May 11, 1926. 1,584,614

C. L. COOK

GAS OR VAPOR ENGINE, PARTICULARLY STEAM ENGINE

Filed Jan. 24, 1921 2 Sheets-Sheet 1

Fig. 1.

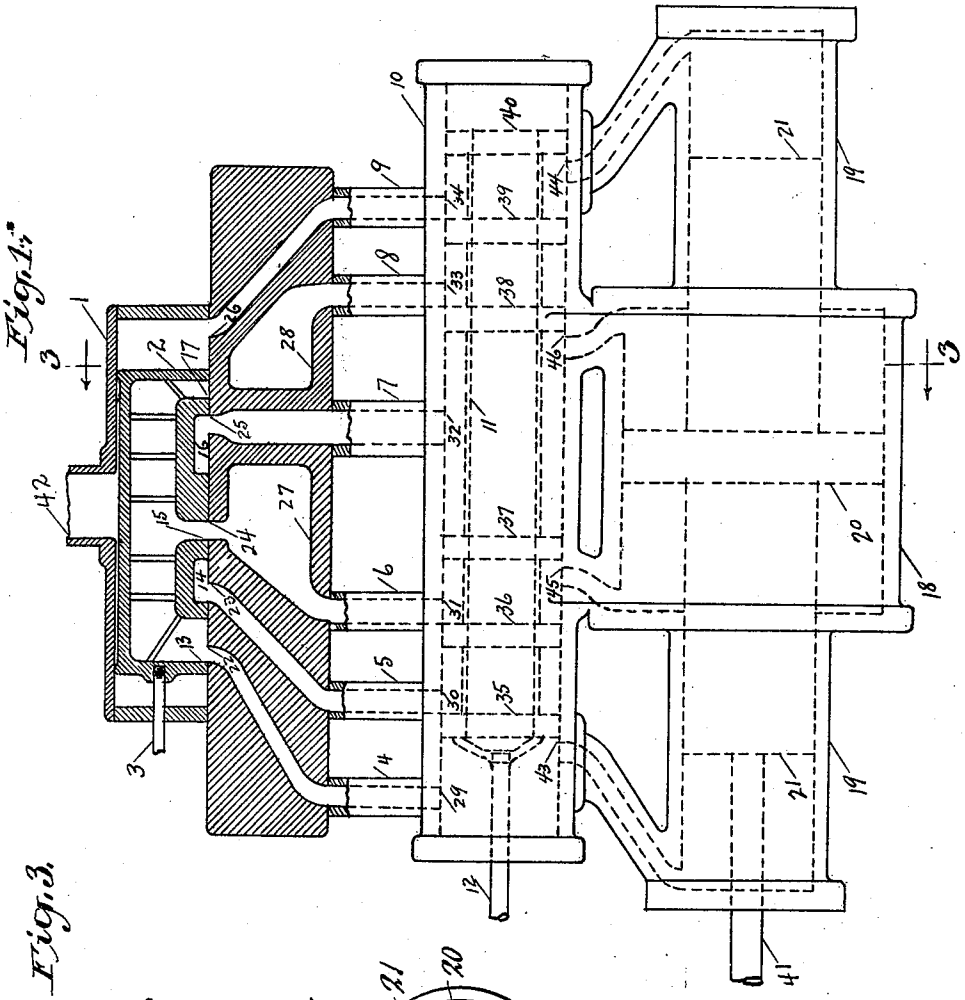
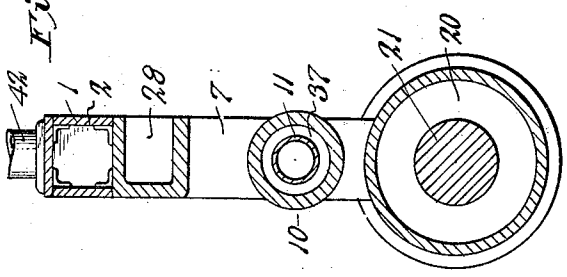


Fig. 3.



