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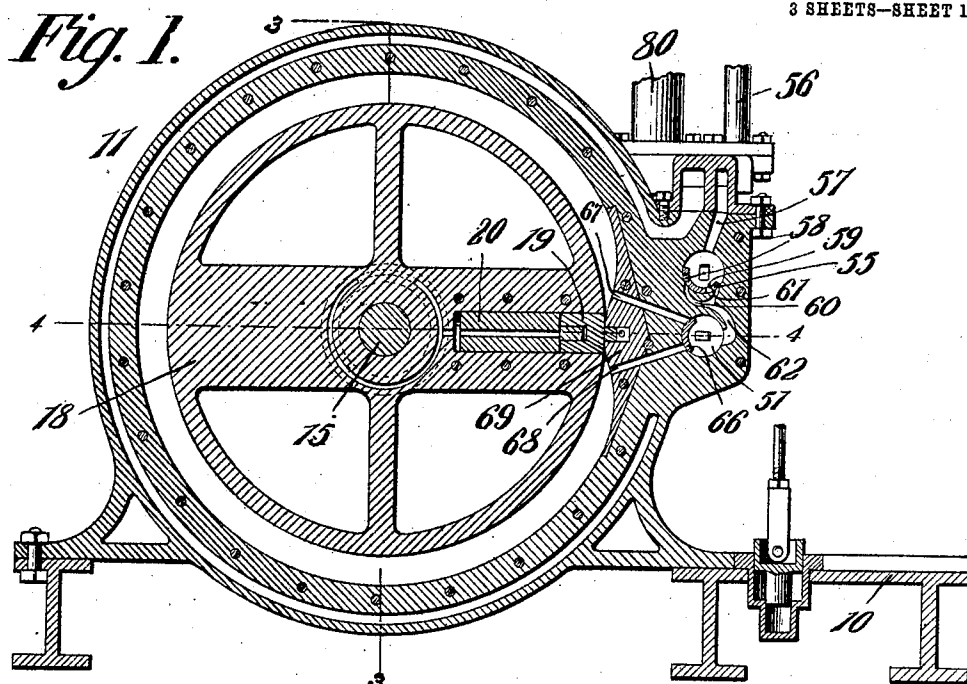
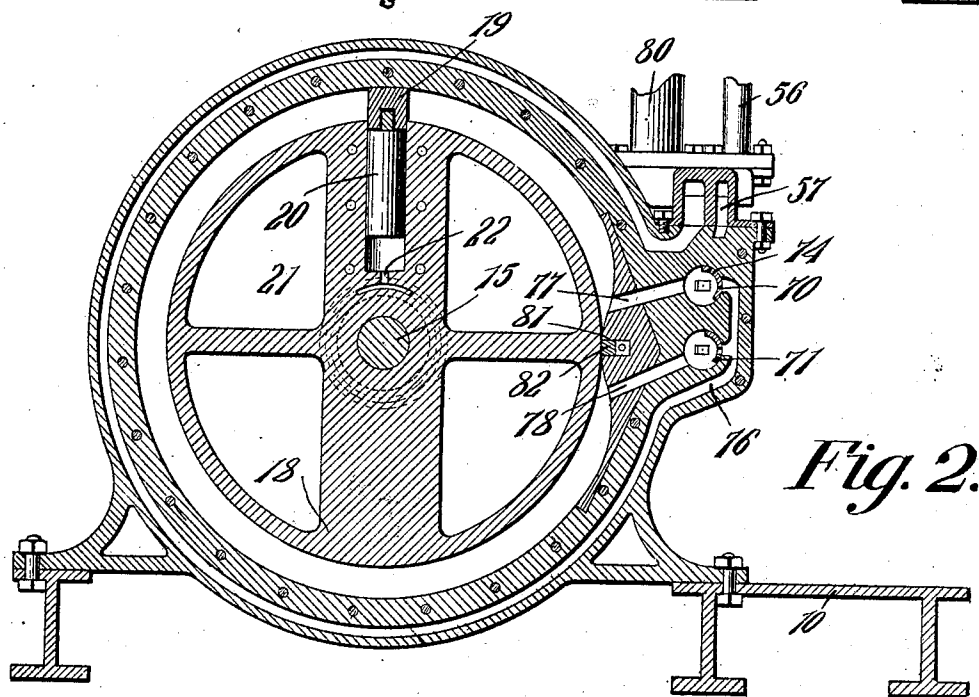
PATENTED OCT. 2, 1906.

