

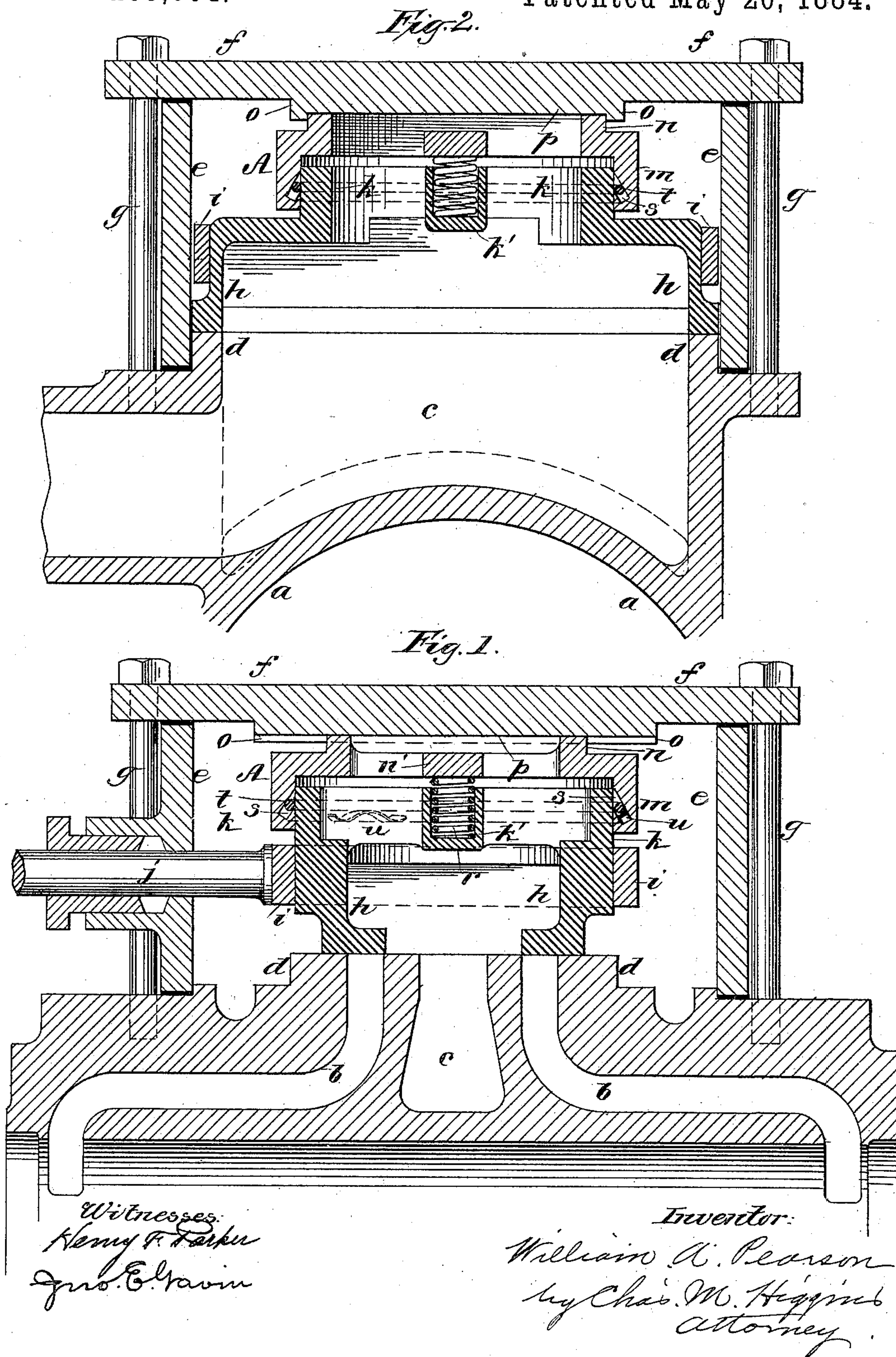
(No Model.)

