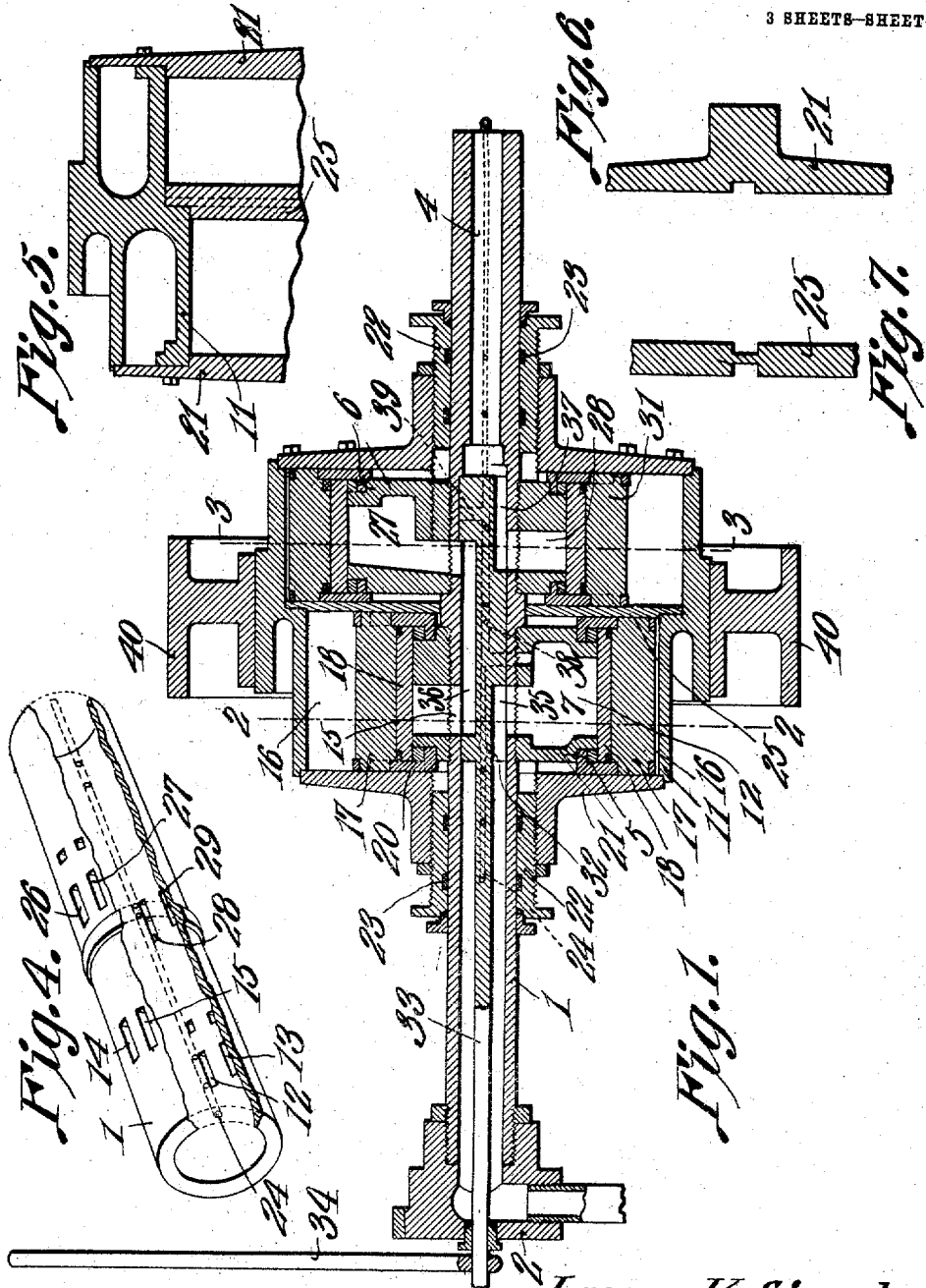


L. K. SIVERTSON.
 COMPOUND ROTARY ENGINE.
 APPLICATION FILED NOV. 25, 1910.

987,264.

Patented Mar. 21, 1911.

