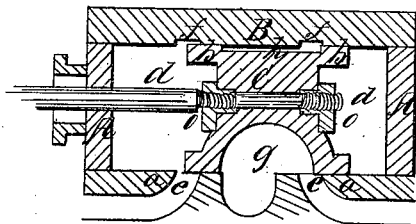
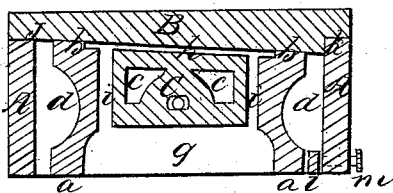


*J. R. Grout,*  
*Steam Balanced Valve.*  
*No 54,331.                      Patented May 1, 1866.*

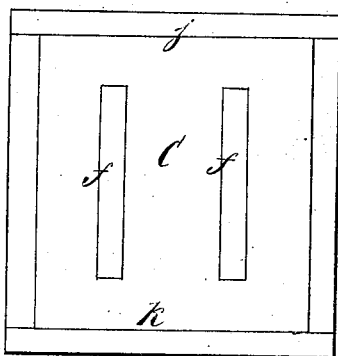
*Fig: 1*



*Fig: 2.*



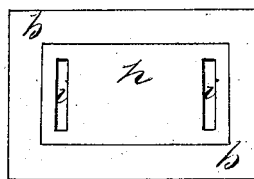
*Fig: 4.*



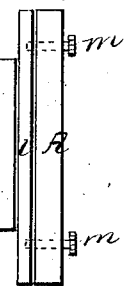
*Fig: 5.*



*Fig: 3*



*Fig: 6.*



*Witnesses:*

*Edwin Reeder Jr.*  
*Oliver T. Case*

*Inventor:*

*John R. Grout*

# UNITED STATES PATENT OFFICE.

JOHN R. GROUT, OF DETROIT, MICHIGAN.

## IMPROVEMENT IN BALANCED SLIDE-VALVES.

Specification forming part of Letters Patent No. 54,331, dated May 1, 1866.

*To all whom it may concern:*

Be it known that I, JOHN R. GROUT, of Detroit, in the county of Wayne and State of Michigan, have invented a new and improved mode of preventing the pressure of steam upon the slide-valves of steam-engines and the wear of the valve; and I do hereby declare that the following is a full, exact, and clear description of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a vertical section through the center of the valve and steam-chest in the direction of the motion of the valve. Fig. 2 is a vertical section through the center of the valve and steam-chest transverse of the direction of the valve motion. Fig. 3 is a face view of the valve. Fig. 4 is a face view of the steam-chest cover. Fig. 5 is a view of the nut securing the valve-rod to the valve. Fig. 6 is a face view of wire bar, side of steam-chest, and adjusting-screws.

My invention consists in so constructing the valve and the cover of the steam-chest as to counterbalance by compensating steam-surfaces the pressure of the steam upon the valve and the weight of the valve, and thereby save the power of the steam which this pressure and weight consume and the wear of the valve and of the surfaces against which the valve acts.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A is the ordinary steam-chest of steam-engines, into which the steam may enter at the end or the side in the usual way.

B is the steam-chest cover, and C is the valve. The valve occupies the usual area at its seat *a*, and is fitted steam-tight in the outer area of its face *b* with the steam-cover. It has open spaces through it, *c*, in the direction of its motion, and also around it, *d*, which spaces admit of the free action of the steam in the steam-chest. The valve is made of the same size at its seat *a* and at the cover of the steam-chest *b*, to the end of counterbalancing the pressure of the steam upon it, and a little wider at the cover transversely of the direction of the valve motion than at its seat, to the further end of counterbalancing its weight.

The valve being steam-tight with the steam-

chest cover, and of the same size at cover and at seat, and it being in position closing the steam-ports *e* when the steam is admitted, it is not then sensible to any pressure of the steam, for the pressure of the steam acting downward upon the valve is compensated for by its pressure against an equal surface acting upward on it, and is counterbalanced.

On movement of the valve so that the steam enters the steam-ports *e* there is the pressure of the steam acting upward against the part of the valve which is exposed over these ports. I compensate for this pressure by making slight recesses *f* in the steam-chest cover, exactly above the steam-ports *e*, and of the same form and surface area. This recess exposes an equal part of the face of the valve, as it passes the recess, to the pressure of the steam, which pressure acts downward at the same instant that it is acting upward on the part exposed at the steam-port, and is counterbalanced.

