

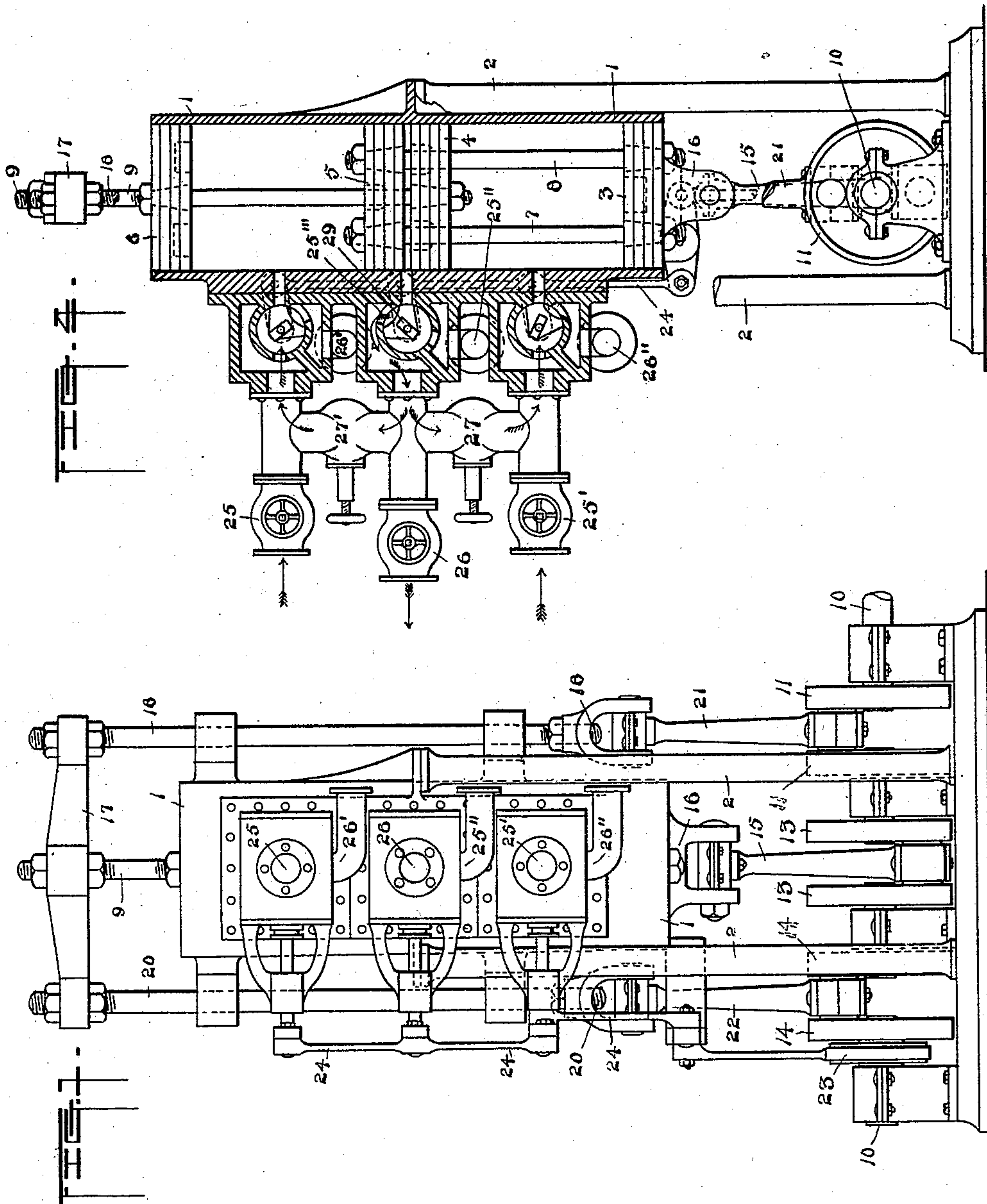
(No Model.)

2 Sheets—Sheet 1.

E. GSCHWIND.  
STEAM ENGINE.

No. 523,118.