P. H. HENDRICKSON.

ROTARY ENGINE.

APPLICATION FILED JULY 17, 1906.

3 SHEETS—SHEET 1.



WITNESSES:

E. J. Stewart
John E. Carter

Peter H. Hendrickson, INVENTOR,

By *Chas. Snow & Co.*
ATTORNEYS

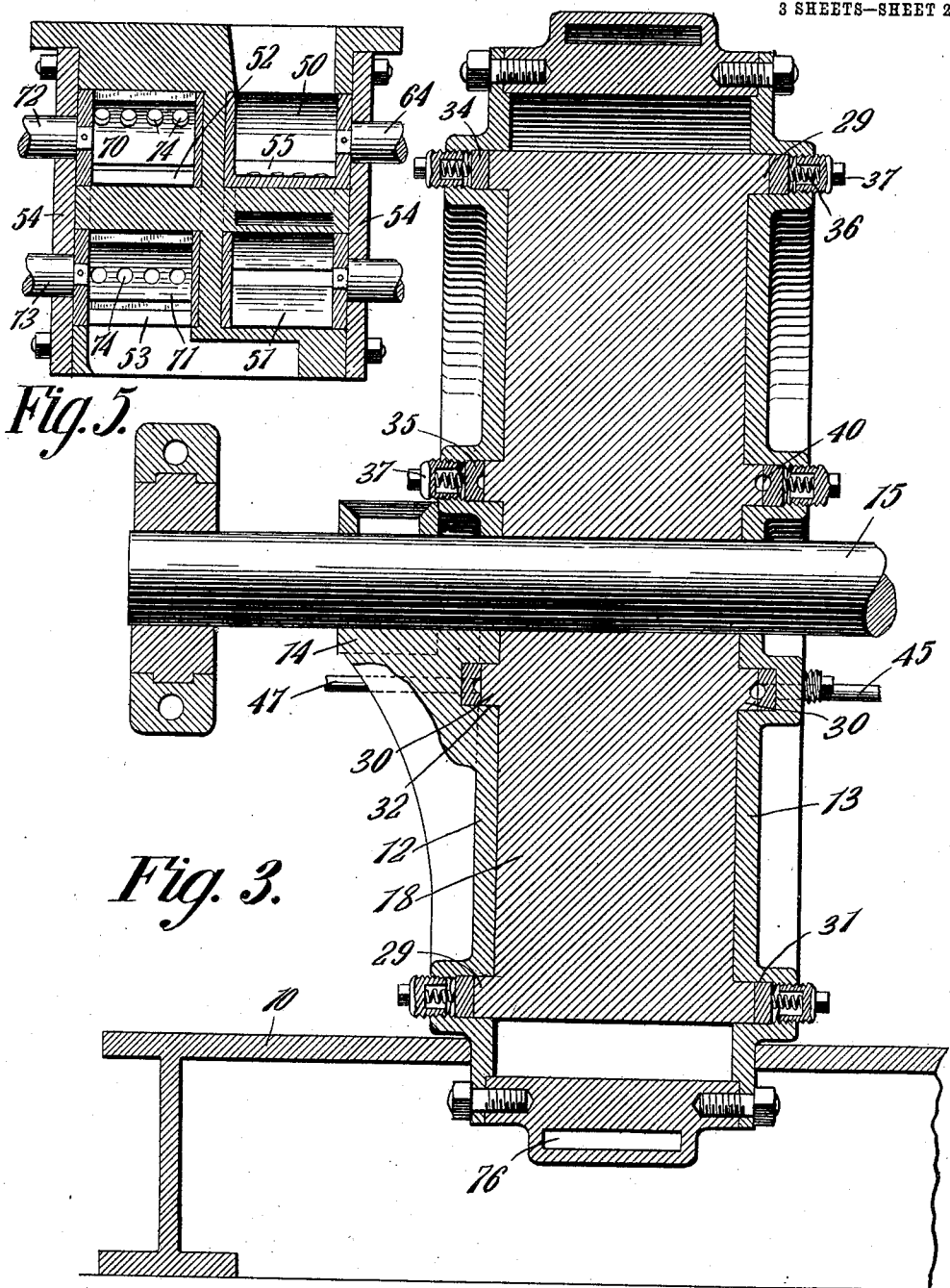
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3 SHEETS—SHEET 3.

