(No Model.) 4 Sheets—Sheet 1.

C. E. BEAUMONT & G. P. WALLINGTON.

STEAM MOTOR.

No. 527,356. Patented Oct. 9, 1894.

Fig. 1.

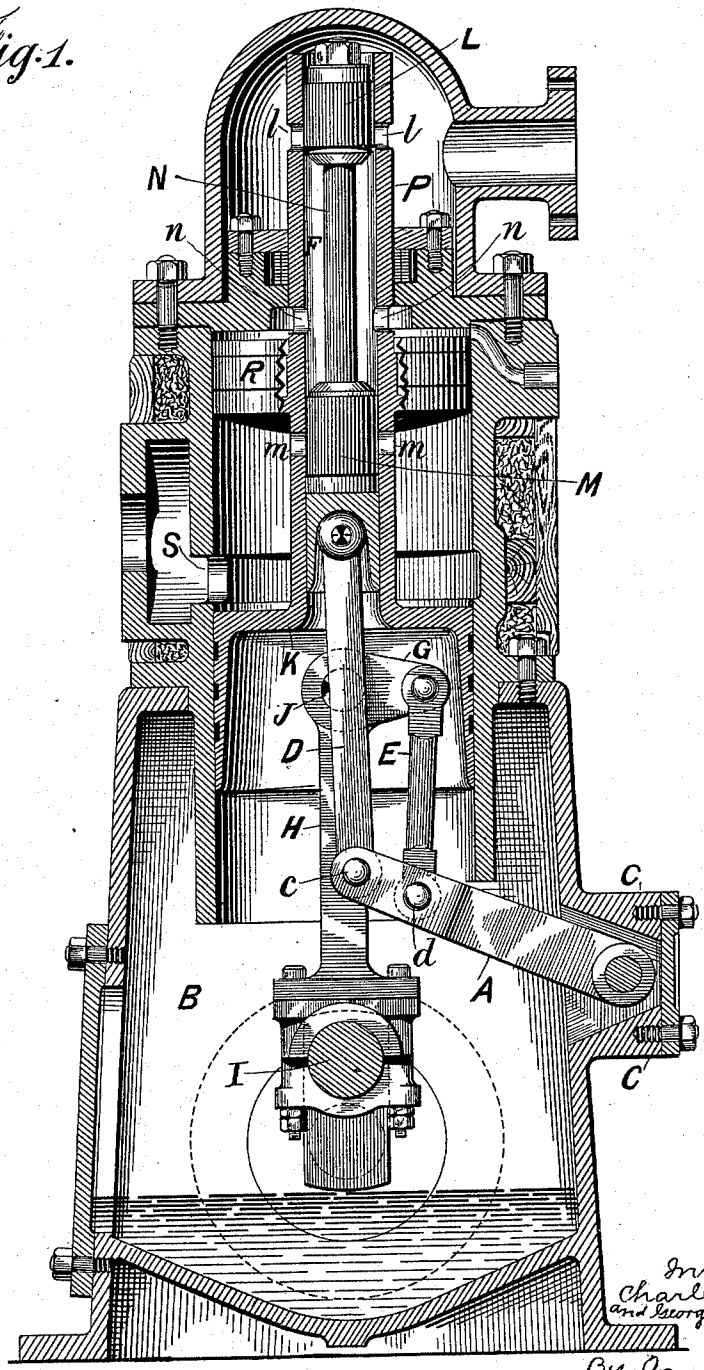

