(No Model.) 2 Sheets—Sheet 1.

D. TUFTS.

SLIDE VALVE.

No. 342,054. Patented May 18, 1886.

Fig 1.

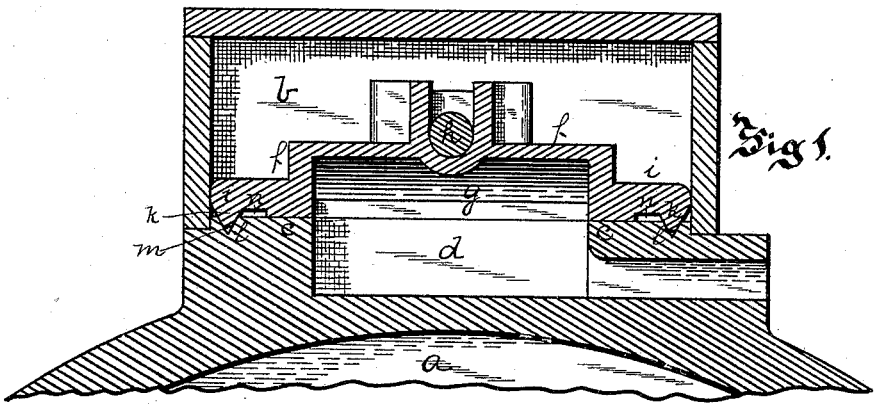


Fig 2.

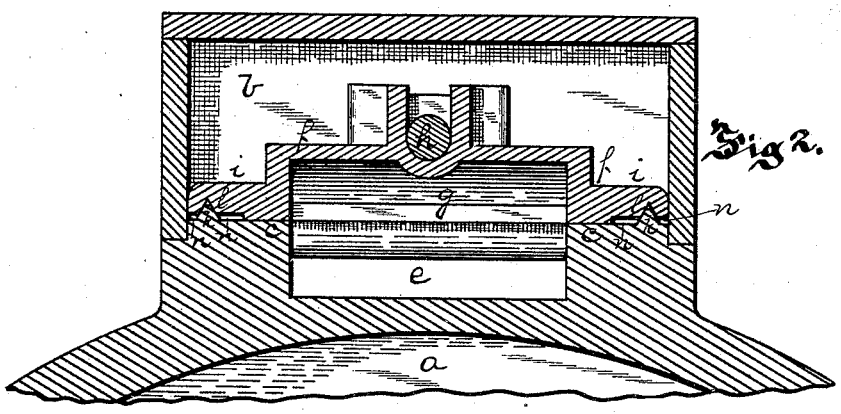
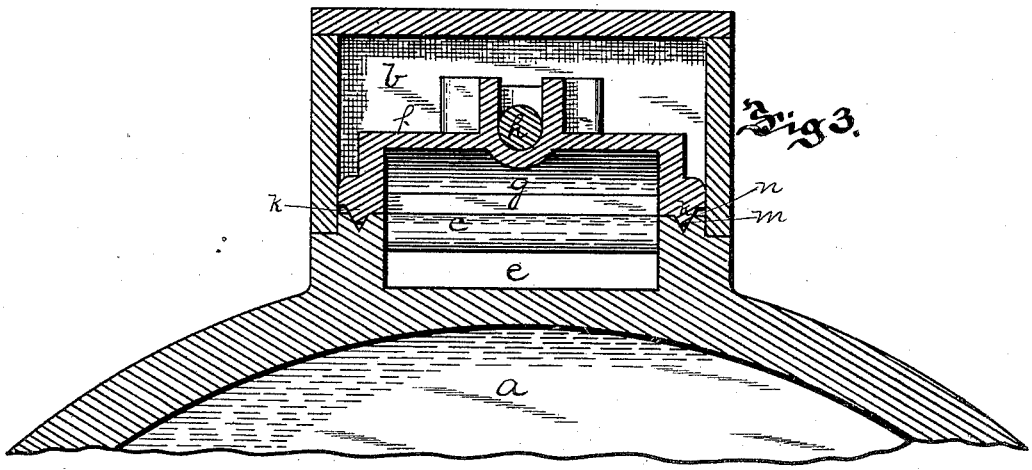


Fig 3.



Witnesses:
J. E. Barnes.