Charles Lee Cook
INVENTOR

By Bradford Webster
ATTORNEY.

May 11, 1926. 1,584,614

C. L. COOK

GAS OR VAPOR ENGINE, PARTICULARLY STEAM ENGINE

Filed Jan. 24, 1921 2 Sheets-Sheet 2

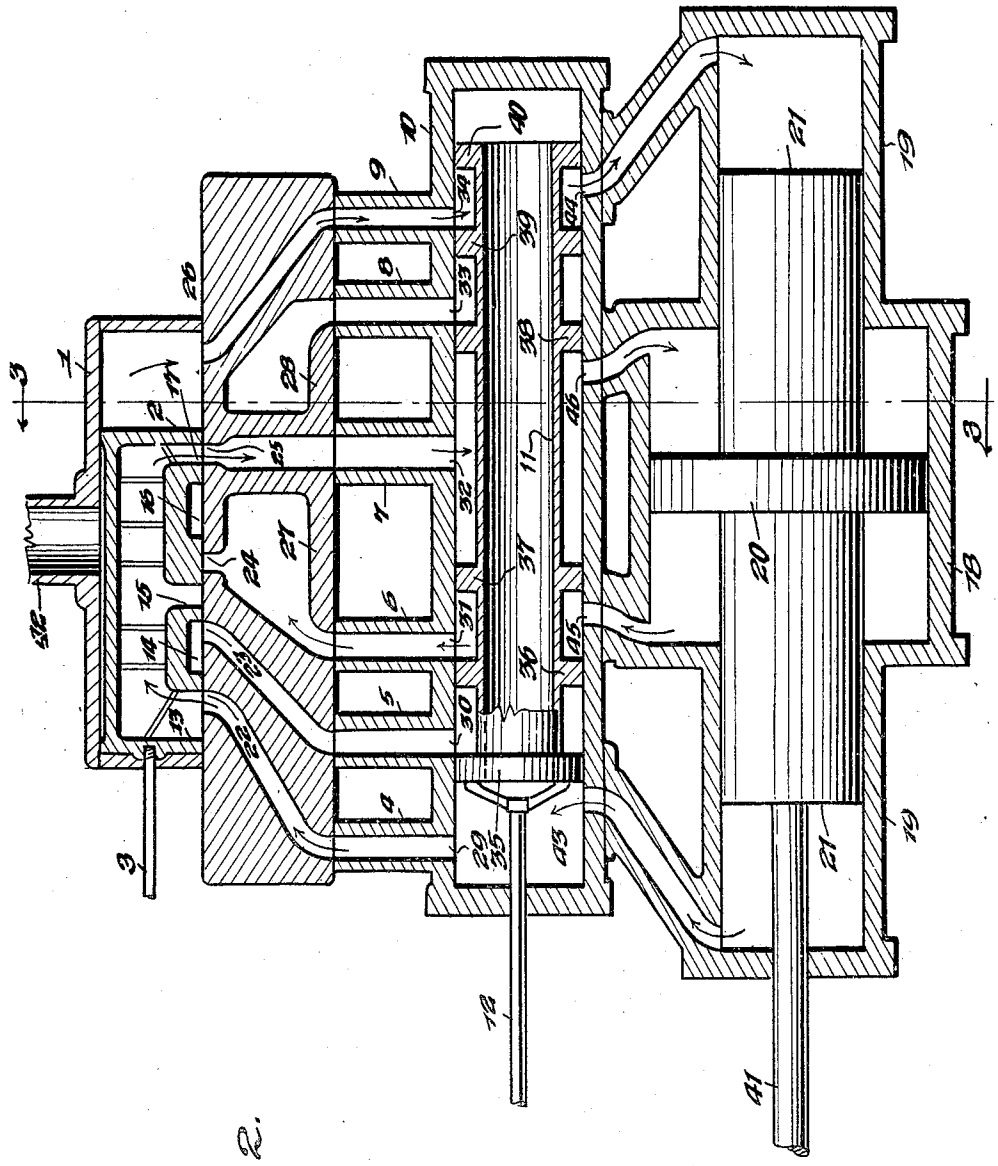


Fig. 2.