2 Sheets—Sheet 1.

W. A. PEARSON.
BALANCED SLIDE VALVE.

No. 299,004.

Patented May 20, 1884.



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Fig. 3.

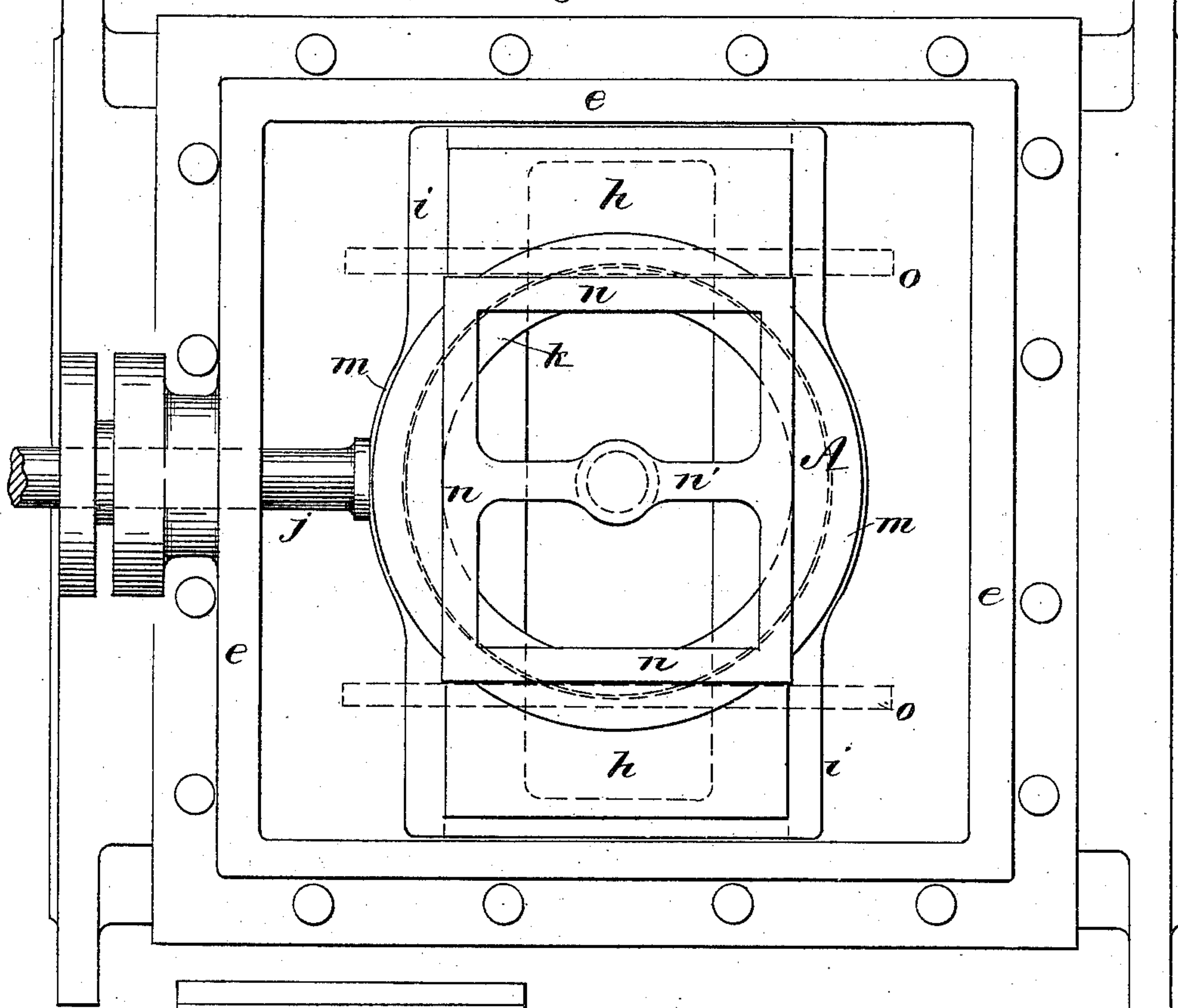