3 SHEETS—SHEET 1.



Witnesses
J. P. Clonin
W. Easterday

Lucas K. Sivertson,
 Inventor
 by *C. A. Snow & Co.*
 Attorneys

L. K. SIVERTSON.
 COMPOUND ROTARY ENGINE.
 APPLICATION FILED NOV. 25, 1910.

987,264.

Patented Mar. 21, 1911.

3 SHEETS-SHEET 2.

Fig. 2.

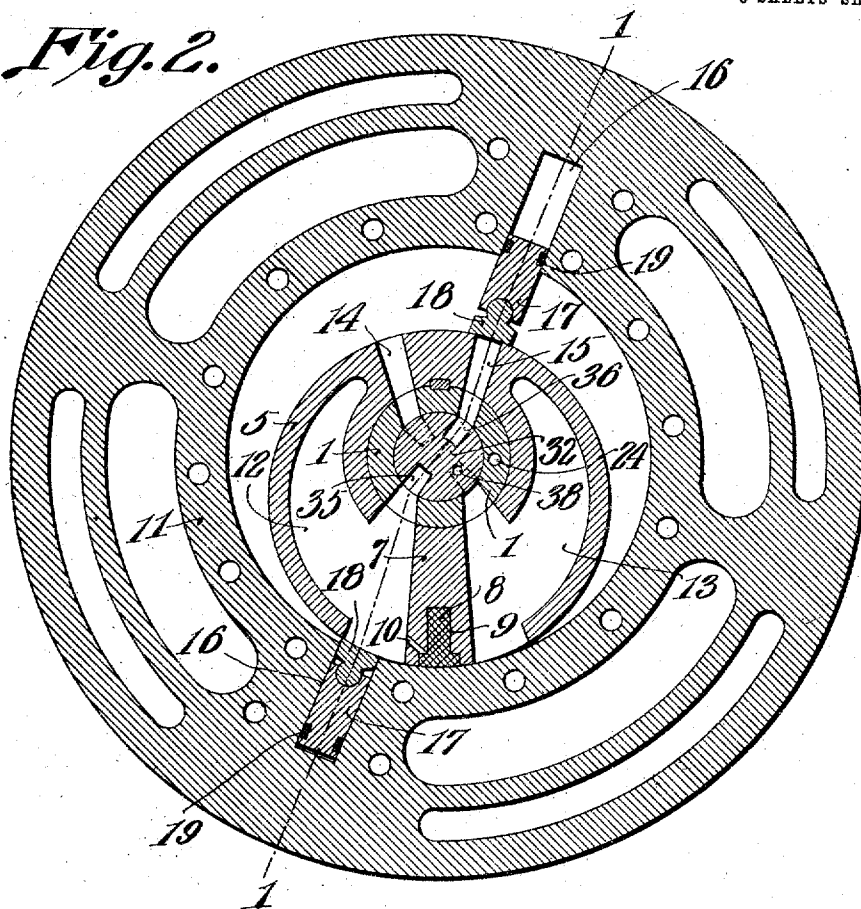


Fig. 8.

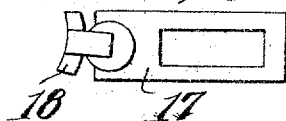
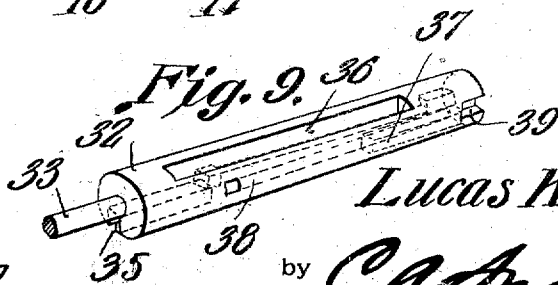


Fig. 9.



Witnesses

J. R. Tomlin
A. Easterday

Lucas K. Sivertson
 Inventor

by *C. A. Snow & Co.*
 Attorneys

L. K. SIVERTSON.
COMPOUND ROTARY ENGINE.
APPLICATION FILED NOV. 25, 1910.

987,264.

Patented Mar. 21, 1911.