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Fig. 2

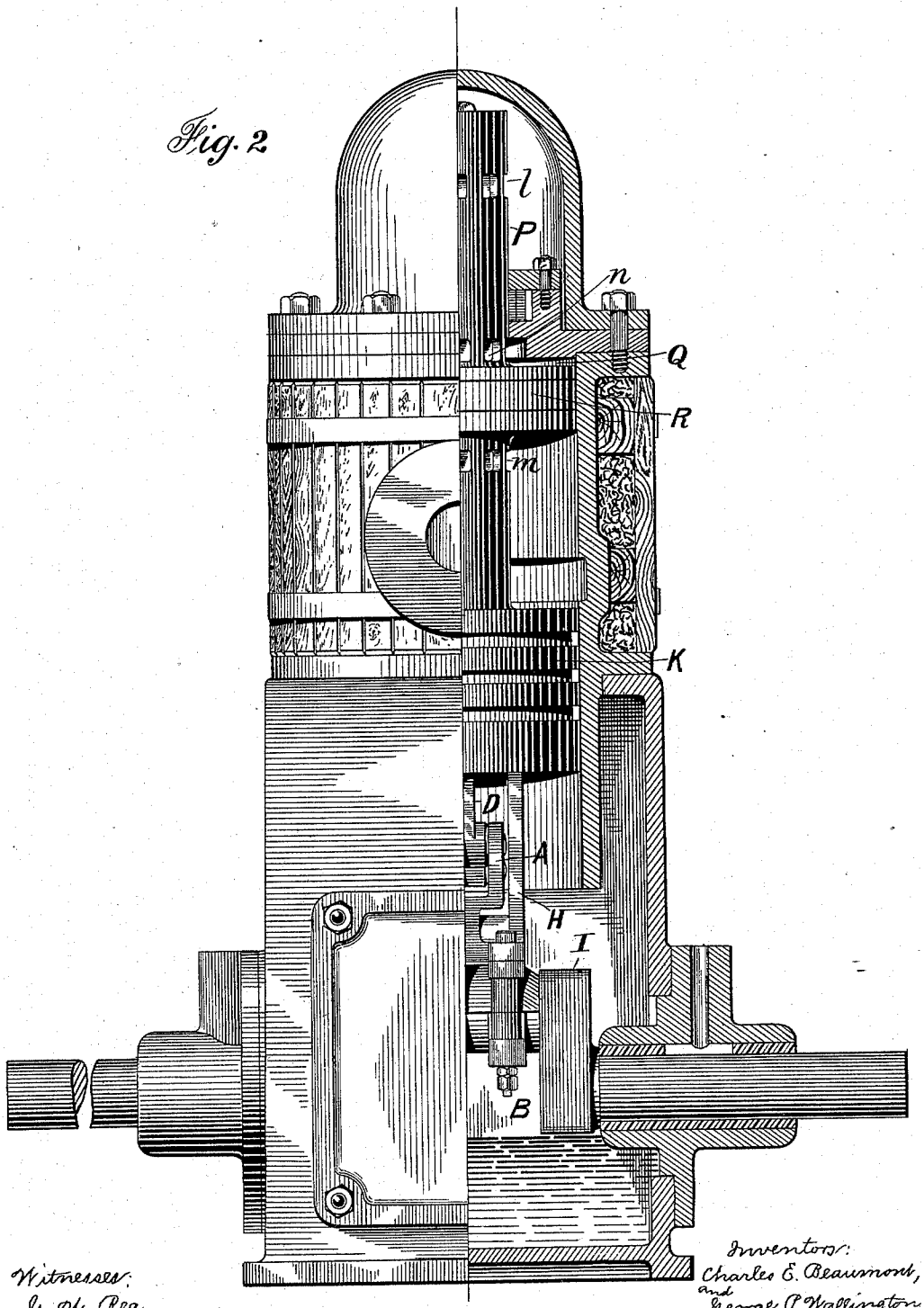

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Fig. 4.

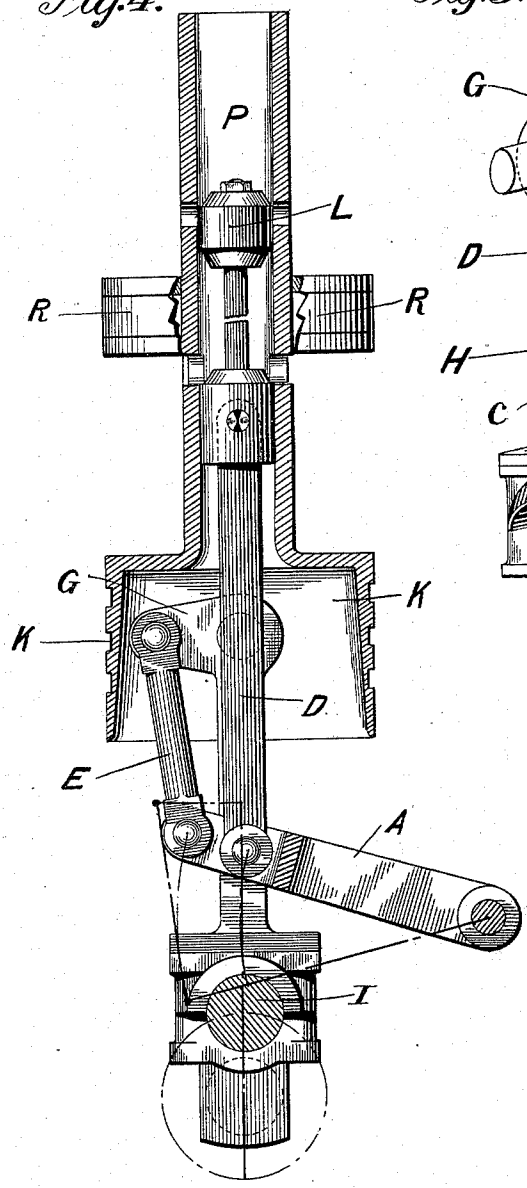

Fig. 3.