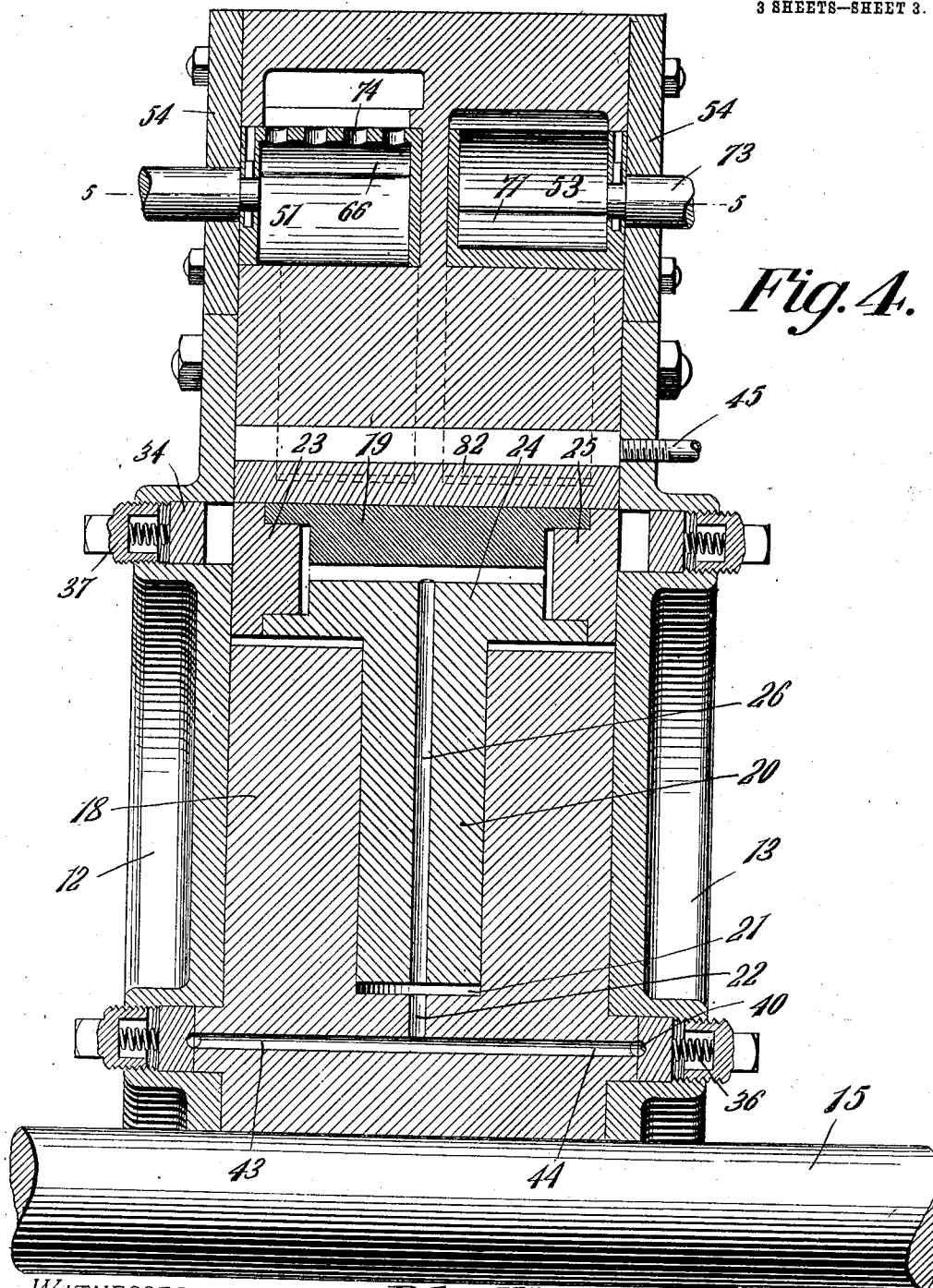


Fig. 4.

