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Fig. 5. A cross-sectional view of a window frame assembly. The frame is labeled 24. The glass pane is labeled 36. The frame has a double-paned structure with a central pane 36 and side panes 36. The frame is secured by a fastener 40. The frame is labeled 41.

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## SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 771,132, dated September 27, 1904.

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*To all whom it may concern:*

Be it known that I, JAMES BYRD EDWARDS, a citizen of the United States, residing at Columbia, in the county of Richland and State of South Carolina, have invented new and useful Improvements in Slide-Valves, of which the following is a specification.

This invention relates to slide-valves for engines, the principal object of the invention being to provide a slide-valve which is of such construction and so related to the valve-seat that at certain points in the throw of the valve a quick exhaust is obtained by reason of the fact that in addition to the usual exhaust-ports a supplemental and relatively large exhaust-chamber is thrown into communication with the steam-passages of the cylinder, thus quickly getting rid of the exhaust-steam and relieving the work on the part of the live steam as it enters the cylinder and acts on the piston.

As a result of the construction hereinafter described it has been found by actual test that a saving of approximately fifteen per cent. in fuel and twenty per cent. in the consumption of water is obtained, as well as increased speed and traction, when used upon locomotive-engines and the like.

With the above and other objects in view, the nature of which will more fully appear as the description proceeds, the invention consists in the novel construction, combination, and arrangement of parts, as herein fully described, illustrated, and claimed.

In the accompanying drawings, Figure 1 is a vertical longitudinal section through a cylinder, steam-chest, and valve embodying the present invention. Fig. 2 is a similar section showing a different position of the valve. Fig. 3 is a vertical cross-section on the line 3 3 of Fig. 1. Fig. 4 is a top plan view of the valve. Fig. 5 is a horizontal section through the valve on the line 5 5 of Fig. 1.

Referring to the drawings, 10 designates a steam-cylinder, in which is arranged the usual piston 11, the cylinder being provided with steam-passages 12 and 13, which open out at the main or lower valve-seat 14, as clearly shown in Figs. 1 and 2, the cylinder being also provided with a transversely-extending

exhaust-port 15, which opens out at the lower valve-seat 14, as shown.

16 designates the steam-chest, provided with the usual cover 17, in which is formed the steam-inlet 18. Connected to the top of the valve-chest and arranged therein is a supplemental upper valve-seat or pressure-plate 19, which is cored out to form an upper exhaust-cavity 20, having the side ports 21 and 22 and an intermediate port 23.

Mounted to slide between the seats 14 and 19 is a slide-valve 24, which is provided with oppositely-curving exhaust-passages 25 and 26 and a central supplemental exhaust-chamber 27, having an upward extension or passage 28, which places chamber 27 in communication with the upper exhaust-cavity 23, the exhaust-passages 25 and 26 also communicating alternately with the cavity 23. The exhaust-passages 25 and 26 are separated from the supplemental exhaust-chamber 27 by means of curved intervening webs 29, and in the sliding movements of the valve the exhaust-passages 25 and 26 are alternately brought into communication with the steam-passages 12 and 13 of the cylinder, while the supplemental exhaust-chamber 27 is also brought into communication therewith, as will appear by an examination of Figs. 1 and 2. Embracing the valve 24 is a yoke or strap 30, to which is connected the usual valve-rod 31, which passes through a stuffing-box 32 at one end of the steam-chest. In order to prevent leakage of the valve, the upper surface of the valve is recessed to receive pieces of packing 33, 34, and 35, the latter being shown in plan in Fig. 4 and in section in Figs. 1 and 2. The said packing-pieces bear against the pressure-plate or supplemental valve-seat 19 and prevent steam from escaping over the top of the valve, at the same time serving to hold the valve downward against the main or lower seat 14. The packing-pieces 34 are also provided with slots or openings 36 to admit steam through the passages 25, 26, and 27. Other packing-strips 37 and 38 extend along the sides and ends of the valve, respectively, for a similar purpose. 39 designates cross webs or braces which reinforce and strengthen the webs 29, and the packing-pieces 33, 34, and



35 are provided with the cross portions 40 to cover the braces 39, as shown in Fig. 4, thus securing close contact at all points between the valve and the upper or supplemental valve-seat 19. Extending entirely around the edge portion of the valve is a steam-inlet passage 41. This valve-passage is entirely closed by the sides and ends of the valve, but opposite portions of the steam-passage 41 are left open at the bottom, as shown in Figs. 1 and 2, so as to communicate with and supply live steam to the steam-passages 12 and 13 of the cylinder.

The operation of the valve will be readily understood by reference to Figs. 1 and 2, in which it will be seen that when the valve is moved to the left—for example, as shown in Fig. 1—the live steam enters the passage 41, passes around the valve, and through the steam-passage 13 into one end of the cylinder. At the same time the exhaust-steam escapes through the passage 12 into the exhaust-passage 25 and the supplemental exhaust-chamber 27 and from the exhaust-passage 25 through the upper exhaust-cavity 23 into the exhaust-chamber 27 and from thence into the exhaust-port 15 to the atmosphere. When the valve is moved to the other limit of movement, the relative arrangement of the ports is reversed, the operation being exactly the same. Thus as the piston approaches the limit of its movement not only is the usual exhaust-passage of the valve placed in communication with the exhaust end of the cylinder, but the supplemental exhaust-chamber is also brought into play, thus obtaining a quick exhaust and relieving the work of the engine, thus effecting a material saving in fuel and water, while at the same time increasing the speed of the engine or other form of vehicle in connection with which the engine is used. The supplemental valve-seat or presser-plate 19 takes the upward pressure of the valve under the influence of the steam

should the latter have a tendency to press the valve away from the main or lower seat 14. This is also particularly advantageous in the event of the accumulation of water of condensation in the cylinder, the blowing out of a cylinder-head or the destruction of a valve-chest being prevented by reason of the fact that any excessive pressure will lift the valve off the lower seat sufficient to permit the steam and water to escape to and through the exhaust-port. Under normal conditions the valve is held tightly against the lower valve-seat by the action of the packing at the top of the valve and the coöperation of said packing with the upper supplemental valve-seat or presser-plate 19.

Having thus described the invention, what is claimed as new is—

The combination with a steam-cylinder having inlet and exhaust passages terminating in a flat valve-seat, a supplemental valve-seat fixed with relation to said first-mentioned valve-seat and formed with an exhaust-cavity, and a slide-valve operable between said seats, said valve being formed with an inlet-passage arranged circumferentially of the valve, an exhaust-chamber centrally of the valve, and maintained at all times in open communication with the exhaust-cavity in the supplemental valve-seat, and exhaust-passages formed in said valve on opposite sides of said exhaust-chamber and arranged for communication with the cylinder inlet and exhaust passages, said valve exhaust-passages, being also arranged for communication with the exhaust-cavity in the supplemental valve-seat.

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

JAMES BYRD EDWARDS.

Witnesses:

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