

No. 837,429.

PATENTED DEC. 4, 1906.

C. L. SNYDER.
STEAM ENGINE.

APPLICATION FILED MAR. 18, 1906.

Fig. 1.

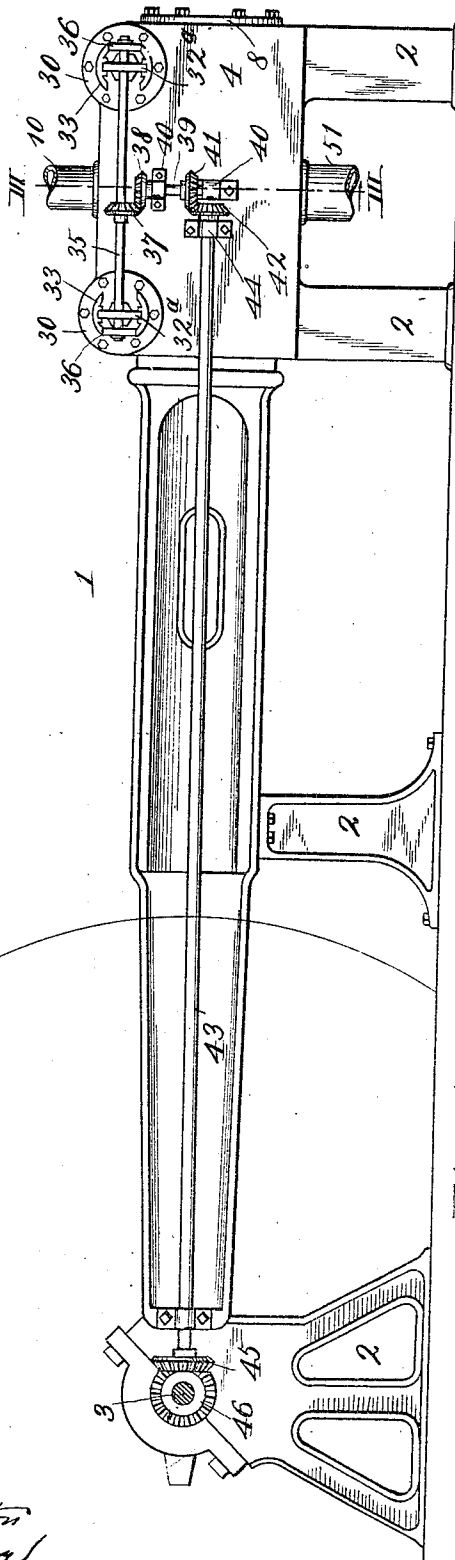


Fig. 5.

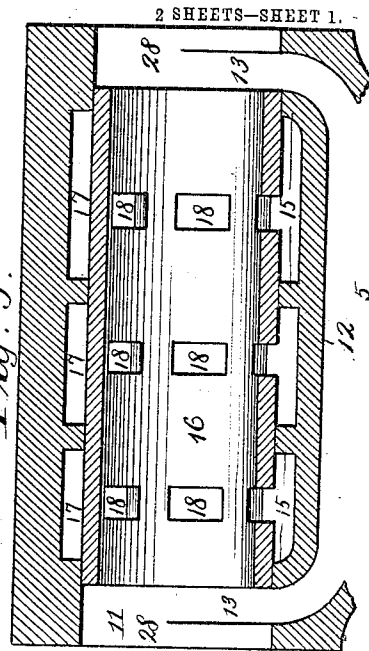
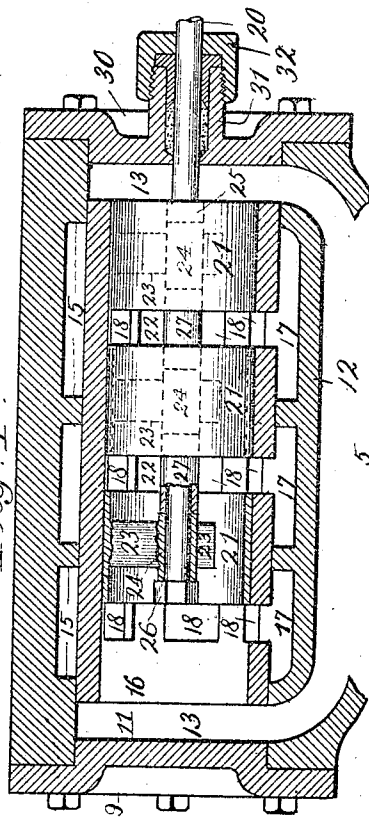


Fig. 4.



Witnesses:

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2 SHEETS-SHEET 2.