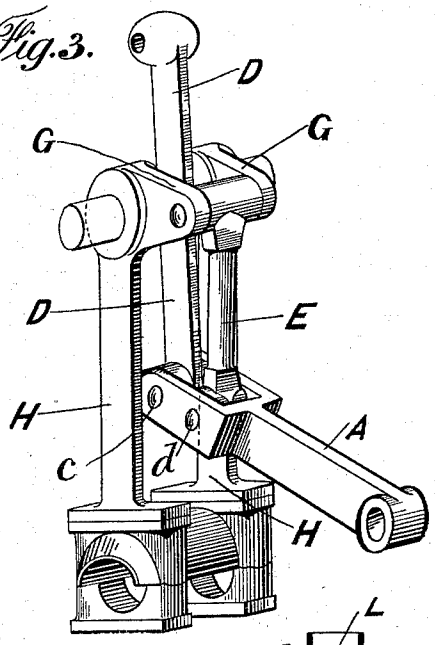

Fig. 5.

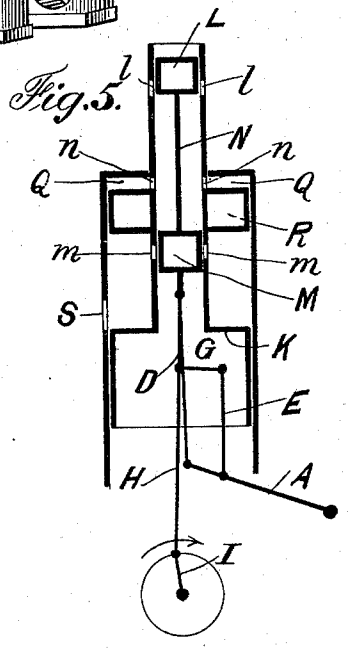

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Fig 6

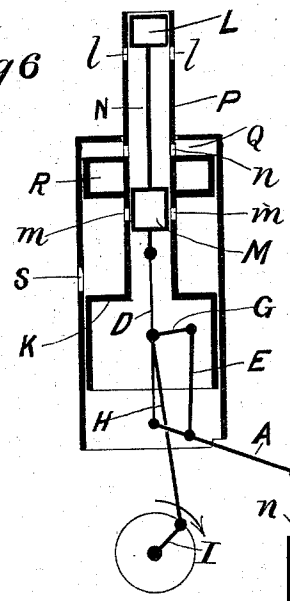


Fig. 7.

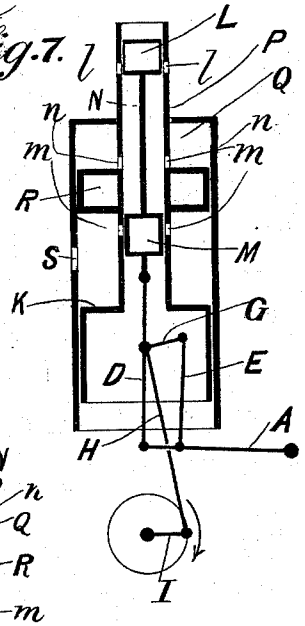


Fig. 10.

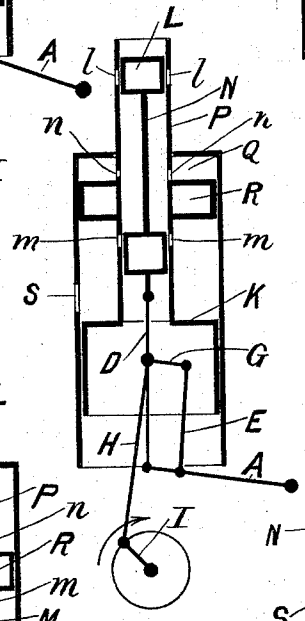


Fig. 8.

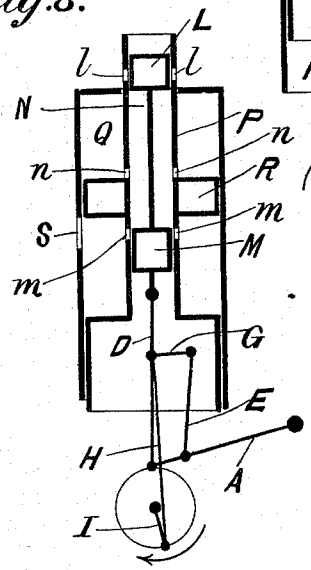
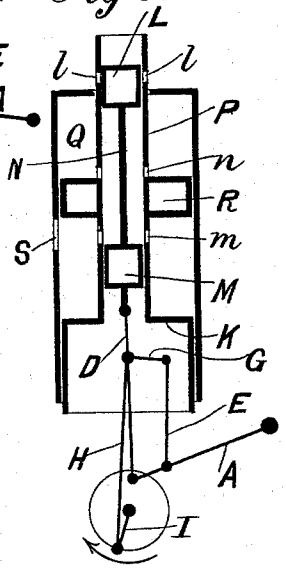


Fig. 9.