Patented July 17, 1894.



Witnesses

Arch. M. Cathin.

Francis D. Blackstone

Inventor

Edward Gschwind

by

Am. R. Cathin Attorney

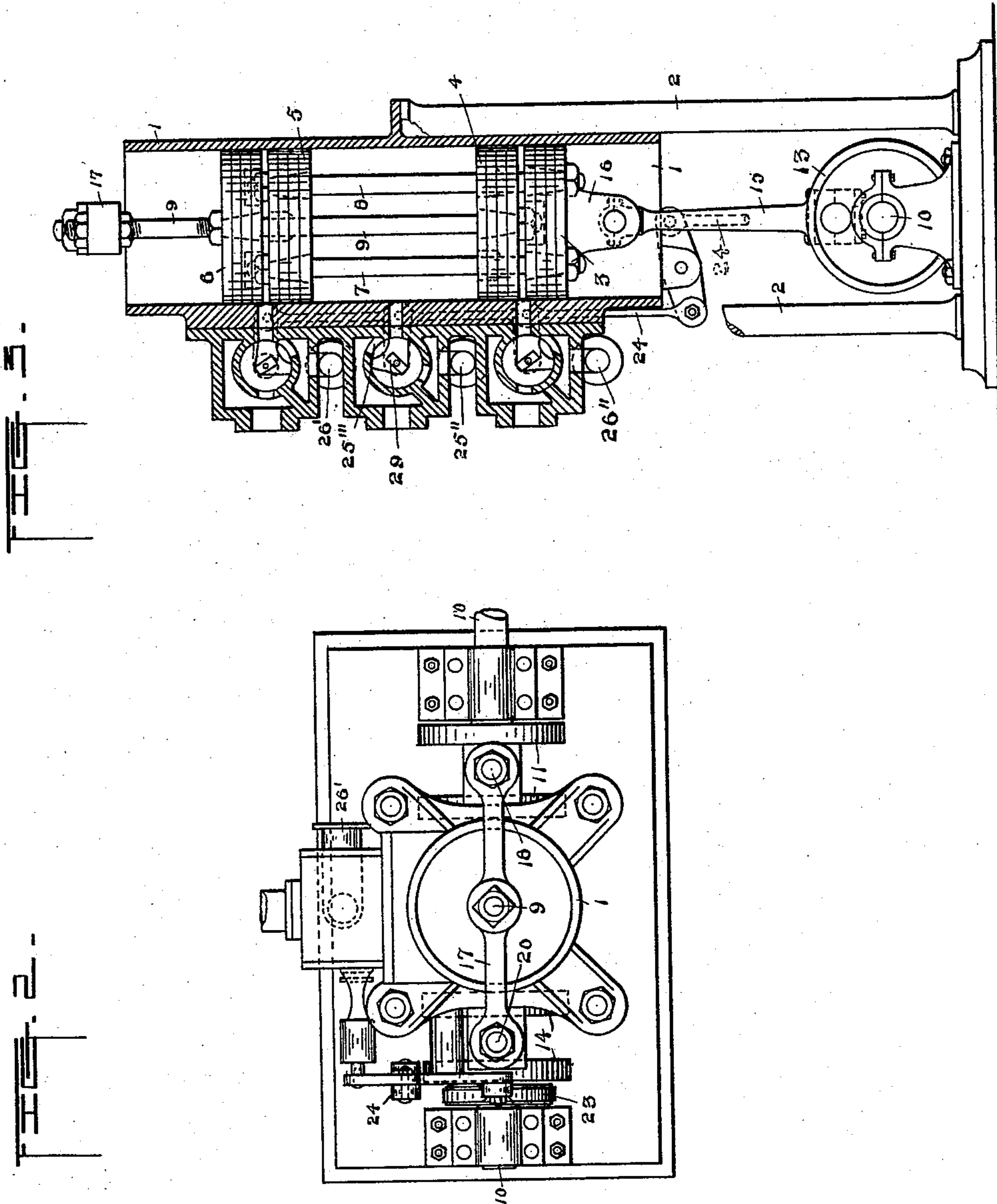
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# UNITED STATES PATENT OFFICE.