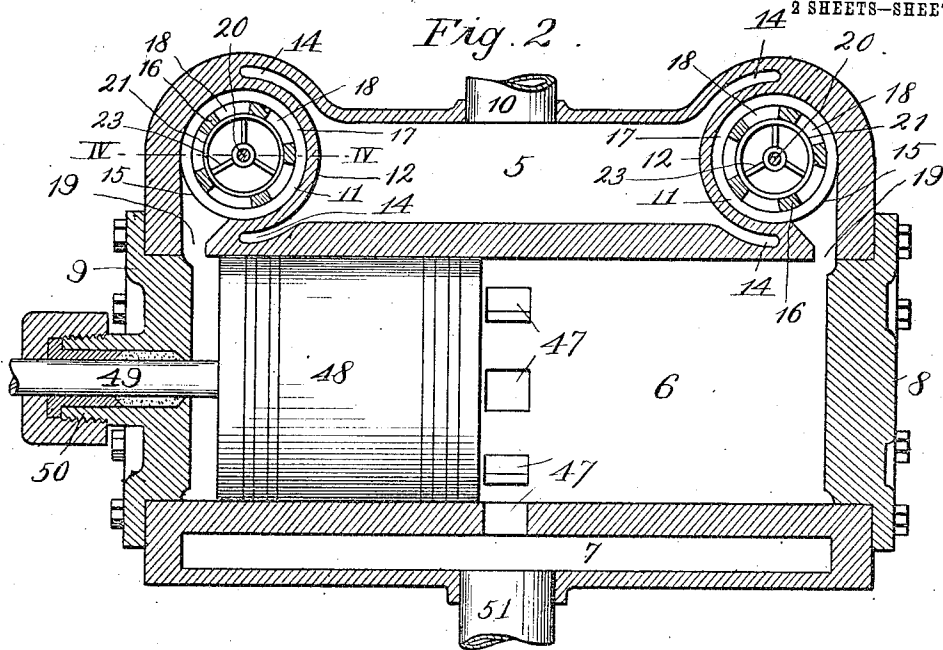


Fig. 3.

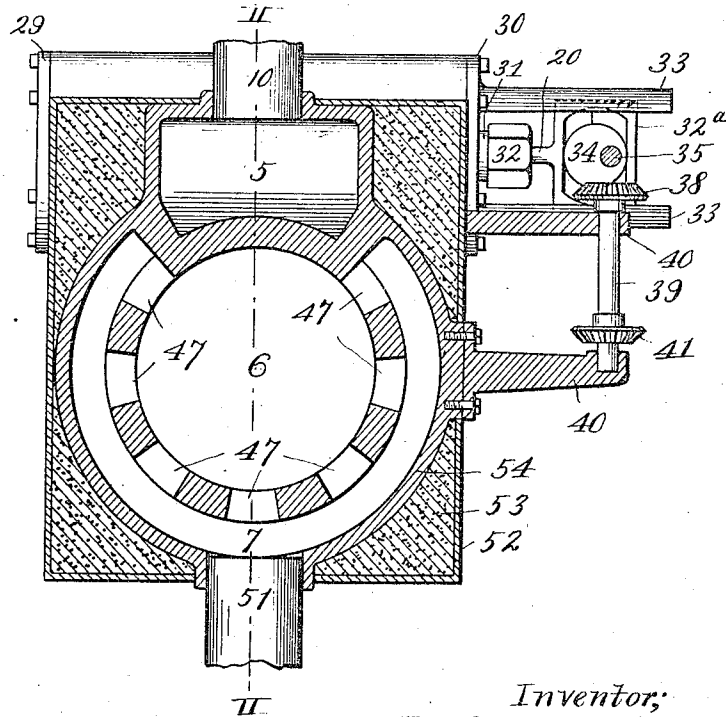
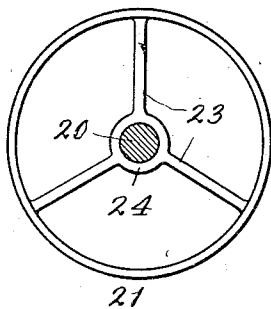


Fig. 6.



Witnesses:

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UNITED STATES PATENT OFFICE.

CHARLES L. SNYDER, OF VERSAILLES, MISSOURI.

STEAM-ENGINE.

No. 837,429.

Specification of Letters Patent.

Patented Dec. 4, 1906.

Application filed March 18, 1905. Serial No. 250,729.

To all whom it may concern:

Be it known that I, CHARLES L. SNYDER, a citizen of the United States, residing at Versailles, in the county of Morgan and State of Missouri, have invented certain new and useful Improvements in Steam - Engines, of which the following is a specification.