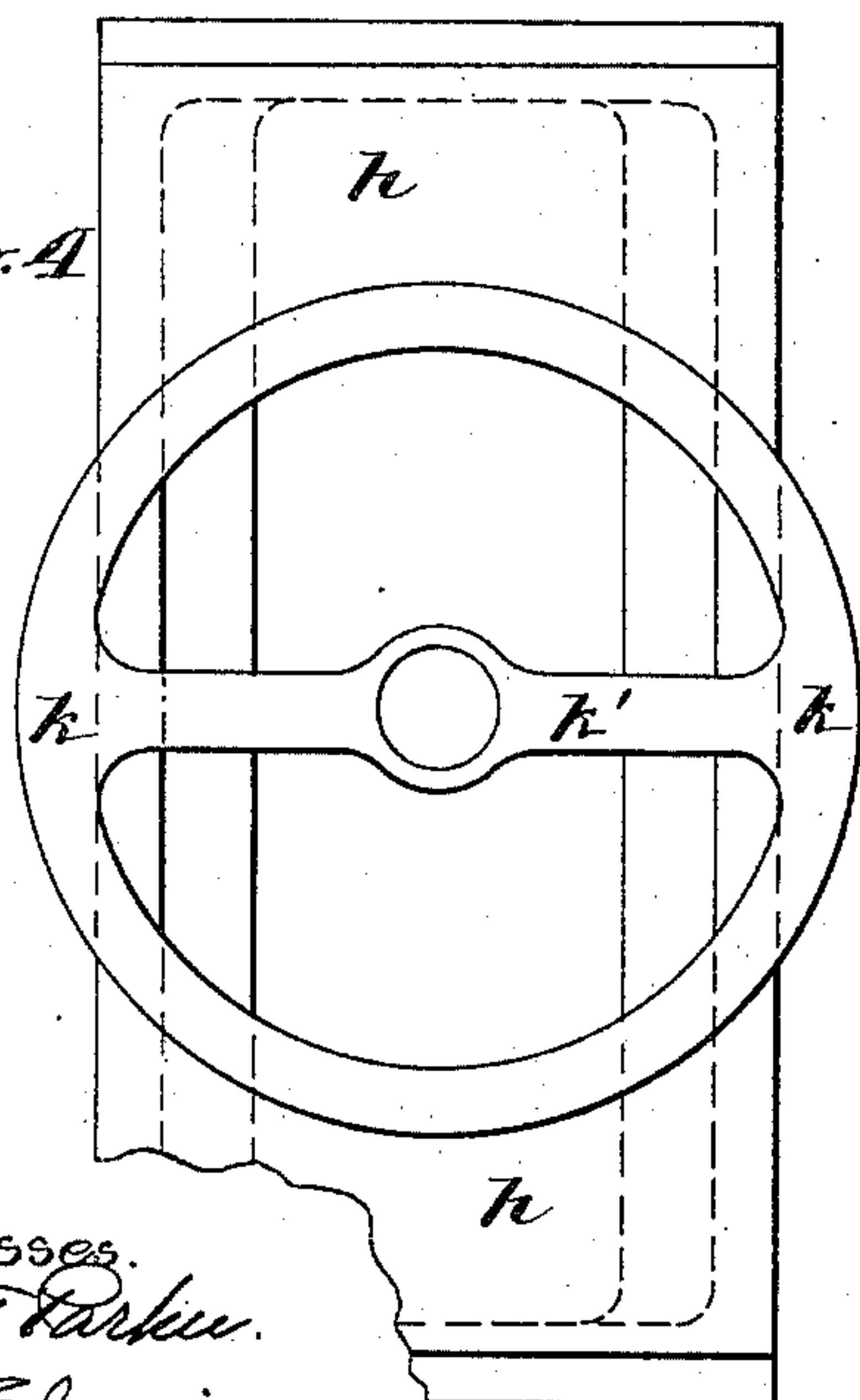
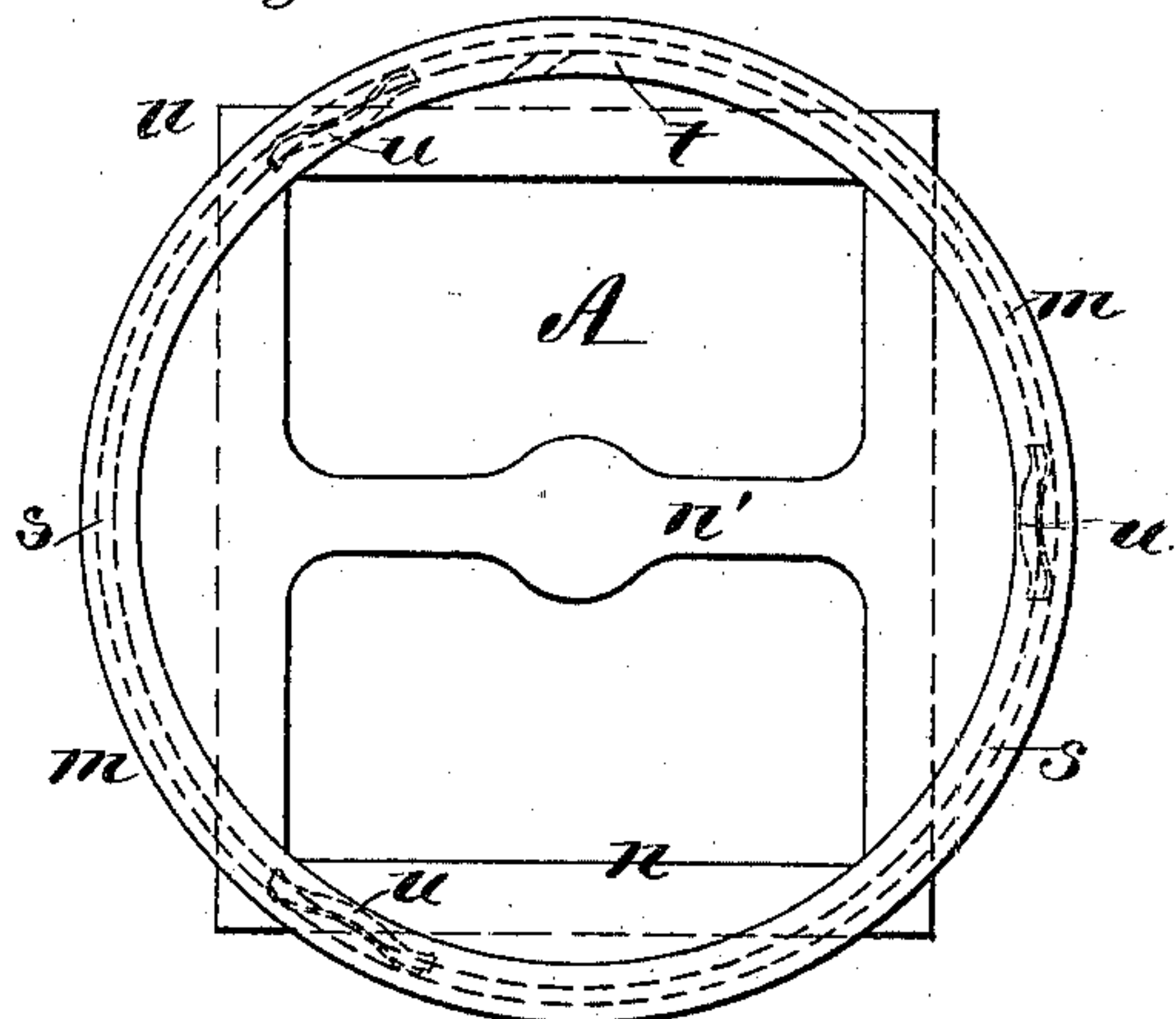


