

No. 673,670.

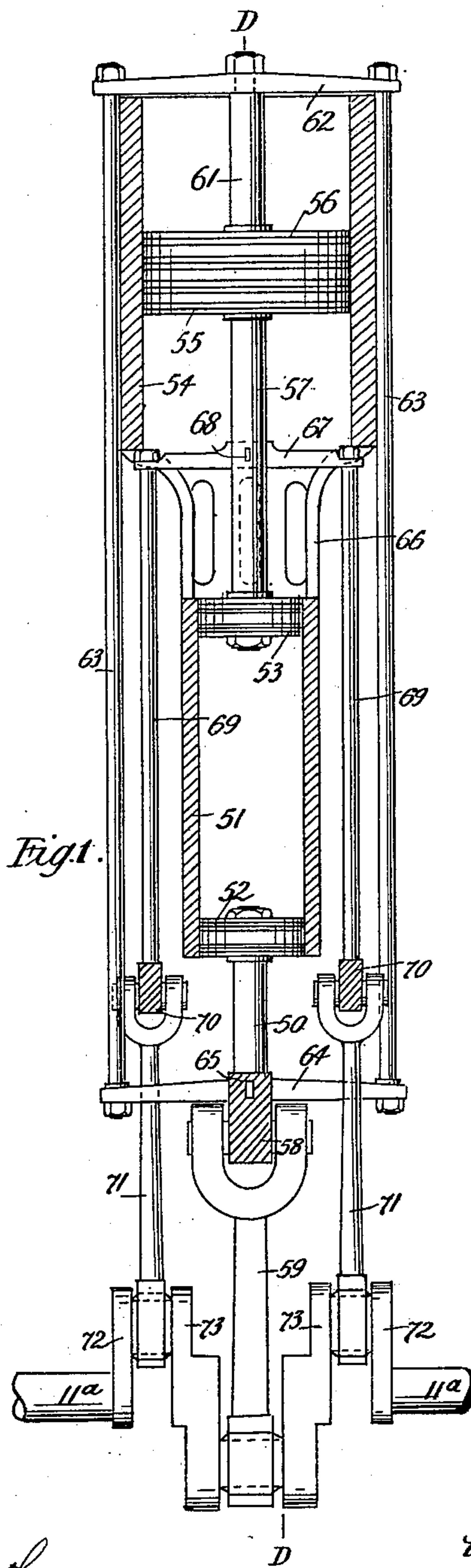
Patented May 7, 1901.

W. WERRY.  
ENGINE FOR STEAM, &c.

(Application filed Dec. 22, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses

Chas. H. Smith  
J. Staib

Inventor

William Werry

per L. W. Terrell & Son  
attys.

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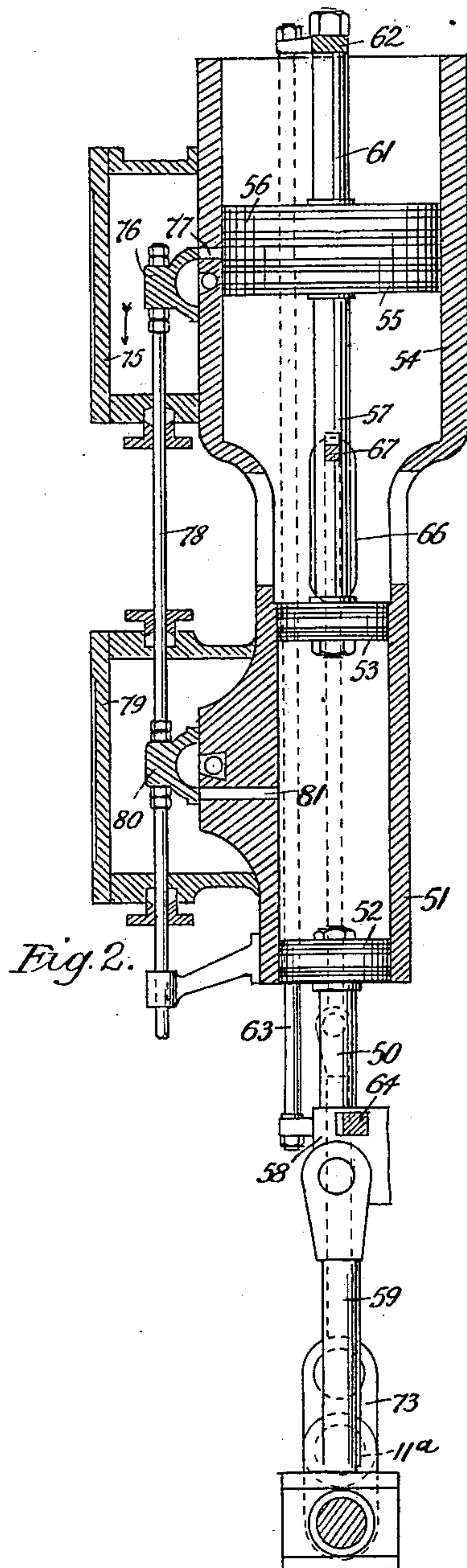
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# UNITED STATES PATENT OFFICE.