Inventor
Charles Lee Cook

By

Attorney

Patented May 11, 1926. 1,584,614

UNITED STATES PATENT OFFICE.

CHARLES LEE COOK, OF LOUISVILLE, KENTUCKY.

GAS OR VAPOR ENGINE, PARTICULARLY STEAM ENGINE.

Application filed January 24, 1921. Serial No. 439,603.

My invention relates particularly to compound steam or gas or vapor engines, and more especially to those used on locomotives. It has for its objects to improve the efficiency and adaptability of compound gas or vapor engines.

In the drawing Figure 1 is a vertical longitudinal section in part elevation of an embodiment of my invention in a locomotive.

Figure 2 is a longitudinal sectional view showing the convertible valve shifted into the position it will occupy when the engine is operating compound.

Figure 3 is a cross sectional view taken on the line 3—3 of Figure 1.

In the main steam chest 1, I place the reciprocative valve 2, manually operated to a plurality of fixed positions by connections including a rod 3 from beyond the end of the chest 1, and provided with a plurality of openings 13 to 17 inclusive positioned with respect to the openings 22 to 26 in the steam chest 1, as I am about to describe. The valve seat in and integral with steam chest 1 also contains exhaust cavities 27 and 28.

Each of the openings 22 to 26 inclusive and the cavities 27 and 28 I connect respectively by pairs of pipes 4 to 9 inclusive with openings 29 to 34 inclusive in each of the valve chambers 10 on opposite sides of the locomotive.

Each valve chamber 10 contains the six discs 35 to 40 inclusive, which are connected and positioned by the tube 11, all being reciprocated by the rod 12, extending beyond the valve chest 10 and reciprocated by the usual valve gear of the locomotive.

Preferably integral with the valve chamber 10, is the compound cylinder consisting of the central cylinder 18 of larger diameter and the two cylinders 19 of smaller diameter extending axially from each end thereof. In the central cylinder 18 is the double-faced piston 20, and extending from each end thereof and fixed thereto are the pistons 21, of smaller diameter, preferably hollow, and of sufficient length to maintain a constant bearing in each smaller cylinder and perform the functions of a piston rod over that distance. Fixed to one of the pistons 21 is the main piston rod 41.

At the longitudinal centre of the steam chest 1 is positioned the steam intake 42.

I connect the valve chamber 10 with the smaller diameter cylinders 19 by the ports 43 and 44. I connect the valve chamber 10 with the larger diameter cylinder 18 by the ports 45 and 46.

I will now proceed to point out the relations of my various ports and valve mechanisms to the reciprocation of the compound piston and the application of steam or other gas or vapor, so that my invention may, by previous adjustment of the valve 2 through the rod 3, be used as a compound high and low pressure engine or as a high pressure engine of maximum power.

When the valve 2 in steam chest 1 is in fixed position to the right, as shown in the drawings, or first position, the engine is operating as a high pressure engine of maximum power.

When the valve 2 in steam chest 1 is in fixed position to the left, or second position, the engine is operating as a compound high and low pressure engine.

In first position, steam enters and fills steam chest 1, passes through opening 26, through pipe 9, into valve chamber 10 through opening 34, between discs 39 and 40, through port 44 into small cylinder 19. Steam also enters through openings 16 and 25 through pipe 7 into valve chamber 10 through opening 32 between discs 37 and 38 through port 46 into larger cylinder 18. Thus high pressure steam acts simultaneously to drive the larger and smaller diameter portions of the compound piston in the same direction.

At the same time the high pressure steam in the small cylinder 19 at the opposite end is exhausted through port 43 into valve chamber 10 through opening 29 through pipe 4 through openings 22, 13, 15, and 24 into exhaust cavity 27, which connects with the open air. High pressure steam in the opposite end of larger cylinder 18 is exhausted through port 45 into valve chamber 10 between discs 36 and 37 through opening 31 through pipe 6 into exhaust cavity 27.