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UNITED STATES PATENT OFFICE.

PETER H. HENDRICKSON, OF SKIBO, MINNESOTA.

ROTARY ENGINE.

No. 832,479.

Specification of Letters Patent.

Patented Oct. 2, 1906.

Application filed July 17, 1906. Serial No. 326,621.

To all whom it may concern:

Be it known that I, PETER H. HENDRICKSON, a citizen of the United States, residing at Skibo, in the county of St. Louis and State of Minnesota, have invented a new and useful Rotary Engine, (Case A,) of which the following is a specification.

This invention relates to rotary engines, and has for its principal object to provide an improved form of reversible engine in which the inlet and exhaust of the steam or other actuating fluid may be perfectly controlled.

A further object of the invention is to improve the construction and arrangement of the valves, more especially the exhaust-valves, with a view of preventing leakage of steam.

A still further object of the invention is to improve the construction and arrangement of the packing and the movable piston wing or abutment.

A still further object of the invention is to arrange the exhaust channel or port so that the exhaust-steam will form a jacket entirely around the curved wall of the cylinder in order to raise the temperature of the latter and prevent condensation of the steam within the cylinder.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is a sectional elevation of a rotary steam-engine constructed in accordance with the invention, the view being taken through the cut-off and reversing valve chambers. Fig. 2 is a similar view across the exhaust-valve chambers. Fig. 3 is a transverse sectional view of the engine on the line 3 3 of Fig. 1 drawn to an enlarged scale. Fig. 4 is a sectional plan view on the line 4 4 of Fig. 1, also drawn to an enlarged scale. Fig. 5 is a transverse sectional view through all of the valve-chambers on the line 5 5 of Fig. 4.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The cylinder of the engine is supported on a suitable base or bed plate 10, said cylinder including a circular body portion 11 and opposite heads 12 and 13, one or both of the heads being preferably provided with bearings 14 for the reception of a shaft 15. It is preferred to place two or three engines on the same shaft, and only one shaft-bearing has therefore been shown in connection with the single engine illustrated in Fig. 3, the mating member being carried by the outer head of the second or the third cylinder.

Mounted on the shaft 15 is a piston 18, which carries a single piston-wing 19, that is arranged to slide radially within a suitable radially-extending slot formed in the periphery of the cylinder. The piston-wing is carried by a radially-movable stem 20, that is mounted in a radial bore 21, to the inner end of which steam is supplied through a port 22, the steam acting on the inner end of the stem and tending to force the same outward for the purpose of maintaining the outer edge of the abutment in constant engagement with the inner curved wall of the cylinder. The abutment is made up of a central member which is formed integral with the stem 20 and three auxiliary members 23, 24, and 25, which are slidable with relation to each other and are held outward by steam-pressure against the wall of the cylinder, steam being admitted from the bore 21 through a passage 26 to a point below or to the rear of the section 24 and thence passing through the inner faces of the sections 23 and 25.

Extending from the opposite sides of the piston are annular ribs 29 and 30, arranged on concentric lines and extending within annular grooves 31 and 32, which are formed in the cylinder-heads, and these ribs are engaged by packing-strips 34 and 35, respectively, said strips being held in engagement with the ribs by means of small compression-springs 36, that are disposed at intervals and are confined in place and held under stress by plugs 37.

The outer face of each of the ribs 30 and the inner face of each of the packing-rings 35 is provided with a groove 40, and these form annular channels which may be placed in

communication with the port 22 by means of two ports 43 and 44, formed in the body of the piston. Communicating with one of the channels 40 is a live-steam pipe 45, through which steam is supplied to maintain pressure on the piston-wing during all that portion of its travel except when the piston-wing is passing the abutment of the cylinder, and when this occurs the port 44 places the port 22 in communication with an exhaust-pipe 47, through which the steam is allowed to pass to the main exhaust-pipe, reducing the pressure on the piston-wing and allowing the latter to move within the recess or slot formed in the periphery of the piston.

At one side of the cylinder the wall is thickened to form a steam-chest, and the chest is bored from opposite sides to form four cylindrical valve-chambers 50, 51, 52, and 53, the ends of these chambers being closed by plates 54, that are provided with suitable openings for the passage of the operating-stems of the valves.