3 SHEETS—SHEET 3.

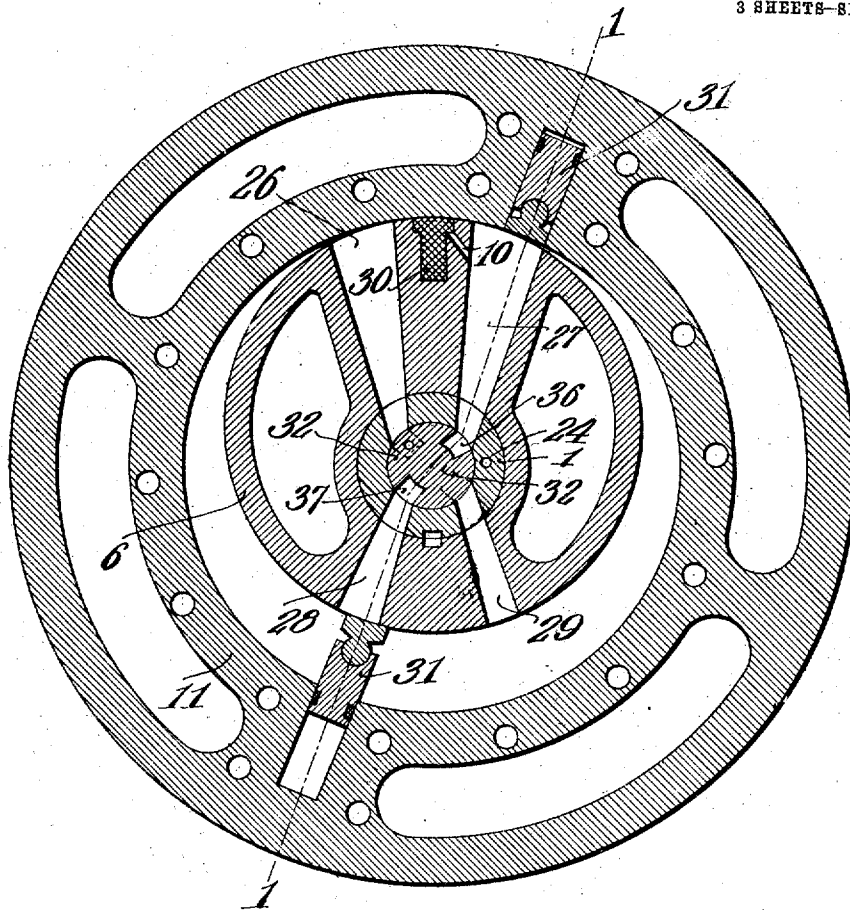


Fig. 3.

Witnesses
J. H. [Signature]
A. Easterdag

Lucas K. Sivertson,
Inventor
by *C. A. Snow & Co.*
Attorneys

UNITED STATES PATENT OFFICE.

LUCAS K. SIVERTSON, OF CARRINGTON, NORTH DAKOTA.

COMPOUND ROTARY ENGINE.

987,264.

Specification of Letters Patent. Patented Mar. 21, 1911.

Application filed November 25, 1910. Serial No. 694,098.

To all whom it may concern:

Be it known that I, LUCAS K. SIVERTSON, a citizen of the United States, residing at Carrington, in the county of Foster and State of North Dakota, have invented a new and useful Compound Rotary Steam-Engine, of which the following is a specification.

This invention has relation to compound rotary steam engines and consists in the novel construction and arrangement of its parts as hereinafter shown and described.

The present invention is an improvement upon my prior patent for rotary engine issued May 21, 1907, #854,001.

The object of the invention is to provide a simple engine of the character indicated in which a double expansion of the same steam is utilized for the purpose of driving the engine thus economizing the use of steam and utilizing its expansive force to a maximum degree to attain mechanical movement in the parts of the engine.

With this object in view the engine includes a fixed hollow shaft having a valve of peculiar configuration located in the same and adapted to govern ports provided in the said shaft. Piston casings are mounted for rotation about the shaft and pistons are fixed to the shaft and are located in their respective casings. One of the said casings is of greater diameter than the other and it is in the larger casing that the second or compound expansion of the steam takes place.

The structure also includes mechanical details which will be explained hereinafter and means is provided for reversing or changing the direction in which the casing will rotate at will.