Fig. 4.



Witnesses.
Henry P. Parker.
Geo. E. Gavin

Fig. 5.



Inventor.
William A. Pearson
by Chas. M. Higgins
Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM A. PEARSON, OF SCRANTON, PENNSYLVANIA.

BALANCED SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 299,004, dated May 20, 1884.

Application filed December 21, 1883. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. PEARSON, of Scranton, in the county of Lackawanna and State of Pennsylvania, have invented certain new and useful Improvements in Balanced Slide-Valves, of which the following is a specification.

My invention relates to that class of slide-valves which are provided with a balance plate or cover which fits over or upon the back of the valve and engage together like a piston and cylinder, the plate or cover being pressed up by a spring against the top of the steam-chest, while the plate and valve slide together steam-tight between the valve-seat and chest-cover, whereby the area of the valve covered by the balance-plate is thus relieved of downward pressure and the valve rendered "balanced," or nearly so. My invention aims to produce a valve of this type which will be more simple and efficient in construction, and in which the action will be smooth and the wear regular. In some valves of this class heretofore the cover has been in the form of a short cylinder or round ring fitting over a piston-like neck on the valve, the round upper end of the cylinder abutting and sliding directly against the level top of the chest. In my case, however, the upper or abutting end of the cylindrical ring is made of square or rectangular outline, to slide against the top of the chest and between longitudinal guides thereon, whereby the bearing-surface is more extended and regular and the wear is rendered uniform, and at the same time the cover is prevented from turning on the valve, so that all displacements of the parts or irregular action or wear is prevented.

My invention therefore consists, mainly, in the features above outlined, and also in the special arrangement and character of the packing between the valve and the balance-cover, and in the arrangement of the spring and its abutments between the two, and in other details, as hereinafter fully set forth.

In the drawings annexed, Figure 1 presents a longitudinal section through the cylinder and valve-chest of a locomotive-engine provided with my improved balanced slide-valve. Fig. 2 is a cross-section thereof. Fig. 3 is a plan view with the top of the chest removed.

Fig. 4 is a plan of the valve, and Fig. 5 an inverted plan of the balance plate or cover which fits over the valve and between the same and the top of the chest.

In Figs. 1, 2, and 3, *a a* indicate the cylinder, which is provided with the usual arrangement of ports *b c b* and valve-seat *d*.

e indicates the sides of the steam-chest, and *f* the cover, which are secured to the cylinder by the usual arrangement of marginal bolts *g*, as illustrated.

h indicates the slide-valve, which rests upon the valve-seat, and which, as usual in locomotive-engines, is short longitudinally and wide transversely and fits closely to the sides of the chest, and is free to move back and forth therein, its dimensions and formation relatively to the ports being the same as commonly used, and acting to admit and exhaust the steam in the usual manner, so that no detailed description thereof is necessary.

i is the yoke or frame, which fits around the valve, and is connected with the valve-stem *j*, whereby the valve is slid back and forth in the usual manner, as will be understood.

Now, the valve, instead of being flat and imperforate on its back or top, is formed with a short cylindrical neck, *k*, which rises therefrom a distance about half the height of the valve, and is open at the top, communicating with the cavity of the valve, and has a cross-bar, *k'*, extending diametrically across the open mouth of the neck, as fully shown in Figs. 4, 2, and 1.

