H. W. ADAMS.

VALVE-BOX FOR ENGINES.

No. 170,149. Patented Nov. 23, 1875.

FIG 1

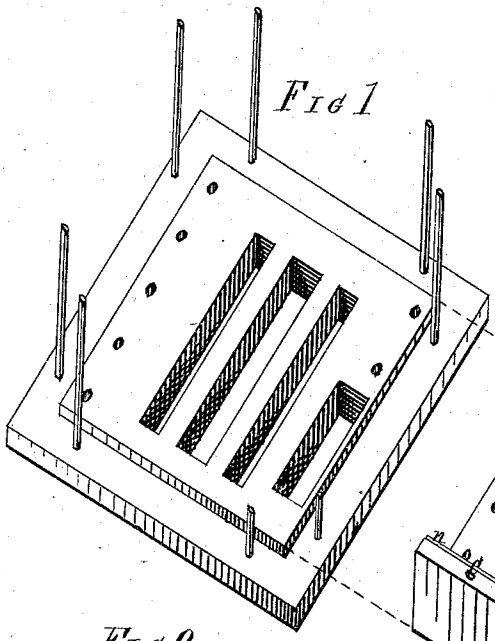


FIG 3

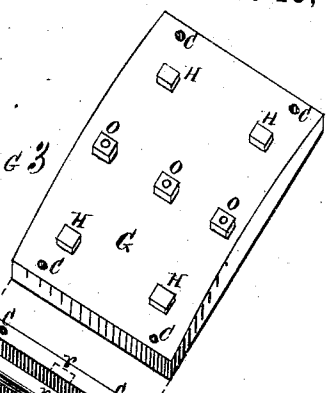


FIG 2

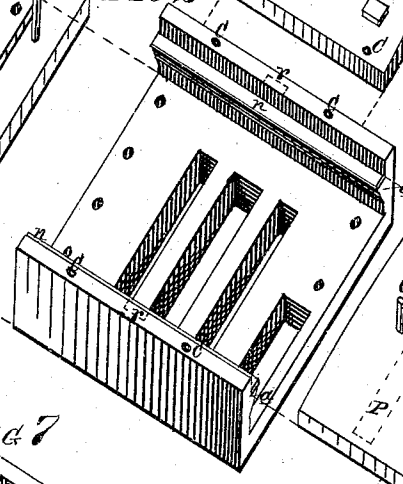


FIG 4

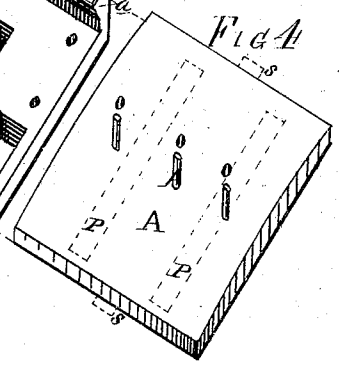


FIG 8

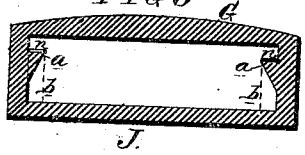


FIG 7

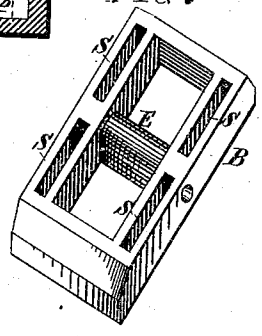


FIG 5

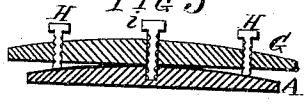


FIG 6

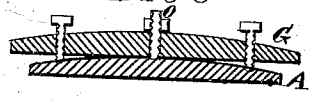


FIG 9

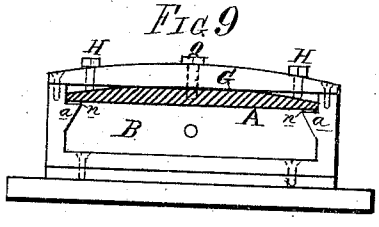
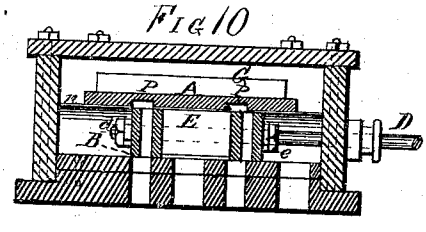


FIG 10



WITNESSES.

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IMPROVEMENT IN VALVE-BOXES FOR ENGINES.

Specification forming part of Letters Patent No. **170,149**, dated November 23, 1875; application filed July 27, 1875.

To all whom it may concern:

Be it known that I, HENRY W. ADAMS, of the city and county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Valves for Engines, which improvement is fully set forth in the following specification, reference being had to the accompanying drawings.