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UNITED STATES PATENT OFFICE.

CHARLES EVERARD BEAUMONT AND GEORGE PRYCE WALLINGTON, OF LONDON, ENGLAND, ASSIGNORS OF ONE-THIRD TO LAURENCE ARCHER WALLINGTON, OF SAME PLACE.

STEAM-MOTOR.

SPECIFICATION forming part of Letters Patent No. 527,356, dated October 9, 1894.

Application filed June 20, 1894. Serial No. 515,112. (No model.) Patented in England December 20, 1893, No. 24,536.

To all whom it may concern:

Be it known that we, CHARLES EVERARD BEAUMONT, residing at 16 South Grove, Peckman, and GEORGE PRYCE WALLINGTON, residing at 15 Bellenden Road, Peckman, London, England, subjects of the Queen of Great Britain, have invented certain new and useful Improvements in and Connected with Steam and other Fluid-Pressure Motors and Pumps, (patented in Great Britain, No. 24,536, December 20, 1893,) of which the following is a specification.

This invention relates primarily to high speed engines of the single acting type, but it is also applicable to double acting engines, whether compound, condensing, non-condensing, steam or other type of fluid pressure motor or pump and has for its object the attainment of a more perfect regulation of the admission of steam to and release from the cylinder or cylinders by reciprocating a valve placed in a hollow cylindrical extension of the piston in a special manner whereby all the functional requirements of this class of engine, such as rapid opening of the inlet and exhaust ports, variable cut off, (predetermined or otherwise,) and early closing of the exhaust for cushioning purposes are obtained without the use of supplementary ports, or using the before-mentioned hollow extension itself as a valve, as is the case when supplementary ports are required. Moreover the central valve is operated without undue obliquity of its connecting link.

The method employed to accomplish the foregoing results consists in pivoting a radial lever at one end to any suitable point in the crank chamber (if one be used) or to any fixed point and articulating the other end to a connecting link for operating the central valve.

The before mentioned radial lever is vibrated by means of an intermediate link connected at one end to a lever projecting at approximately right angles from the main connecting rod, and the other end at any predetermined point on the radial lever between its fulcrum, and the end to which the before-mentioned valve link is attached or it may be at the end and the valve link occupy the intermediate position.

In order that our invention may be completely understood the accompanying drawings are appended in which like letters are used to denote like parts throughout the several figures.

Figure 1, represents a transverse sectional elevation of a complete simple single acting high speed engine with our invention applied thereto. Fig. 2, is a part front sectional elevation of the same. Fig. 3, is a perspective view of the valve gear and connecting rod. Fig. 4, is a sectional elevation of the piston and hollow extension thereof showing another method of attaching the gear to the central valve. Figs. 5 to 10 inclusive are diagrams illustrating the different positions of the valve and gear during one revolution of the crank.

In carrying out our invention as applied to a high speed engine of the simple single acting type of the class generally known as "central valve engines," that is to say, engines in which a piston valve is fitted within a hollow extension of the main piston or rod, we fulcrum or pivot the end of a lever A, hereinafter termed a radial lever, at a predetermined fixed point of the crank chamber B preferably within a recess C formed on one side of the crank chamber as shown in Fig. 1. The other end of the radial lever A is forked, see Fig. 3, to receive the lower ends of the valve and intermediate links D and E respectively, they being loosely pivoted thereto by the pins *c*, *d*, fitted in the fork end. The top end of the link D is pivoted in any suitable manner to the central valve F, and that of the intermediate link E to a lever or levers G projecting at approximate right angles from the main connecting rod or rods H, H, of which it or they form a part. The main connecting rods H, H, are connected by brasses to the crank I and by gudgeons J to the piston guide K in the usual manner, and

are divided, as shown more particularly at Fig. 3, to allow the radial lever A, valve and intermediate links D and E, respectively, to vibrate centrally between them, so that the central valve itself can be operated without any undue obliquity of the connecting rods, as will be quite evident upon referring to Figs. 5 to 10 inclusive.