The chamber 50 contains a cut-off valve 55, which is at all times in communication with the steam-inlet pipe 56 through a main inlet-port 57. The cut-off valve 55 is provided with two sets of ports 58 and 59, which may be brought into operative relation with ports 60 61, respectively, both of these latter ports merging into a main port 62, that leads to the reversing-valve chamber 51. The operating-stem 64 of the cut-off valve is connected to any suitable valve-operating mechanism which will permit rocking movement of the valve, the mechanism being preferably of the Corliss type in order to permit quick cut-off, although any well-known form of valve-operating mechanism may be employed.

In the reversing-valve chamber 51 is a reversing-valve 66, which may be adjusted to control the admission of steam through either cylinder-port 67 or 68, these ports leading, respectively, to opposite sides of the cylinder-abutment 69 and the steam being directed through one or other of the ports in accordance with the direction in which the engine is to rotate.

In the valve-chambers 52 and 53 are arranged exhaust-valves 70 and 71, these being operated through stems 72 and 73. The valves are each provided with ports 74, formed of a number of openings and so arranged that when one valve is moved to closed position the other valve will be moved to open position, in this manner placing the exhaust-channel in communication with either of the exhaust-ports 77 78, leading from the cylinder. The steam passes freely through the ports of the exhaust-valve which is open and acts on the surface of the other valve to maintain the latter steam-tight, thus materially preventing the waste of steam. The ex-

haust passes through the chamber 76, which extends entirely around the cylinder, with the exception of the short space in which the uppermost valves are arranged, and finally passes to a main exhaust-pipe 80.

At the center of the abutment is a recess 81, containing a packing-strip 22, that is held outward by steam-pressure, the steam being supplied from the branch steam-pipe 45, that leads to the central portion of the piston, the abutment being constantly subjected to the pressure of steam while the engine is running.

I claim—

1. In a rotary engine, a cylinder having in one of its walls an inlet-valve chamber, a reversing-valve chamber and two exhaust-valve chambers, all of said chambers being independent of each other, an independent port extending from each valve-chamber to the interior of the cylinder, a port extending between the inlet-valve chamber and the reversing-valve chamber, an exhaust-port leading from both exhaust-valve chambers, a steam-inlet port leading to the inlet-valve chamber, and steam-controlling valves disposed in the several chambers.

2. The combination in a rotary engine, of a cylinder, a piston therein, an inlet-valve, a reversing-valve, a pair of exhaust-valves, independent chambers for said valves, a steam-inlet port leading to the inlet-valve chamber, a branched port leading from the inlet-valve chamber to the reversing-valve chamber, an exhaust port or channel in communication with both of the exhaust-valve chambers, the exhaust-valves when in closed position being held closely to their seats by the pressure of steam.

3. The combination in a rotary engine, of a cylinder, a revoluble piston therein, a movable piston-wing, an abutment carried by the cylinder and arranged to engage the periphery of the piston, a steam-inlet port, and an exhaust-port arranged at each side of the abutment, independent valves for controlling the exhaust through the exhaust-ports, a reversing-valve adjustable to allow steam under pressure to pass through either of the inlet-ports, and a cut-off valve for controlling the passage of steam to the reversing-valve.

4. The combination in a rotary engine of a cylinder, a piston having a peripherally-disposed radial recess and provided with a radially-arranged bore in communication therewith, a sectional piston-wing arranged within the recess, there being steam-spaces between the sections of the wing, a hollow stem adapted to the bore and secured to one of the sections of the wing, steam inlet and exhaust passages formed in the head of the piston and in communication with the inner end of the bore, there being annular steam-grooves formed at the sides of the piston and in the

5 cylinder-heads, a steam-supply pipe connect-
ed to one of the heads and in communication
with one set of flues, and a steam-exhaust
pipe connected to the opposite head of the cyl-
inder and in communication with the oppo-
site set of grooves.

In testimony that I claim the foregoing as

my own I have hereto affixed my signature
in the presence of two witnesses.

PETER H. HENDRICKSON.

Witnesses:

EDWARD M. GAYLORD,
GEORGE N. GILMAN.