The object of my invention is to produce a valve for use in all kinds of engines, which has no weight of live steam or compressed air, or other elastic body, on its top, which moves with little power and friction, which gives and exhausts steam or other elastic force more abundantly than the valve now in use, and which also will perform the function of a brake when the live steam or other operative power is cut off, and a vacuum is produced in the steam-chest.

My improved valve is illustrated more in detail by the following figures:

Figure 1 is a persective view of an ordinary valve-face of a steam-engine, showing the ports and the bolts to fasten on the steam-chest. It shows the slight and usual elevation of the valve-face inside the steam-chest, and the close fit of the bottom of said steam-chest around the said elevated valve-face. On this valve-face I secure a valve box or chest, open at the two ends, but having a bottom exactly the size of the said valve face and sides, and a somewhat narrower top. This box is shown in Figs. 8 and 10. Its bottom and sides should be at least one inch thick, and should be bolted down very fast to the old valve-face with several large screws, and rendered perfectly immovable. The steam-chest fits close around the bottom of this valve-box, and affords additional security against its working loose. The bottom and sides of this box, with cover detached and steam-ports cut through it, exactly corresponding with those in the valve-face of Fig. 1, are shown in Figs. 2 and 10. Fig. 3 is the cover, which may be cast on, as in Fig. 8, or bolted onto the sides, as shown in Fig. 9. Fig. 7 is a view in perspective of my improved valve. It is a box-valve, open, and having its top and bottom faces precisely alike, except, in some cases, the top is beveled so as to work under the shoulders *a a* in Fig. 9, so as to allow these shoulders to sustain the ends of the covering-plate A. It is well known that lugs have been used and cast on steam-chests for the support of balancing-plates. It is also well known that when the steam-chest is removed and rigidly fixed to its resting-place again, the packing under it, or between it and the cylinder, will shrink by the pressure of the screwing down, and thereby lower the said lugs and the pressure-plate which rests upon them, and cause the weight of live steam to press the said plate upon the top of the valve. This plate is out of sight and out of reach, shut up in the steam-chest. It cannot be accurately adjusted, under these circumstances, to make a steam-tight joint with the top of the valve, and, at the same time, bear up the weight of live steam from the same. All this is avoided by my device, for the reason that the lugs or supporting-shoulders *a a* are a part of the valve-box, which is immovably secured to the valve-face, and never changes its position. When the covering-plate is made to rest upon these shoulders by its two opposite ends, in such a manner as to just touch the top of the valve and make a steam-tight joint with it, it remains undisturbed and exactly balanced inside of the steam-chest, and independent of it. The latter may be removed and not alter the adjustment of the covering-plate. The valve may be drawn out from under the covering-plate from either end of it when the steam-chest is removed, in Fig. 4, and shown in Fig. 9, without shortening the live-steam ports, which are covered and uncovered by the bottom of the valve B.

When, for greater convenience of putting in the valve and removing, it is practicable to shorten the steam-ports two inches, then the top of the valve B is not beveled, and the sides of the valve-box, as shown in Fig. 8, are cast perpendicular from the shoulders *a a* down to the bottom, as shown by the dotted lines *b b*, so that the valve B can be put in and lifted out of its place by taking off the cover of the steam-chest, and drawing the screws *c c c c*, and removing the cover G and its attached plate A.

To understand the method of setting and adjusting my valve, and taking up any lost motion, or tightening or loosening it from

time time to time, as occasion may require, we will suppose the valve-box, as shown in Fig. 8, with a solid cast-iron cover, or, as shown in Figs. 2 and 3, with a cover screwed onto its top, to be bolted down firmly to the valve-face cast onto the cylinder. The bottom of this box now becomes the real valve-face, on which the valve B slides. The valve B is next put in its place, as shown in Figs. 9 and 10. The steam-chest is next put on in the usual manner, and the valve-stem D is passed through the end of the steam-chest, and through the hollow casting E, which is cast with the valve B, and which prevents any leakage between the live-steam and the exhaust port, and strengthens the valve. This stem D is made fast in E by the lock-nuts *d d* and *e e*. The shoulders *a a* are planed off about a thirty-second of an inch, more or less, lower than the top of the valve. They should be one inch wide. On these shoulders are now laid thin strips of metal *n n n n*, a trifle higher than the top of the valve B, as shown in Fig. 9. On these thin strips of metal the plate A is placed. This plate, in case of a locomotive, should be at least one inch and a quarter thick at the ends which rest on the shoulders *a a*, and rounded up gradually to the middle to an inch and a half in thickness, to prevent springing by reason of the weight of live steam pressing down upon it. This plate now hardly touches the top surface of the valve B. Next, if the cover G (shown in Fig. 3) is used instead of the solid casting, (shown in Fig. 8,) it is screwed down firmly onto the sides of the box, as shown in Fig. 9. In that case the strong bolts O O O, at least one inch in diameter, screwed firmly into, and nearly through, the plate A, pass up through holes bored for them in the cover G. The set-screws H H H H, being at least one inch in diameter, are now turned down until they set the plate A down so as just to touch the tops of the valve. The true point is easily ascertained by pushing and pulling the valve-stem D, and moving the valve B. When it is felt that the plate A is about touching the top of the valve B the set-screws H H H H are turned down no more. Then the nuts are screwed down on the bolts O O O with considerable tightness. This holds the plate A firmly in its position, so that when the weight of the live steam sets in between the plate A and the cover G, and presses on this plate with a weight of several tons, the valve B is not affected by it in the slightest degree. The solid cast-iron shoulders *a a* along the entire width of the throw of the valve are adequate to sustain any burden. The plate A rests on these two shoulders, by its two ends, for a distance of at least one inch in length, and the whole width of the said plate. The strong bolts O O O also hold up the center of the plate A by pulling down against the strong cover G. This should be as thick and as arching as the plate A.