Now, *A* indicates the balance plate or cover, which is interposed between the top of the chest and the top or back of the valve. This cover has a round, ring-like, or cylindrical body, *m*, which fits over the cylindrical neck *k* on the valve like a cylinder around a piston; but it has a square or rectangular neck, *n*, at the top, which fits up against the under side of the chest-cover *f*, with its longitudinal edges in conjunction with longitudinal guiding-ribs *o o* on the said cover, as fully shown in Figs. 1 and 2, and by dotted lines in Fig. 3. The balance-cover *A*, as shown, is hollow or open throughout, in the form of a ring or frame, round below and square above, as well shown in Fig. 5, also in Figs. 3, 2, and 1. The edges of the round end *m* approach, but do not

touch, the top of the valve, as seen in Figs. 2 and 1, while the edges of the square end abut against the top of the chest upon a scaped bearing-seat, *p*, which projects from the top of the chest between the guide-ribs *o o*. The cavity of the valve thus communicates with the interior or cavity of the balance ring or cover *A*, and this cavity is closed at the bottom by the valve-seat and at the top by the bearing-seat *p*, and the square edges of the ring are constantly pressed up steam-tight against the said seat *p* by a spiral spring, *r*, which is socketed in a cylindrical hole or socket in the cross-bar *k'* of the valve, and abuts against a similar cross-bar, *n'*, extending diametrically across the interior of the balance-ring *A*. It will therefore be seen that as the balance-ring *A* covers a large portion of the valve and fits steam-tight between the valve and the top of the chest, it thus relieves the valve of the downward steam-pressure on the greater part of its surface, and thus renders it balanced, or nearly so, and enables it to move back and forth on its seat with comparatively little friction.

It will be noted that the balance-cover *A* does not relieve the entire area of the valve from pressure, as it is desirable to leave a portion of the area exposed, so as to obtain sufficient downward pressure to hold the valve firmly to its seat for efficient action.

In order to form a steam-tight or piston-like joint between the neck *k* of the valve and the cylinder or neck *m* of the balance-cover, a packing-ring of any suitable kind may be arranged in a groove in one part to press out against the other. I greatly prefer, however, to have the groove and ring in the cylinder *m*, and not in the neck *k* of the valve, as heretofore, as shown best in Figs. 1 and 2. I also prefer to cut the groove *s* in the cylinder in an oblique form or position, and insert therein a split ring, *t*, of soft metal, preferably copper, and of round section, as shown, being preferably made of ordinary soft round copper wire. Three half-elliptic springs, *u*, are placed in the bottom of the groove at equidistant points, as shown in Figs. 1 and 5, and tend to constantly press the wire upward and outward, with the effect to keep the outer circumference of the wire in firm contact with the inclined upper part of the groove, and the inner circumference in contact with the neck *k* of the valve, thus producing a steam-tight joint, and preventing the access of steam between either of the contacting points referred to.

It will be seen that the narrow annular space above the wire *t*, between the grooved side of the ring *m* and the straight side of the neck *k*, is of tapering or wedging form, and hence, as the wire *t* is pressed up, it will be wedged between the two surfaces, and its fit thereto insured. The wire being soft and elastic will readily adapt itself to the surfaces, and being of non-corrosive metal will not stick or corrode, thus forming a most simple and efficient

