist plates being rocked in unison by connecting links, one of the wrist plates, usually that nearest the crank shaft of the engine, being connected by an eccentric rod with and actuated by an eccentric upon the said crank shaft.

In the most recent practice in the manufacture of single "Corliss" engines, the cylinder is provided with two wrist plates or segments, instead of a single one, as formerly, one wrist plate or segment being connected with and actuating the steam valves, and the other wrist plate connected with and actuating the exhaust valves, the two wrist plates or segments being actuated independently, from independent eccentrics upon the crank shaft of the engine. This arrangement is desirable because it provides a greater range of variation in cutting off steam, and a greater range of power for the engine. In tandem engines, however, where a plurality of cylinders are employed, the custom has been to apply the two wrist segments, to the first cylinder of the series, usually the low-pressure cylinder only, the remaining cylinders of the series being equipped each with a single wrist plate connected with and actuated by one of the segments upon the first or low-pressure cylinder, as in former practice before the two-segment movement came into use. Inasmuch as the two-segment movement is desirable for

the first cylinder of the series, it is likewise desirable for the remaining cylinders of the series, and the two segments have not been applied to the remaining cylinders of the series, simply because thus far, it has been found impossible to devise practical means for transmitting the reciprocating motions from one to another of the pair of segments upon the respective cylinders. For practical reasons it is customary to connect the eccentric rods for and to the first pair of segments, at the same side of their common axis usually below the said axis, and undoubtedly the difficulty heretofore experienced in extending the two-segment movement throughout the entire series of cylinders has been that it is impracticable to provide two lines of connection rods extending side by side, from cylinder to cylinder and connecting and to actuate the respective wrist plates or segments upon the said cylinders. Particularly is this difficulty apparent, when, as is frequently the case with large engines of five thousand or more horse power, the connections from one wrist plate or segment to the other along the series of segments, go below the floor level.

Realizing the importance of providing all the cylinders of the series with independently actuated wrist segments, I have devised the mechanism embodying my present invention, in which the first cylinder of the series is provided with two segments, as heretofore, both actuated by independent eccentric rods from the crank shaft, said rods being connected with their respective segments at the same side of the axis of the latter. One of the said segments, as for instance, that actuating the steam valves, is then connected with the corresponding segments upon the remaining cylinders of the series; by a series of links arranged below and at the same side of the axes of said segments as the eccentric rod actuating the first segment of the series. The other segment on the first cylinder, say for instance, that connected with and actuating the exhaust valves, is provided with an arm extended from the opposite side of its axis, and is connected by a series of links arranged above the axes of the several segments, with the corresponding segments upon the remaining cylinders of the series. By this arrangement, both the segments of the first cylinder

are actuated by connecting rods attached at the same side of the axis of the segments, and thereafter, the corresponding segments on the remaining cylinders of the series are connected and actuated by links arranged at opposite sides of the axes of the said segments, those segments operating the exhaust valves being connected one to another above their axes, while those segments operating the steam valves are connected one to another below their axes, or vice versa, the two lines of connections being thus separated and removed from interference one with another and the complications and practical difficulties which would result if the two lines of connections were at the same side the axes of the several segments are avoided.

In the drawings, Figure 1, represents in side elevation, the three cylinders of a triple expansion engine of the "Corliss" type, the said cylinders being equipped with independently actuated wrist segments in accordance with my invention; and Fig. 2, on an enlarged scale shows the two segments for operating the valves on the first or low-pressure cylinder.

Referring to the drawings, in the embodiment of my invention there shown, A, B and C represent the high pressure, intermediate and low pressure cylinders of a "Corliss" type of triple expansion engine, of usual construction, the said cylinders being arranged tandem, *i. e.*, with their axes coincident.

In accordance with my invention, the first cylinder C of the series, is provided at one side with a pivot stud c^x , upon which are journaled the two wrist-segments c and c' , the segment c , substantially triangular in shape, having the ends of its arms connected in usual manner with and to operate the steam valves c^2 , c^3 , and at its apex, below the pivot stud c^x , jointed at c^3 to one end of the eccentric actuating rod c^4 extending back to and reciprocated by an eccentric arranged upon the crank shaft of the engine, as is usual in engines of this type, and not, therefore, herein shown. The segment c' , also substantially triangular in shape, is connected in the usual manner with and operates the usual exhaust valves c^5 , c^6 , said segment at its apex c^6 , also below the pivot stud c^x , being jointed to one end of the eccentric actuating rod c^7 , also extended back to and reciprocated by its own independent eccentric mounted upon the crank shaft of the engine, as is customary in this type of engine, and need not, therefore, be herein further described, it being sufficient to say that the said wrist segments are independently vibrated about their common axis to give to their respective valves the proper movement.

The intermediate cylinder B, is provided at one side with a pivot stud b^x , upon which is pivoted the triangular wrist-segment b , operating the steam valves b^2 , b^3 , precisely as the valves c^2 on the cylinder C are operated, the said wrist-segment b , at its apex b^3 having a pin, which is engaged by the hooked

end b^4 of the connecting link b^5 jointed at its opposite end to the pin c^3 at the apex of the wrist-segment c , so that the wrist-segment b is operated in unison with and by the segment c upon the first cylinder of the series.