WILLIAM WERRY, OF BENDIGO, VICTORIA.

## ENGINE FOR STEAM, &c.

SPECIFICATION forming part of Letters Patent No. 673,670, dated May 7, 1901.

Application filed December 22, 1900. Serial No. 40,735. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM WERRY, a subject of the Queen of Great Britain, residing at Phillip street, Long Gully, Bendigo, in the Colony of Victoria, have invented certain new and useful Improvements in Engines for Steam or other Expansive Pressure Fluids, of which the following is a specification.

My invention relates to improvements in engines having pistons actuated by steam or other expansive pressure fluids—such as air, gas, and the like—and particularly to the so-called “tandem” type of such engines. I employ a high-pressure cylinder and a low-pressure cylinder in the same axial line, a pair of separate and independent pistons in each cylinder and means for supplying steam to each cylinder between the pistons and for exhausting the same, piston-rods connected to the respective pistons and cross-heads connected to the piston-rods, and links and connecting-rods extending from the cross-heads to a common crank-shaft.

In the drawings, Figure 1 is a sectional plan showing my invention. Fig. 2 shows a longitudinal section of the same, taken on line D D of Fig. 1.

The drawings show my improved double-expansion engine of tandem form. 51 represents a cylinder having two pistons 52 53 within it. The cylinder 51 is in line with and preferably constructed integrally with a second and enlarged cylinder 54. This cylinder has also two pistons 55 56 within it, and the piston 55 is connected by the rod 57 with the piston 53 in the smaller cylinder. The piston 52 has a piston-rod 50, which is connected by cross-head 58 with connecting-rod 59. This connecting-rod is pivoted between cranks 73. The piston 56 has piston-rod 61, with a cross-bar 62 bolted at each end to lateral rods 63, which latter connect this cross-bar to a similar cross-bar 64. This latter cross-bar 64 passes through a slot in the cross-head 58, and a key 65 holds it in position. The frame connecting the two cylinders has slots or openings 66, (in addition to slots for the escape of steam from the cylinders,) one opposite the other. A cross-bar 67 passes across piston-rod 57 and is secured by key 68. This cross-bar projects through the openings 66 and has secured to it at either end lateral rods 69, said rods be-

ing connected by cross-heads 70 with connecting-rods 71 and which are pivoted between the cranks 72 73 of the common crank-shaft 11<sup>a</sup>. The crank 73 is thus a double crank, which turns on its own axis in the motion of the engine. The cross-heads 58 and 70 may be supported and guided in any well-known manner. The cross-bars 62 64 are preferably set diagonally—that is, not in a horizontal line—in order that during the motion of the parts the rod 63 and cross-bar 64 will clear the connecting-rods 71.

In Fig. 2, 75 represents the valve-box, and 76 the valve to the cylinder 54, which has central inlet and exhaust port 77. 79 is the valve-box, and 80 the valve to the cylinder 51. These valves are set in line and upon the same rod 78, the cylinder 51 having central port 81. These ports are controlled by the valves 76 and 80. The valves may be operated by any suitable mechanism.