Fig. 6 is a perspective view of this. When the cover G is cast onto the said box, the plate A can be put in its place, when the steam-chest is off and before the valve B is put in; or strong screws instead of studs and nuts, as in Fig. 5, may be used to draw up the plate A. The letters *i i i* in Fig. 5 represent three screws. The top of the box G, as shown in Fig. 9, is thus made to support a part of the weight of the live steam, which rests upon the plate A.

If at any time it becomes necessary to tighten or loosen the valve B, the set-screws H H H H may be turned up or down, the nuts on the tops of the bolts O O O adjusted to suit, and the strips of metal on the shoulders *a a*, under the ends of the plate A, removed or added to, as the case may require, and the valve B may be perpetually preserved from its customary tonnage of live steam.

It is obvious that the plate A may be liable to lateral motion by means of some friction between it and the top surface of the valve B under some circumstances. The bolts O O O, anchored in the top G, and passing into the plate A, will hold the said plate from moving. Besides, if occasion should require that the plate A should be fastened more securely, it could be most effectually done by cutting down a recess or recesses in the sides of the box, and letting the ends of the plate A project into them, as shown in Figs. 2 and 4 by letters *r r* and *s s*. It is believed that this valve is thus rendered strong, durable, easily adjustable, and reliable.

Another distinguishing feature of my valve is my device for exhausting the steam of an engine more abundantly and suddenly from the piston before it turns the dead-center, and for giving steam in a more forcible volume to the piston as soon as it has passed the dead-center. This is accomplished by cutting two recesses, P P, in the under side of the plate A, directly over the two live-steam ports, and of precisely the same length and width, or nearly so, and then cutting ports through the ends of the valve B, which last-named ports are represented by the letters S S S S. The recesses P P are a part of the supplementary ports for supplying and exhausting the steam of an engine in conjunction with the present method.

It will be seen that my valve will give an engine steam and exhaust it nearly twice as fast as the valve in ordinary use.

My supplementary ports also balance the ends of the valve B when they cross and recross the ports in the valve-face, and prevent the rocking motion which wears the arcs on the face of the old slide-valve, causing it to leak, and to need frequent and costly reseating. My valve, moving in a horizontal manner without any weight on it, and perfectly balanced, wears but imperceptibly during a long period, and saves the wear and tear of the eccentrics and link-motion.

Fig. 10 is a vertical section cut through my improved valve, and illustrating more fully,

in conjunction with Fig. 9, its construction and operation.

What I claim is—

1. The valve-box J, in combination with the valve-face of a cylinder, rigidly secured thereto, whereby the valve may be removed without changing the normal position of the same when balanced, substantially as shown and described.

2. In combination with the valve-box, such as described, the shoulders *a a*, cast thereon, whereby the balancing-plate is supported and adjusted, substantially in the manner and for the purposes set forth.

3. The combination of the valve-box *j*, top or lid G, plate A, and valve B, independent of the steam-chest or steam-chest cover, whereby the valve is not affected by the screwing down or unscrewing of the bolts or nuts of the said steam-chest or its cover, substantially in the manner and for the purposes set forth.

4. In combination with the cylinder of a steam-engine, the valve-box *j*, having shoulders *a a*, its lid or cover A and G, the double-ported valve B, provided with hollow casting E, all being arranged within the steam-chest of said engine, whereby the valve is balanced, and the weight of live steam removed from it, all operating in the manner and for the purposes substantially as shown and described.

HENRY W. ADAMS.

Witnesses:

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S. S. BROOKS.