In the drawings,—Figure 1 is a longitudinal sectional view of the engine cut on the lines 1—1 of Figs. 2 and 3. Fig. 2 is a transverse sectional view of the engine cut on the line 2—2 of Fig. 1. Fig. 3 is a transverse sectional view of the engine cut on the line 3—3 of Fig. 1. Fig. 4 is a perspective view of a portion of the engine shaft. Fig. 5 is a sectional view of a portion of the engine casing. Fig. 6 is a sectional view of a portion of one of the casing heads. Fig. 7 is a sectional view of a portion of the casing partition. Fig. 8 is an end view of an abutment. Fig. 9 is a perspective view of a valve used in the engine.

The engine consists of a hollow shaft 1

which in practice is held in stationary position by any suitable means. The fitting 2 is fixed to one end of the shaft 1 and through the said fitting steam is admitted to the interior of the shaft. That end of the shaft 1 opposite the end thereof at which the fitting 2 is mounted is open and constitutes an exhaust passage 4.

Cylindrical pistons 5 and 6 are fixed to the intermediate portion of the shaft 1 and the said pistons are eccentrically positioned upon the said shaft with their deeper portions projecting beyond the opposite sides of the shafts in opposite directions. The piston 5 is provided with a partition 7 which extends along the greater radius of the piston and is provided at its outer portion with a recess 8 which slidably receives a packing member 9. The said partition 7 is provided at its opposite sides with steam ducts 10 through which steam may pass from the interior of the piston into the recess 8 and serve as means for forcing the packing member into engagement with the inner periphery of the casing 11 in which the said pistons are housed. The piston 5 is provided with steam cavities 12 and 13 which are the counter parts of each other and which are located at the opposite sides of the partition 7 of the said piston. The said piston is furthermore provided with steam channels 14 and 15 and the inner ends of the said cavities and the inner ends of the said channels are adapted to register with channels and ports provided in a valve journaled in the shaft 1 as will be hereinafter explained. The casing 11 is provided with diametrically opposite cavities 16 the inner ends of which communicate with the interior of the said casing. Abutments 17 are slidably located in the cavities 16 and each abutment is provided at its inner end with a pivoted valve portion 18 which rests against the periphery of the piston 5. Suitable packings 19 may be provided between the sides of the abutments 17 and the side walls of the cavities 16 and circular channels 20 are formed at the ends of the piston 5 and receive projecting end portions of the said abutments 17 whereby the valved portions 18 are held in close contact with the periphery of the piston 5 as the casing 11 rotates. Heads 21 close the ends of the casing 11 and each head is provided with a bearing 22 which is journaled upon the shaft 1. Cavities 23 are provided in the bearings 22 and are adapted

to receive packings and an oil duct 24 extends longitudinally of the shaft 1 and communicates with all of the cavities 23 and may be used as means for conveying oil to the said cavities for the purposes of lubrication.

A partition 25 divides the casing 11 into two end portions in one of which the piston 5 hereinbefore described is located and in the other of which is located the piston 6. The partition 25 is also provided with grooves adapted to guide the end portions of the abutments 17 and the valves carried thereby.

The piston 6 is provided with steam cavities 26 and 27 and steam channels 28 and 29. The inner ends of these cavities and channels communicate with the interior of the piston and the outer ends thereof are at the periphery of the piston. The piston 6 is provided with a partition and packing 30 similar to the partition 7 and packing 9 described in connection with the piston 5. The casing 11 is also provided with abutments 31 similar in construction and arrangement to the abutment 17 hereinbefore described and the said abutments 31 operate against the periphery of the piston 6 in a similar manner to the operation of the abutments 17 upon the periphery of the piston 5.

A rotatable valve 32 is journaled in the shaft 1 and is provided with a stem 33 which extends longitudinally of the said shaft and projects through the fitting 2 provided at the end of the shaft. An operating handle lever 34 is fixed to the projecting end of the valve stem 33. The valve 32 is provided with a steam channel 35 which at times is brought into register with the inner end of the steam cavity 12 in the piston 5. When this is done one end of a steam channel 36 also provided in the valve 32 communicates with the inner end of the cavity 15 in the piston 5 and the other end of the said channel 36 communicates with the cavity 27 in the piston 6. Also the said valve 32 is provided with a steam channel 37 which, when the channel 35 is in communication with the cavity 12 in the piston 5 the said channel 37 communicates with the cavity 28 in the piston 6 and also with the exhaust passage 4 in the end of the said shaft. The valve 32 is further provided with a steam duct 38 which when the channel 35 communicates with the cavity 12 the said duct establishes communication between the cavity 13 of the piston 5 and the exhaust passage 4 of the shaft. The said valve 32 is also provided with a steam duct 39 which communicates at one end with the duct 38 and at its other end is adapted to communicate with the cavity 26 of the piston 6 when the steam channel 35 communicates with the cavity 12 of the piston 5.