In the engine embodying my invention the steam always acts against two pistons to propel them in opposite directions. Thus high-pressure steam would enter the cylinder 51 by its port 81, and said steam after expanding against the pistons 52 53 and forcing them into the positions indicated in Fig. 2 the exhaust would upon return of pistons 52 53 be conducted to the second cylinder 54, the pistons of which would at this time be adjacent, and the low-pressure steam now entering this cylinder would exercise its expansive energy to propel the pistons 55 56 away from each other, the piston 55 thus acting upon its connecting-piston 53, and at every interval of the pistons coming together the pressure fluid will thus act upon them and a constant and regular motion will be obtained with a maximum efficiency of expansion, and consequent economy of fuel. The pistons 56 and 52 being connected by cross-bars 62 and 64 and lateral rods 63 move together, and the connected pistons 53 and 55 are operated by the cross-bar 67 and lateral rods 69, which are connected with cross-heads 70, the cross-heads 58 and 70 operating upon the common crank-shaft 11<sup>a</sup>.

I do not limit myself to coupling the piston-rods onto the same shaft, as aforesaid, as the connecting-rods may be arranged and coupled in any manner desired and well



known in the art according to the purposes to be accomplished.

The invention may be applied to different types of engines—horizontal, vertical, stationary, or locomotive.

It is obvious that in lieu of steam other expandible pressure-gases may be employed; but the modifications necessary to apply the invention to any of such cases will be readily understood by engineers without further description or illustration. In addition to the enhanced efficiency in regard to the expansion of the steam or other pressure fluids my invention affords increased advantages and economy of space. The employment of packing-glands for the piston-rods may be entirely done away with and a very considerable amount of friction obviated in comparison with other engines in which such glands are used. Furthermore, by the employment of my invention the dead-points in the strokes may be easily overcome by the balancing of the different cranks from the various pistons, and it is expected that the life of the bearings on the main shaft and the crank-brasses of the connecting-rods will be prolonged when my invention is employed.

I claim as my invention—

1. In expansive-fluid-pressure engines and in combination, a high-pressure cylinder and a low-pressure cylinder in the same axial line, a pair of separate and independent pistons in each cylinder and means for supplying steam to each cylinder between the pistons and for exhausting the same, piston-rods connected to the respective pistons and cross-heads connected to the piston-rods, links and connecting-rods extending from the cross-heads to a common crank-shaft, substantially as set forth.

2. In expansive-fluid-pressure engines and in combination, a high-pressure cylinder and a low-pressure cylinder in the same axial line, a pair of separate and independent pistons in each cylinder, a piston-rod connecting the adjacent pistons of the respective high and low pressure cylinders, piston-rods

extending in opposite directions from the distant pistons of the respective cylinders, connections therefrom to a common crank-shaft and means for supplying steam between the respective pairs of pistons and exhausting the same, so that they act simultaneously in opposite directions, substantially as set forth.

3. In expansive-fluid-pressure engines, and in combination, an open-ended high-pressure cylinder and an open-ended low-pressure cylinder in the same axial line, pairs of separate and independent pistons in the said cylinders, and a piston-rod connecting the adjacent pistons of the said cylinders, a central port in each cylinder for admitting steam between the pairs of pistons, an exhaust-port and valves for controlling the admission of steam and exhaust through the same ports, and connections from the said pistons for operating a common crank-shaft, substantially as set forth.

4. In expansive-fluid-pressure engines and in combination, an open-ended high-pressure cylinder and an open-ended low-pressure cylinder in the same axial line, pairs of separate and independent pistons in the said cylinders, and a piston-rod connecting the adjacent pistons of the said cylinders, a central port in each cylinder for admitting steam between the pairs of pistons, an exhaust-port and valves for controlling the admission of steam and exhaust through the same ports, piston-rods extending in opposite directions from the distant pistons of the respective cylinders, cross-heads connected to the said piston-rods and to the intermediate piston-rod, and links and connecting-rods from the respective cross-heads to a common crank-shaft, substantially as set forth.

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

WILLIAM WERRY.

Witnesses:

A. O. SACHSE,  
A. HARKER.