When fitting an engine with a radial lever A connected in the manner shown in Figs. 1 and 2, and 5 to 10 inclusive, we preferably employ a central valve F having two pistons L, M, connected by a rod N, one piston L controlling the steam ports *l* and the other piston M controlling the exhaust ports *m* both of which are cut in the hollow extension P of the piston, so that steam on entering the ports *l* passes down the hollow extension P through the ports *n* to the cylinder Q to exert pressure upon the piston R forcing it down to perform work upon the crank I by means of the connecting rod or rods H H, in the well known manner. When the stroke is completed the port *m* is uncovered and the steam escapes into the space between the piston R and guide K which communicates with the atmosphere or condenser, as the case may be, by the outlet S in the cylinder side, the position of such outlet being so arranged that it is never at any time covered by the movement of the piston or the piston guide, as can be seen upon referring to the diagrams.

Sometimes it may be more convenient to use a longer radial lever A and attach the valve link D to the said lever in the intermediate position but still immediately under the central valve, the projecting lever or levers G being arranged upon the opposite side to that shown in Fig. 1, and the links E connected to the end of the levers as shown in Fig. 4. In this case a single piston is used as the central valve and a single port in the hollow extension, the movement of the valve being such that it alternately moves below the ports for steam inlet and above said ports for exhausting immediately into the crank chamber below, or into the space between the piston and guide.

By fulcruming a radial lever A to a fixed point upon a non-moving part of the engine, such as the crank chamber B, and causing it to act as a lever of the third kind by applying the power derived from the movement of the connecting rods H, H, through the lever G and link E intermediate of its fulcrum and the point of application of the power to move the central valve, as shown in Fig. 1, or causing the radial lever A to act as a lever of the second kind by arranging the link D for moving the valve between the fulcrum and the power as shown in Fig. 4, we are enabled to obtain a differential movement of the valve relatively to that of the hollow extension within which said valve is fitted, whereby all the functional requirements of a high speed engine, such as rapid opening of the ports to steam and exhaust, variable lap and lead and early closing of the exhaust for cushioning purposes are obtained without the use of auxiliary ports and chambers such as are required in engines fitted with valve gear that only actuates same in a manner equivalent to an eccentric set at right angles to the crank.

The hereinbefore mentioned proposition with regard to rapid opening and closing of the various ports in their sequential order during one revolution of the crank, and the relative positions the radial lever A, valve and intermediate links D, E, and main connecting rods H occupy will be completely understood upon reference to the diagrams Figs. 5 to 10 inclusive.

In all the figures the crank is rotated in the direction indicated by the arrows.

Fig. 5 represents the crank at the position in which the piston L is about to uncover the port *l*, the distance from this point to the top center representing the amount of lead given to the engine from this position until the piston in descending moves the crank to an angle of about forty-five degrees, as indicated at Fig. 6, the port *l* is rapidly uncovered, it being now fully open. Steam is cut off at approximately half stroke, as at Fig. 7, in which it will be seen that the steam already admitted to the cylinder is used expansively until the piston is almost at the bottom of its stroke, as at Fig. 8, the crank then being near its bottom center and the exhaust port *m* just about to open. By a very small movement of the crank past its bottom center the exhaust port *m* is fully uncovered, as at Fig. 9, to allow the steam to escape upon the uprising of the piston to the position shown in Fig. 10, the crank being then about fifty degrees from the top center, and the exhaust and inlet ports covered to allow compression of the remaining steam to take place, and act as a cushion to keep the parts in constant thrust and prevent all knocking.

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

1. In a central valve high speed engine, fluid motor or pump, the combination with the main connecting rod or rods and projections thereon, of a radial arm having one end pivoted to a non-moving part of the engine at a predetermined point in the crank chamber, a link connecting said arm with the projections on the main connecting rod or rods, and a link connecting the said lever with the centrally located valve, substantially as and for the purpose shown and described.

2. In a central valve high speed engine, fluid motor or pump, the combination of the crank I, the piston R having a tubular rod provided with ports and guide portion K, the cylinder, the piston valve F, the rod or rods

H connecting the crank I and piston guide K, the radial arm A having one end pivoted to a non-moving part of the engine at a predetermined point in the crank chamber, the link D connecting the valve F with the end of the arm A and the link E connecting a projection G on the main connecting rod H with the lever A at a point intermediate its ends, substantially as and for the purpose described.

In witness whereof we have hereto signed our names, in the presence of two subscribing witnesses, this 28th day of May, 1894.

CHARLES EVERARD BEAUMONT.
GEORGE PRYCE WALLINGTON.

Witnesses:
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RICHARD CORE GARDNER,
Patent Agents, 166 *Fleet Street, London, England.*