packing-ring between the said parts. Any other form of packing or packing-ring may, however, be used besides the particular one described; but it is an advantage to have the packing-ring in the neck *m*, and not in the neck *k*, as in this case the valve and plate need not be made so high as would otherwise be the case, and there will be more vertical play of one part on the other, and the improvement will be more easily adapted to ordinary locomotive valve-chests. It will now be seen that as the valve *h* rests on the seat and fits closely at its sides between the sides of the valve-chest, (see Figs. 2 and 3,) it is free to move longitudinally back and forth on its seat in the usual manner, and is prevented from turning around, and as the cylinder-like balance plate or cover *A* fits over the valve, and its upper square or rectangular margin, *n*, abuts closely against the bearing-face *p* between the guides *o o*, it is also free to slide longitudinally back and forth with the valve, and is prevented from turning on the valve. The bearing outline of the balance-cover *A*, being thus square or rectangular, similar to the valve, its bearing is obviously made more even and extended, and harmonious with the valve, and the wear thereon is even and regular, whereas it is well known that in practice a bearing-surface of round outline in a slide-valve wears very unevenly, and cannot be relied on for long and continued usage, as it is liable to become rocky and leaky, but which defect is entirely obviated by the feature which I have described, and which forms an important practical improvement in my valve. It will be also seen that as the balance-cover is prevented from turning on the valve, hence when the bearing-surfaces work to a smooth fit they cannot become turned out of place, nor can any of the parts become displaced relatively to each other, which is an important feature in the working of these devices. It will be seen, however, that it is not necessary to employ the guides *o o* to prevent the turning of the cover *A*, for as the valve is itself prevented from turning on the seat it will serve the same purpose to prevent the cover turning on the valve by any engagement of the two which will allow the vertical play of one on the other, but prevent rotation. For example, a dowel-pin may project radially from the neck *m* or *k* and engage with a vertical groove in the neck *k* or *m*; but I consider the guides *o o* preferable.

It will be seen that not only is this valve balanced by a simple and efficient means, which is applicable to any existing engine, but the valve is still left entirely free to vertical play or movement from its seat, so that in case of water-thrust from the cylinder the valve is free to rise and allow the escape thereof without endangering the bursting of the cylinder-heads; but I do not of course claim this as an advantage peculiar to my invention.

It will be noted that by making the necks *k* round and the bearing edge of the plate *A* rectangular I render the construction very

simple, and at the same time secure the advantage of an extended and evenly-disposed and regular wearing-surface for the plate, whereas if the necks *k m* were made rectangular and the top of the neck made the bearing edge the last-named advantage might be secured, but the first would not, as the construction would be expensive and defective, whereas by combining the round and rectangular necks in the balance-cover I secure both advantages at once.

It will seen that it is not essential that the neck *k* fit into the neck *m*, and this might be reversed, if desired, but I do not recommend it; and it will be also seen that instead of having the neck *n* abut against the top of the chest it might abut against a fixed plate within the chest, but it is not desirable.

What I claim is—

1. The combination, with a slide-valve having a round neck, of a balance plate or cover, *A*, interposed between the valve and the top of the chest, and having a round neck engaging steam-tight with the neck of the valve, and having a square or rectangular abutting margin, *n*, to bear upon the top of the chest or its equivalent, and with means, substantially such as described, to prevent the rotation of the same, substantially as herein set forth.

2. The combination, with a slide-valve having a cylindrical neck, *k*, of the balance-cover *A*, interposed between the valve and the chest-cover, having the circular neck *m*, engaging the neck *k*, and the rectangular abutting neck *n* with longitudinal guides *o o*, between which

said neck fits, substantially as and for the purpose set forth.

3. The combination, with a steam-chest and its slide-valve, of a balance-cover fitting between the top of the chest and the valve, and engaging together in the manner of a piston and cylinder, the top of the balance-cover being rectangular, with the chest-cover *f*, formed with the raised bearing-surface *p* to receive said rectangular top, and with guides *o o* to embrace the same, substantially as and for the purpose set forth.

4. In combination with the slide-valve *h* and balance-cover *A*, engaging in the manner of a cylinder and piston, the oblique groove *s* in one of said engaging parts, with the split packing-ring *t* of soft metallic wire fitted in said groove, and the springs *u*, placed beneath the ring and serving to press it out upon the other part, substantially as herein shown and described.

5. The combination, with a slide-valve and a balance-cover, *h A*, having necks which engage in the manner of a cylinder and piston, of an oblique groove, *s*, formed in one of the necks, and a packing-ring, *t*, placed in said groove, and means, substantially as described, for pressing said ring up in the oblique groove, and thereby wedging it against the opposite neck, substantially as herein shown and described.

W. A. PEARSON.

Witnesses:

JAS. H. TORREY,
J. CORDEAUX.