EDWARD GSCHWIND, OF NEW ORLEANS, LOUISIANA.

## STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 523,118, dated July 17, 1894.

Application filed October 27, 1893. Serial No. 489,267. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD GSCHWIND, a resident of New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

The invention relates to steam engines and the like and has for its object to simplify their construction and secure a high economy of power; and it consists in the construction hereinafter described and particularly pointed out.

In the accompanying drawings Figure 1 is a side elevation. Fig. 2 is a plan; and Figs. 3 and 4 are broken sections taken at right angles to the view in Fig. 1 and showing two situations of the cylinder pistons.

Numeral 1 denotes a cylinder supported by posts or standards 2 rising from a suitable bed plate or base. But any desired manner of arranging and supporting it may be adopted. Cylinder 1 is without fixed heads and is provided with four pistons 3, 4, 5 and 6. The pistons 3 and 5 are fixed to the rods 7 and 8 which pass freely through stuffing boxes or packed openings in piston 4. The latter piston as well as piston 6 are fixed to the rod 9 which passes through a suitably packed opening in piston 5.

10 denotes a crank shaft, and 11, 13 and 14 are crank arms. To arm 13 is pivotally joined the connecting rod 15 which has a loose connection with a bracket 16 attached to piston rods 7 and 8 and mediatly to the pistons 3 and 5.

The pistons 4 and 5 are by the medium of rod 9 fixed to a cross head 17 which in turn is connected by rods 18 and 20 and loose connecting rods 21 and 22 to the crank arms 11 and 14 respectively. These arms are set at a distance of one hundred and eighty degrees from arms 13 the latter constituting in effect but a single crank.

23 denotes an eccentric for operating the valve gear, and 24 are connecting rods for transmitting power to suitably move the valves.

25, 25' and 25'' denote valve ports for admitting live steam and 26, 26' and 26'' indicate exhaust ports.

27 and 27' are valves designed to be closed when it is desired to use live steam between pistons 3 and 4 and between pistons 5 and 6. At other times when steam is exhausted into the space between these pistons as indicated by the arrows feathered upon one side only the valves 27 and 27' will be opened. Thus, for example, in starting a locomotive these valves would be closed and live steam would be admitted alternately through valve ports 25, and 25', 25''.

Steam entering through port 25'' and valve 29 being suitably opened would enter between pistons 4 and 5 and cause them to recede from each other the pistons 3 and 6 being at the same time drawn toward each other. As soon as these movements have attained their desired and predetermined limits the steam inlet port 25'' is closed and exhaust port 25''' opened and steam thereupon exhausted through it and through the central port 26. Simultaneously with this exhaust, live steam is admitted through ports 25 and 25' with the effect to return the pistons to their original situations, exhaust taking place through the ports 26' and 26'' subsequently and during the time pistons 4 and 5 are being again driven apart.

The operation thus described does not provide for utilizing exhaust steam which however may and in general practice will be done in the manner common in compound engines. In such case valves 27 and 27' will be open and after admitting steam between pistons 4 and 5 through port 25'' the port is closed and port 25''' opened and the steam allowed to follow the paths indicated by the arrows feathered on one side only and to expand at one end between pistons 3 and 4 and at the other between pistons 5 and 6. The steam is finally exhausted through ports 26' and 26'' as before, the exhaust port 26 remaining closed.