Inventor.
David Tufts
By James F. Ray
Attorney

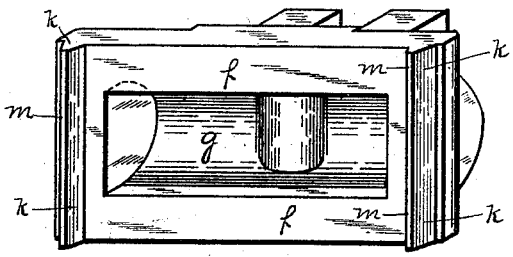
(No Model.) 2 Sheets—Sheet 2.

D. TUFTS.

SLIDE VALVE.

No. 342,054. Patented May 18, 1886.

Fig 4.



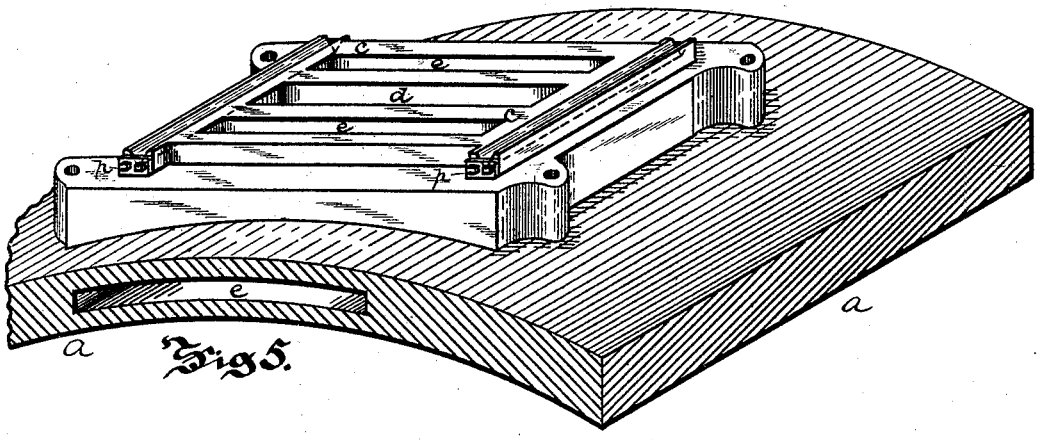


Fig 5.

Witnesses;
J. M. Cooke.
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UNITED STATES PATENT OFFICE.

DAVID TUFTS, OF PITTSBURG, PENNSYLVANIA.

SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 342,054, dated May 18, 1886.

Application filed October 6, 1885. Serial No. 179,107. (No model.)

To all whom it may concern:

Be it known that I, DAVID TUFTS, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Slide-Valves for Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to the slide-valves of steam-engines, having special reference to the slide-valves employed in what are termed "locomotive-engines," though it is applicable to the ordinary stationary steam and other engines. In the ordinary engines, where the steam-chest is located above the steam-cylinder, the slide-valve rests upon a planed face or seat, within which are formed the supply-ports and the exhaust-port of the engine, the exhaust-port being formed in the center of the seat and communicating with the exhaust-pipe, which, in locomotive-engines, leads into and opens at the base of the locomotive-stack, and the supply-ports being located on each side of the exhaust-port and leading therefrom to the ends of the cylinder, the slide-valve being operated by any suitable means, and being reciprocated over this planed port-seat within the steam-chest in such manner as to expose one of the supply-ports within the steam-chest through which steam enters to the cylinder, and form communication between the other supply-port and the exhaust-port to form an escape for the dead-steam. As usually constructed, these slide-valves have rested directly upon this planed seat, and the pressure of the steam within the steam-cylinder, added to the weight of the valve itself, has caused the valve to operate with considerable friction, on account of the pressure of the face of the valve upon the port-seat, and it is found that this pressure and the friction caused thereby gradually cause the dishing of the valve and port-seat, so that it is liable to leak in a comparatively short time; and it is also found that on account of this friction or pressure between the faces of the slide-valve and port-seat the valve could not be reversed as quickly as desirable, and required considerable force to reverse it. This dishing of the valve was also caused, to some extent, by the wabbling or side motion of the slide-valve upon the port-seat, the only means employed for holding the valve in proper position on the seat being the stem of the slide-valve rod, which fitted into a fork or like connection on the slide-valve.