The steam escaping from the cylinder and entering the exhaust-chamber *g* presses upward against the valve. I compensate for this pressure by making a chamber, *h*, in the face *b* of the valve, which is of the same surface-area as exhaust-chamber *g*, and exactly above it, and I connect chambers *g* and *h* by two free openings, *i i*, Fig. 2. The exhausting steam passing through these openings into chamber *h*, its pressure acts downward on the valve there at the same instant and with the same force that it acts upward against it in the exhaust-chamber *g*, and is counterbalanced.

At the moment the valve reaches the point of steam-exhaust, recess *f* connects with chamber *h* and the steam in *f* escapes into *h*, Fig. 1, meeting the exhausting-steam entering *h* through *i i*, Fig. 2. The steam of *f* and *h* then escapes through *i i* into chamber *g*, which is open to the exhaust-port. *f* and *h* receive steam from different sources and counterbalance the steam-pressure on different parts of the valve, but in the exhausting of the steam they act in combination with *i i* and *g*, and hence their perfect effectiveness, with the aid of the latter, in continuing the counterbalancing action.

I compensate for the weight of the valve by making its surface area larger at the steam-chest cover than at its seat. I do this by giving the valve more breadth transversely of the

direction of its motion at the cover than at its seat. Its surface area at the cover, so provided, is to exceed its surface area at its seat by the number of square inches which, acted upon by the steam at its average working pressure, shall equal in pounds the weight of the valve. The upward pressure of the steam then counterbalances its weight.

This manner of compensating for the pressure of steam in the slide-valves of steam-engines compensates also for the pressure of the atmosphere against the steam at the exhaust-ports, relieving the valve from any atmospheric action, and it is equally applicable to free high-pressure engines, high-pressures with constrained exhaust—as locomotive-engines—and to low-pressure engines.

The valve being relieved from any pressure of the steam, and from its own weight, there is still this essential condition: It must work steam-tight at its seat and at the cover, and must not bind in any part. Being fitted, in the first instance, in this manner, when steam is admitted to the steam-chest, the valve receiving and retaining the full heat of the steam, it will expand more than the sides of the steam-chest, and bind or not move free. To compensate for or relieve it from this effect I slightly incline the face of the valve transversely of the direction of its motion, giving to the face of the steam-chest cover the same inclination, as shown by the line *j k*, Fig. 2, and I place within the steam-chest and along the heel of the valve a steel bar, *l*, held and operated by screws *m*, tapped through the side of the steam-chest, as shown, Figs. 2 and 6. By this inclination of the valve-face and the action of this wire bar slightly setting the valve away from that side of the steam-chest by force of the adjusting-screws, any binding of the valve arising from its expansion from the heat of the

steam is relieved, and the valve, once relieved under its full expansion by thus setting the wire bar, works free and steam-tight thereafter. While the bar acts as a guide to the valve the force of the steam on the large surface area of its opposite side keeps the valve steadily in place against the bar. This inclination of the face of the valve allows the valve to work away from the adjusting wire bar and its tight connection with the steam-chest cover, and to become perfectly free in engines running with steam off, as locomotive-engines running down grade.

I make an oblong opening, *n*, through the valve to receive the valve-rod, which admits of the necessary lateral movement of the valve, and attach the rod to the valve by T-nuts *o*, Fig. 5, which lock by a shoulder on the valve, holding it firm and allowing of the lateral motion.

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

1. The recess or chamber *h*, formed in the upper face of the valve, substantially as and for the purpose set forth.

2. The counterbalancing-chamber *h* in the upper face of the valve, in combination with the openings *i i* from exhaust-chamber *h*, for the purpose substantially as herein described.

3. The recesses in the chest-cover and the chamber *h* in the upper face of the valve, in combination with openings *i i* and exhaust-chamber *g*, operating substantially as herein set forth.

4. The wire bar *l*, constructed and arranged to operate substantially as herein described.  
Detroit, February 8, 1865.

JOHN R. GROUT.

Witnesses:

JULIUS STOLL,  
EDWARD Y. SWIFT.