As in the operation just described the partially exhausted steam from between the middle pistons is divided into two parts each of which is allowed to finally expand between two pistons it has double space for expansion



therein. The apparatus can therefore be used as a compound engine and though simple in structure is adapted to use steam economically and under either a high or low pressure. In neither case is any steam pressure wasted on a fixed cylinder head as the whole is applied directly to the pistons. And the pressure upon these is so balanced as to avoid all unnecessary strains and shocks and to produce a very quiet and smoothly running engine. The improvement utilizes the thrust or push which in case of cylinders having fixed heads is expended on said heads by applying it through the medium of the pistons to the crank shaft. This enables heavy bed plates and frames to be dispensed with. Further as the dead centers are directly opposite each other, the thrust on the shaft is neutralized and the strain and friction at the shaft bearings reduced. The cylinder is preferably made a little longer than four times the length of the piston stroke plus the aggregate thickness of the pistons. Each steam port is placed at about the center of a third of the cylinder's length and each is adapted to be used both for admitting steam to or exhausting it from the cylinder.

Neither the particular form of the valve chest and valve gear, nor the upright position of the cylinder, nor the kind of piston, nor the particular character of other details are essential and these may be varied by mechanical skill provided substantially the same principles of operation and construction are preserved.

It is obvious that two or more cylinders with pistons and other necessary devices can be used in combination and their crank arms so set that they cannot all be simultaneously in line with the connecting rods and with the dead centers. It is further obvious that two crank shafts may be run by each cylinder and that these shafts may be situated at opposite ends of the cylinder.

Although steam has been mentioned the engine can be run by any suitable fluid customarily utilized for the transmission of pressure in engines, and it is adapted for general use and is not limited to any special purpose or machinery.

I am aware that open ended cylinders having four pistons have been proposed, the outer pistons being both connected to a crank arm to move together in the same direction and the others being arranged to be moved each by a separate crank, the three cranks being arranged at angles of one hundred and twenty degrees to each other and I am also aware that separate pistons have been connected to crank arms situated at one hundred and eighty degrees apart and that multiple cylinders have been provided with ports for introducing and exhausting steam, individual ports being used for both purposes and such matters are not claimed but the constructions

hereinafter pointed out. It is characteristic of my improvement in these respects that the alternate pistons only are rigidly connected to each other, each end piston having a rod or rods fixed to it and passing loosely through the adjoining piston and fixed to that one which is next the other end piston all as required by the operation herein set forth.

Having thus described my invention, what I claim is—

1. In an engine the headless cylinder for applying power by fluid pressure in combination with four pistons the alternate pistons being fixed to each other by rods passing freely through the inner piston of each pair respectively, and a valve and valve port between the innermost pistons adapted to admit steam to separate them and to cause the end pistons both to move inwardly and ports for admitting steam to move said end pistons outwardly substantially as set forth.

2. In an engine the headless cylinder for applying power by fluid pressure in combination with four pistons the alternate pistons being fixed to each other in pairs by rods passing freely through the inner piston of each pair respectively and valves for admitting live steam alternately between the inner pistons and between each of them and an outer piston for working under high pressure and moving a member of each pair alternately toward and from the corresponding member of the other pair, substantially as set forth.

3. In an engine the headless cylinder for applying power by fluid pressure in combination with four pistons the alternate pistons being connected in pairs by rods passing through the inner piston of each pair respectively and valves for admitting live steam between the inner pistons and exhausting from thence to and between each of them and an outer piston to work the steam expansively, substantially as set forth.

4. In an engine the headless cylinder for applying power by fluid pressure in combination with four pistons the alternate pistons being connected in pairs by rods passing through the inner piston of each pair respectively, valves for either admitting live steam alternately between the inner pistons and between each of them and an outer piston or for admitting live steam between the inner pistons and exhausting from thence to and between each of them and an outer piston, substantially as set forth.

5. In combination the headless cylinder having the four pistons, the alternate pistons being fixed to each other in pairs, the shaft provided with crank arms, the intermediate devices connecting the alternate pistons to independent crank arms, said arms being arranged on directly opposite sides of the shaft, substantially as set forth.

6. In combination a cylinder having no fixed



heads and provided with three ports each adapted to admit steam to or exhaust it from the same, valves to control such alternative operations and four pistons, the alternate pistons being fixed to each other in pairs by rods passing freely through the inner piston of the other pair, substantially as set forth.

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

EDWARD GSCHWIND.

Witnesses:

BENJ. R. CATLIN,  
ARCH. M. CATLIN.