The object of my invention is twofold, being, first, to overcome the heavy pressure and consequently the friction and wearing between the face of the slide-valve and the face of the port-seat, and so prevent wear and reduce the force necessary in reversing the valve, and, second, to form a perfect guide for the slide-valve and prevent wabbling or side movement thereof.

It consists, essentially, in forming a tongue-and-groove joint on the faces of the slide-valve and port-seat on each side of the steam-ports, these tongue-and-groove joints acting to support the slide-valve upon the port-seat and take the pressure caused by the weight of the valve and the pressure of the steam within the chest, as well as reduce the friction and overcome the wear consequent to the movement of the valve, and at the same time to guide the valve in its movement as it slides back and forth over the port-seat, any wabbling or side motion of the valve being thus entirely precluded.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a cross-section of the steam-chest and upper portion of the steam-cylinder through the exhaust-port. Figs. 2 and 3 are like cross-sections through one supply-port, these figures showing different arrangements of my invention. Fig. 4 is a perspective view of the slide-valve, and Fig. 5 is a like view of the port-seat.

Like letters of reference indicate like parts in each.

In the accompanying drawings, the cylinder *a* and steam-chest *b* are of the ordinary construction, the port-seat *c* being formed in the same manner as in the ordinary engine, and having therein the exhaust-port *d* and the supply-ports *e*, the exhaust-port leading off in any suitable manner for carrying away

the exhaust-steam, and the supply-ports leading to the ends of the steam-cylinder, as in the ordinary steam-engine. Resting on the port-seat *c* is the slide-valve *f*, this slide-valve having therein the recess *g*, by means of which communication is formed between the supply-ports and the exhaust-port, the slide-valve being connected in any suitable manner with the valve-rod *h*, which extends through a suitable stuffing-box at one end of the steam-chest, and is connected to the ordinary cam or other means of reciprocating the valve.

I have shown several different forms of my improved slide-valve, and will first describe that shown in Fig. 1, in which extensions *i* are formed at the sides of the slide-valve, these extensions having tongues *k* on the face of the slide-valve, these tongues fitting into grooves *l* on the face of the port-seat, both the tongues and the grooves being formed tapering or V-shaped, as shown, and the apex of the tapering tongue *k* being planed off, as at *m*, so as to leave a space at the base of the groove for the reception of oil, as well as any grit which may be carried into the groove, while at the same time, as the tongue is not pointed, there is not so great liability of the tongue cutting into the groove or of the point forming a bearing for the slide-valve within the groove. The faces of the slide-valve and port-seat between the ports *d e* and the tongue-and-groove joints are planed, so as to bear upon each other with only sufficient force to form a steam-tight joint, and between these faces and the tongue-and-groove joints are formed spaces or recesses *n*, to allow for the wear of the tongue as the faces of the tongue-and-groove joints of the slide-valve and port-seat wear off, and to permit the planing of the slide-valve and port-seat in case they become uneven. These recesses *n* may be formed either at the sides of the tongues or at the sides of the groove, sufficient space for the wearing of the tongue and groove being thus formed without affecting the planed joint between the port-seat and the slide-valve. The ends of the grooves *l* may either be open or may be closed by any suitable means, it being preferred to close the ends of the grooves, in order to retain the oil which might otherwise escape therefrom, the groove forming a channel through which the oil would escape too rapidly. As it is desired to plane the grooves accurately, I prefer to close them by means of a plate or washer, as shown at *p*, the grooves being planed entirely across the face of the port-seat, and the washers *p* being secured at the ends of the grooves by means of bolts or other suitable device.

In Fig. 2 the tongues are shown formed on the face of the port-seat, and the grooves are formed in the face of the slide-valves, the recesses *n* being formed at the sides of the grooves *l* in the face of the slide-valve.