On the return stroke, steam enters through openings 14 and 23, through pipe 5, through opening 30 into valve chamber 10 between discs 35 and 36, through port 43, into smaller cylinder 19. Steam also enters through openings 16 and 25 through pipe 7 through

opening 32 into valve chamber 10 between discs 37 and 38, through port 45, into the larger cylinder 18. At the same time the high pressure steam in smaller cylinder 19 at the opposite end exhausts through port 44 into valve chamber 10 through tube 11, through opening 29, through pipe 4, through openings 22, 13, 15, and 24 into exhaust cavity 27, which is connected with the outer air. High pressure steam in the opposite end of the larger cylinder 18 is exhausted through port 46 into valve chamber 10, between discs 38 and 39, through opening 33 and through pipe 8 into exhaust cavity 28, which is connected with the outer air.

In second position, the steam enters the steam chest 1 through pipe 42, through opening 26, through pipe 9, through opening 34, into valve chamber 10 between discs 39 and 40, through port 44 into smaller cylinder 19. At the same time, steam which has exhausted from the smaller cylinder 19 at the opposite end, passes through port 43 into valve chamber 10, through opening 29, through pipe 4, through openings 22, 13, 17, and 25, through pipe 7, through opening 32, into valve chamber 10, between discs 37 and 38, through port 46, into larger cylinder 18. At the same time steam is exhausted from the opposite end of larger cylinder 18 through port 45 into valve chamber 10 between discs 36 and 37, through opening 31, through pipe 6, into exhaust cavity 27, and thence to the outer air.

On the return stroke, steam enters through openings 14 and 23, through pipe 5, through opening 30 in valve chamber 10, between discs 35 and 36, through port 43 into the smaller cylinder 19. At the same time, steam is exhausted from the smaller cylinder 19 from the opposite end, through port 44, into valve chamber 10, through tube 11, through opening 29, through pipe 4, through openings 22, 13, 17, and 25, through pipe 7, through opening 32, into valve chamber 10, between discs 37 and 38, through port 45, into larger cylinder 18. At the same time steam is exhausted from the opposite end of larger cylinder 18 through port 46 into valve chamber 10 between discs 38 and 39, through opening 33, through pipe 8, into exhaust cavity 28, and thence into the outer air.

I do not limit myself further than is indicated in the claims which follow.

I claim:

1. A compound gas or vapor engine comprising a plurality of compound cylinders and compound reciprocating pistons therein, a steam chest having a plurality of exit openings, a single valve chamber intermediate the steam chest and cylinders, a reciprocating valve therein, and a manually adjustable valve in the steam chest movable to two positions, in one of which steam is admitted at high pressure through said valve chamber to both of the compound pistons, and in the other of which high pressure steam is admitted to one piston and exhaust steam to the other piston.

2. A compound gas or vapor engine comprising a compound cylinder, a compound reciprocating piston provided with heads of different diameters, a steam chest having a plurality of exit openings therefrom, a single valve chamber between the cylinder and steam chest, a reciprocating valve therein, and mannually operable means for varying the admission of steam from the steam chest to the valve chamber and consequently the operation of the engine.

3. A compound gas or vapor engine comprising a compound cylinder, a compound reciprocating piston provided with heads of different diameters, a steam chest having a plurality of exit openings therefrom, a single valve chamber between the cylinder and the steam chest, a reciprocating valve therein, and a valve in the steam chest manually operable to two positions to vary the passage of steam through the exit openings to the valve chamber and thereby the operation of the engine.

4. A compound gas or vapor engine comprising a compound cylinder, a compound reciprocating piston provided with heads of different diameters, a steam chest having a plurality of exit openings therefrom, a single valve chamber between the cylinder and the steam chest, a reciprocating valve therein, and a valve in the steam chest manually operable to two positions, in one of which high pressure steam is admitted to the piston heads of both diameters, and in the other of which high pressure steam is admitted to the smaller piston head and exhaust steam to the larger piston head.

CHARLES LEE COOK.