My invention relates to improvements in valves for steam - engines; and it consists more particularly in the arrangement and construction of the valve mechanism for controlling the admission and the exhaust of the steam to and from the cylinder.

The invention consists in the construction, combination, and arrangement of parts hereinafter described, and pointed out in the claims, and in order that it may be fully understood reference will now be made to the accompanying drawings, in which—

Figure 1 represents a side elevation of an engine provided with my improvements. Fig. 2 is a longitudinal vertical section taken on line II II of Fig. 3 of the casing containing the steam-chests, cylinder, piston, and valves employed in carrying out my invention. Fig. 3 is a vertical transverse section of same, taken on line III III of Fig. 1. Fig. 4 is a longitudinal section taken on line IV IV of Fig. 2 of one of the balanced valves and the chamber in which it operates. Fig. 5 is a similar view with the balanced valve removed. Fig. 6 is an end view of the balanced valve.

In said drawings I have shown my improvements applied to an engine 1 of the ordinary type, mounted upon pedestals 2 and provided with the customary crank-shaft 3.

4 designates an elongated rectangular casing divided into three compartments comprising a live-steam chest 5, a cylinder 6, arranged beneath said steam-chest, and a segmental exhaust-steam chest 7, partly surrounding the cylinder, which latter is closed at its opposite ends with cylinder-heads 8 and 9.

10 designates a live-steam-supply pipe communicating with the central top portion of steam-chest 5, which latter is subdivided at its ends into tubular compartments 11 by semicircular partitions 12, formed integral with the top and bottom walls of said chest. Partitions 12 terminate within a short distance of the sides of the compartments in order to form steamways 13 for the admission of live steam from the steam-chest to said compartments.

In order that the steam may have free access from the steam-chest to the tubular compartments, I enlarge the diameter of partitions 12 so that they will be greater than the height of the steam-chest 5 and continue such partitions around for a full semicircle, so as to provide steamways 14, leading from the steam-chest into the centers of the upper and lower portions of the steamways 13.

The wall of each compartment 11 is provided with internal annular ribs 15, which form, in conjunction with a tubular lining 16, three annular channels 17, communicating with the interior of said lining through a plurality of ports 18, arranged in the lining an equal distance apart and having a combined area equal to steamways 13, so that the volume and pressure of the steam will not be reduced in passing through said ports. Said channels are of greater width than ribs 15 and communicate directly with the cylinder through ports 19, thus allowing a free flow of steam to said cylinder. Ribs 15, in addition to strengthening the walls of the tubular compartment, bridge port 19 and thus form continuous bearings for the lining.

The passage of steam through ports 18 is controlled by a balanced piston-valve slidably arranged within the lining and comprising a valve-stem 20 and three annular rims 21 having a longitudinal series of intervening spaces 22, equal in width to ports 18 and adapted to register simultaneously with two of said ports when the valve is in the position shown in Fig. 4. Rims 21 are provided with spokes 23 and hubs 24, which latter are secured upon the valve-stem by a shoulder 25 and a nut 26 and retained the proper distance apart by sleeves 27 encircling the valve-stem and abutting against the adjacent ends of hubs 24. Rims 21 are made very thin in order to present a very slight area to the steam, and thus avoid end pressure on the valve when the latter is in operation.

Access may be had to the interior of the tubular compartment through its open ends 28, normally closed by heads 29 30, respectively, which latter is provided with a stuffing-box 31 and a packing-nut 32 in order to form a steam-tight joint around that portion of the valve-stem extending therethrough. The valve-stems are provided at their outer ends with yokes 32^a, arranged to slide back and forth in guides 33, secured to head 30.

The piston-valves are reciprocated by eccentrics 34, rigidly mounted upon a longitudinal counter-shaft 35, journaled in bearings 36 and provided near its central portion with a rigidly-mounted bevel gear-wheel 37, which is driven by a similar gear-wheel 38, rigidly mounted upon the upper end of a short vertical shaft 39, journaled in bearings 40 and provided at its lower portion with a bevel gear-wheel 41, driven by a similar gear-wheel 42, rigidly mounted upon one end of a longitudinal shaft 43, journaled in bearings 44 and provided at its opposite end with a bevel gear-wheel 45, driven by a similar gear-wheel 46, rigidly mounted upon the crank-shaft 3.