Presuming that the steam channels and steam ducts are in communication with the

various cavities and passages in the pistons as last above described and steam is admitted through the shaft 1. From the interior of the said shaft steam will pass through the channel 35 into the cavity 12 of the piston 5. The steam will pass out of the said cavity at its outer end and come in contact with the sides of one of the abutments 17 located in the casing 11. Thus as the said steam expands the casing 11 is carried around. As soon as the abutment against which the steam is operating passes beyond the outer end of the passage 15 in the piston 5 the said steam may exhaust down through the said passage into the steam channel 36 in the valve 32. The steam will pass along the said channel and enter the cavity 27 in the piston 6 and pass out at the outer end of the said cavity. From the said cavity the steam will impact against the side of one of the abutments 31 and the said steam is thus permitted to exercise a second expansion which will augment the rotary movement of the casing 11. When the abutment 31 passes beyond the end of the passage 28 in the piston 6 the said steam may exhaust through the said passage into the steam channel 37 from whence it passes into the exhaust passage 4 of the shaft 1. At the same time that the steam is operating in the piston as above described it is possible and quite likely that some steam will be trapped in both of the said pistons and in order to prevent back pressure from the same the steam that is trapped for instance in the piston 5 in advance of the abutment 17 will be forced around by the said abutment 17 as it passes beyond the end of the passage 5 and the said trapped steam will be forced through the cavity 13 into the duct 38 and from the said duct will pass into the exhaust passage 4 of the shaft 1. Again should any steam or pressure be trapped in the piston 6 it will be carried around in advance of the abutment 31 and will be forced through the cavity 26 and steam duct 39 into the duct 38 from which it will pass into the exhaust passage 4. Thus it will be seen that provision is made for rotating the casing 11 in one direction. Presuming now it is desired to rotate the said casing in an opposite direction an operator grasps the handle lever 34 and turns the stem of the valve 33 so that the steam passage 35 of the said valve 32 is brought into communication with the cavity 15 in the piston 5. This movement will bring the ends of the steam channel 36 into communication with the cavity 12 in the piston 5 and the cavity 26 in the piston 6. Thus the steam will be admitted to the said pistons in the opposite direction from that first above described and the casing 11 will be driven around the piston in the opposite direction. The turning movement on the part of the valve 32 will bring the various

exhaust ducts and passages into register with the proper cavities and steam passages so that the exhaust steam is carried through the engine and liberated into the exhaust passage 4. A belt rim 40 is attached to the periphery of the casing 11 and a belt may be applied to the said rim whereby the rotary movement established in the casing 11 may be transmitted to machines or other objects.

10 Therefore it will be seen that a rotary engine is provided in which a compound expansion of the steam is utilized for the purpose of actuating the operable parts of the engine and this utilization of the compound

15 expansion of the steam will result in material saving of steam pressure by which economical advantages are attained.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent is:—

1. An engine comprising a hollow shaft, pistons fixed to the shaft and eccentrically positioned upon the same with their longer radii extending in opposite directions at the

25 opposite sides of the shaft, said pistons having steam cavities, a casing receiving the

pistons and having abutments bearing against the peripheries of the pistons, a valve located in the shaft and arranged to convey steam to one of the pistons and from the first said piston to the second piston and then convey the exhaust steam from the second mentioned piston.

2. An engine comprising a hollow fixed shaft, pistons fixed to the shaft and eccentrically positioned thereon and having their longer radii extending in opposite directions at the opposite sides of the shaft, a rotatable valve located in the shaft and having channels adapted to convey steam to the first piston and transmit the steam from the first piston to the second mentioned piston and convey the exhaust steam from the second mentioned piston.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

LUCAS K. SIVERTSON.

Witnesses:

THORVAL BERG,
P. HANSEN.