In Fig. 3 is shown the preferable form of my invention, in which the tapering tongue-and-groove joint is employed for the purpose of forming a steam-tight joint between the port-seat and slide-valve, as well as supporting the slide-valve and guiding its movement, the tongue-and-groove joints being formed close to the ports in the port-seat, and the portion of the faces between these ports and the tongue-and-groove joints being made narrow, and bearing for their entire surface against each other, so that the steam, in order to escape, must pass first between the flat faces of the slide-valve and port-seat, and then between the tapering faces of the tongue-and-groove joint, it being found that by the employment of this tongue-and-groove joint close to the ports a much more secure steam-tight joint is obtained, while at the same time I am enabled to reduce the pressure between the flat faces of the slide-valve and port-seat. It can be applied to the slide-valves now in use, as it does not require the widening of the slide-valve or port-seat. In this case the recesses *n* are formed on the outer sides of the tongue-and-groove joints.

When my improved slide-valve is employed, reciprocating motion is imparted to it in any desired manner, as above described, and the movement of the slide-valve over the face of the port-seat is guided by the tongue-and-groove joints on the faces thereof, while at the same time the weight of the slide-valve is supported by these tongue-and-groove joints, which also sustain the pressure of steam within the steam-chest upon the valve, so that there is comparatively little friction between the flat faces of the slide-valve and port-seat, it only being necessary to have such contact as will form a steam-tight joint between them, and as the surface-contact of the tongue-and-groove joints at each side of the ports is but slight, it is evident that the friction between the slide-valve and port-seat is reduced to a minimum, the friction, as between my improved valve and the ordinary valve, being substantially in the ratio of the surface-contact between the face of the entire valve and between the faces of the tongue-and-groove joint. I am thus enabled to guide the movement of the slide-valve perfectly, and prevent any wabbling or side movement of the slide-valve over the face of the port-seat, to relieve to a great extent the pressure between the flat faces of the slide-valve and port-seat, so enabling the valve to move much more smoothly and with less friction, to reduce the force necessary in reversing the valve, to overcome friction and wear between the faces of the valve, and to prevent entirely the dishing of the faces of the valve and port-seat, this dishing being caused by the heavy friction between the faces and by the wabbling or side movement of the valve, my improved valve wearing from two to three times longer than the ordinary slide-valve having no such guiding means.

I have shown the tongue-and-groove joints as tapering or V-shaped, and I prefer this form, as it accommodates itself better to the wearing of the faces of tongue and groove, and

at the same time enables me to provide a space at the base of the groove for the reception of grit or other materials, which might prevent the smooth movement of the slide-valve, and where the tongue-and-groove joint is employed, as shown in Fig. 3, to aid in forming a steam-tight joint between the faces of the slide-valve and port-seat gives better results than where a square tongue and groove is employed; but it is evident that a square or angular tongue-and-groove joint may be employed for the purpose, substantially the same advantages being obtained therefrom, the essential feature of my invention being the tongue-and-groove joint formed on the faces of the slide-valve and port-seat to sustain the weight of the slide-valve, relieve the pressure and friction of the faces, and prevent the wabbling of the valve across the face of the port-seat.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In slide-valves for steam-engines, a tongue-and-groove joint formed on the faces of the slide-valve and port-seat at each side of the ports, substantially as and for the purposes set forth.

2. In slide-valves for steam-engines, a tapering tongue-and-groove joint formed on the faces of the slide-valve and port-seat at each side of the ports, substantially as and for the purposes set forth.

3. In slide-valves for steam-engines, a tapering tongue-and-groove joint formed on the faces of the slide-valve and port-seat at each side of the ports, the apex of the tongues being removed, substantially as and for the purposes set forth.

4. In slide-valves for steam-engines, a tongue-and-groove joint formed on the faces of the slide-valve and port-seat, in combination with recesses at the side of the joint, to allow for wear, substantially as set forth.

5. In slide-valves for steam-engines, a tongue-and-groove joint formed on the faces of the slide-valve and port-seat at the side of and adjoining the flat bearing-faces thereof on each side of the ports, substantially as and for the purposes set forth.

6. In slide-valves for steam-engines, the combination of the slide-valve having tongues thereon, and the port-seat having grooves thereon at the sides of the ports, said grooves being closed at the ends, substantially as and for the purposes set forth.

7. In slide-valves for steam-engines, the combination of the slide-valve having tongues thereon, the port-seat having corresponding grooves thereon at the sides of the ports, and washers secured at the ends of said grooves, substantially as and for the purposes set forth.

In testimony whereof I, the said DAVID TUFTS, have hereunto set my hand.

DAVID TUFTS.

Witnesses:
JAMES I. KAY,
J. N. COOKE.