Cylinder 6 communicates with the exhaust-chest 7 through a segmental series of exhaust-ports 47, extending through the cylinder-wall at points almost completely around the cylinder and arranged midway between ports 19. (See Fig. 2.) The flow of steam through ports 47 is controlled by an elongated piston-head 48, extending when at the end of a stroke from a point close to one of ports 19 to within a short distance of ports 47, as shown in Fig. 2, and provided with a piston-stem 49, extending through head 9, and a stuffing-box 50, formed at the outer side of said head.

By making the exhaust-chest 7 segmental in cross-section the exhaust-steam circulates around the greater portion of the cylinder before it escapes through exhaust-pipe 51. Hence the steam in said cylinder will be maintained at a high degree of heat and of course prove more effective than if permitted to cool, as it would if said cylinder were exposed to the outer atmosphere. The steam in the cylinder is further protected by the outer shell 52 of casing 4 and non-conducting material 53 placed between said shell and the outer wall 54 of the exhaust-steam chest.

In operation steam is admitted to steam-chest 5 through supply-pipe 10 and passing through steamways 13 14 enters tubular linings 16 and the piston-valves ready to flow into cylinders 6 through ports 19 just as soon as ports 18 are uncovered by the valves, which latter are arranged to alternately open and close said ports, the high radiuses of eccentrics 34 being set diametrically opposite each other on shaft 35. For instance, when the piston-head occupies the position shown in Fig. 2 the piston-valve in the rear or left compartment 11 will begin to uncover ports 18, so that steam may flow from steam-chest 5 to the rear of the piston-head, and thus advance the latter, while the piston-valve in the right-hand compartment is closed. As the piston-head advances it will close exhaust-ports 47, and thus entrap and compress any remaining steam within the cylinder, causing it to act as a cushion between the forward cylinder-head 8 and the forward end of the piston-head as the latter approaches the end of a forward stroke. When nearing the end

of a forward stroke, the rear end of the piston-head will uncover exhaust-ports 47, and thus open an avenue of escape for the live steam in the rear of said piston-head. The piston-valve in the rear of compartment 11 will close before the rear end of the piston-head uncovers exhaust-ports 47, so the steam will be used expansively in completing the forward stroke of the piston-head and in order that live steam will not pass directly from said compartment to chest 7 through the cylinder and the exhaust-ports. When the piston-head completes its forward stroke, it will be immediately started backwardly by the admission of steam from compartment 11 at the forward end of the steam-chest.

By locating the piston-valves close to ports 13 to 19 the steam has no long and narrow passage-way through which to pass, and by arranging ports 18 in the manner shown a large area and a short valve-stroke is obtained, or, in other words, the area exposed by the simultaneous opening of the three sets of ports will equal three times the amount of space through which the piston-valves travel. Consequently steam pressure almost equaling that in the boiler is had in the cylinder, with its resultant efficiency on the piston-head.

The area of ports 47 is sufficient to permit the escape of practically all of the exhaust-steam in the cylinder before said ports are covered by the piston-head; but more or less of said exhaust-steam may be retained in the cylinder to act as a cushion by the proper adjustment of a valve (not shown) controlling the flow of exhaust-steam through pipe 51.

While I have shown my improvements applied to a horizontal engine, it of course will prove equally as effective in engines of the vertical type, and I claim the right to make such changes in the construction and arrangement of parts as will properly fall within the scope of the appended claims.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a steam-engine, the combination with the cylinder and piston, and a steam-chest cast longitudinally upon the cylinder; of a curved upright partition extending transversely across each end of the chest and continued around for a full semicircle so as to form a tubular compartment therein, the partition terminating short of the ends of the compartment to form steamways at the top and bottom for the admission of live steam into the compartment and being also of such diameter that the compartment will be of greater height than the chest, a port connecting the cylinder with each compartment, and a valve in the latter.

2. In a steam-engine, the combination with the piston, the steam-chest, and the valves therein; of a cylinder communicating with

the valve-chambers and having a segmental series of exhaust-ports at the center of its length, and a concentric wall surrounding and spaced from the cylinder throughout its entire length to form a segmental exhaust-steam chest communicating with said ports, for the purpose set forth.

3. In a steam-engine, the combination with the piston, the live-steam chest, and transverse valves therein at the ends thereof; of a cylinder subjacent to and continuous with the length of the steam-chest, communicating with the valve-chambers thereof, and

having a segmental series of exhaust-ports, a concentric wall surrounding and spaced from the cylinder throughout its length to form a segmental steam-chest communicating with said exhaust-ports, and an outer shell inclosing said wall, for the purpose set forth.

In testimony whereof I affix my signature in the presence of two witnesses.

CHARLES L. SNYDER.

Witnesses:

G. W. PETTY,
F. P. JONES.