The high pressure cylinder A, at its side, is provided with a pivot stud a^x , to which is pivoted the triangular wrist-segment a , operating the steam valves a^2 , a^3 , the said wrist-segment, at its apex, being provided with a pin a^3 engaged by the hooked end a^4 of a link a^5 , jointed to the pin b^3 on the segment b , whereby the said segment a is operated in unison with the segments b and c to rock all the steam valves of the series in unison.

In accordance with my invention, the exhaust segment c' for the first cylinder C of the series is provided with an arm c^8 extended upwardly from its axis c^x and at a point, distant from said axis equal to the radial distance of the pin c^6 from said axis, the said arm c^8 is provided with a pin c^9 to which is jointed one end of a link c^{10} , having its opposite hooked end c^{11} engaging a pin b^6 at the apex of the segment b' for the cylinder B, the said segment b' being pivoted upon the stud b^x and connected at its ends with and to operate the exhaust valves b^5 , b^6 . The pin b^6 of the segment b' , in turn, has jointed to it one end of a link b^{10} , having its hooked end b^{11} engaging a pin a^6 at the apex of the segment a' , pivoted upon the stud a^x of the cylinder A, and connected at its ends with and to operate the exhaust valves a^5 , a^6 , of the said cylinder A.

It will be noticed that the eccentric rods c^4 , c^7 , for actuating the steam and exhaust wrist-segments c and c' for the first cylinder of the series are connected to the said segments respectively, at the same side of their common axis c^x , and that all the steam segments of the series are connected by the links b^5 and a^5 , below their axes of vibration and close to the floor, and in substantial alignment with the eccentric rod actuating the first steam-segment of the series.

When the engine is a large one, the cylinders A, B and C are of such size as necessitates carrying these connections between the several wrist-segments, below the floor level, a suitable trough being usually provided to receive the same.

It will readily be seen that if the exhaust segments of the several cylinders were likewise turned down and actuated from the under side of their axes of vibration, the two lines of connections running parallel, and close to each other along close to or below the floor level, would provide a construction which would give rise to continual difficulties of interference one with the other in operating the engine, and of difficulty of access for repairs, oiling, &c. Much the same difficulties of access for oiling, disconnecting, &c., would be present if both lines of connections were run above the axes of the segments. In my improved mechanism, however, while I prefer

the connections for the steam-segments to remain as heretofore, close to the floor at the under side of the axes of the several segments, the connections for the exhaust segments are carried to a similar distance above the said axes where they will be free from interference with any of the other parts. This I have accomplished, as described, by providing the exhaust segment for the first cylinder of the series with oppositely extended arms, to one of which the eccentric rod is connected, and to the other of which is connected the first of the series of links joining the several exhaust valves of the series.

By my invention, I am able, as will be seen, to provide all the cylinders of a tandem engine with independently actuated wrist-segments for producing the desired valve movements, and by a mechanism at all times easily accessible for repairs, oiling, &c.

While I have herein provided the exhaust segment of the first series, with the oppositely extended arms, it is evident that the steam-segment may be provided with the said arms in order that the several steam-segments shall be connected above their axes, and the exhaust-segments below their axes, being the reverse of the arrangement shown in Fig. 1 of the drawings, all within the scope of my invention.

My invention is not limited to the particular shape and construction of cylinders, wrist plates or segments herein shown and described, although the same are such as have been found very practical in daily use.

I claim—

1. An automatic cut-off steam engine, containing the following instrumentalities, viz;— a plurality of cylinders arranged tandem; two vibrating wrist segments mounted at the side of each and connected with and to independently actuate the steam and exhaust valves for their respective cylinders; independent actuating rods for and connected to the respective segments of one of said cylinders at the same side of the axes for said segments; two lines of connections joining the corresponding segments upon the several cylinders, one line of connections being above and the

other below the axes of the several segments, substantially as described.

2. An automatic cut-off steam engine, containing the following instrumentalities, viz;— a plurality of cylinders arranged tandem; two vibrating wrist-segments pivoted at the side of each of said cylinders, one connected below its axis with and to actuate two of its cylinder valves; the other connected above its axis with and to actuate the remaining two of its valves; two independently movable actuating rods connected to the two segments of one of said cylinders, one of said rods being connected to its segment at the same side its axis as its valve connections, the other of said rods connected to its segment at the side of its axis opposite its valve connections, and two lines of connections joining corresponding segments upon the several cylinders, one line of connections being above and the other below the axes of the several segments, whereby one series of wrist segments is connected and actuated at the same side their axes as the actuating rod for the first segment of the series, and the other series of wrist segments connected and actuated at the side of their axes opposite that at which the actuating rod for the first segment of the series is actuated, substantially as and for the purpose specified.

3. An automatic cut-off steam engine, containing the following instrumentalities, viz;— a plurality of cylinders arranged tandem; two vibrating wrist segments pivoted at the side of each of said cylinders, and eccentric rods for and to independently actuate the segments on one of said cylinders, and two lines of connections, one above and the other below the axes of the several segments, each line of connections joining corresponding segments on the several cylinders, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN KILBURN.

Witnesses:

FREDERICK L. EMERY,
EMMA J. BENNETT.