(No Model.) 5 Sheets—Sheet 1.

T. TRIPP.

BALANCED VALVE.

No. 457,884. Patented Aug. 18, 1891.

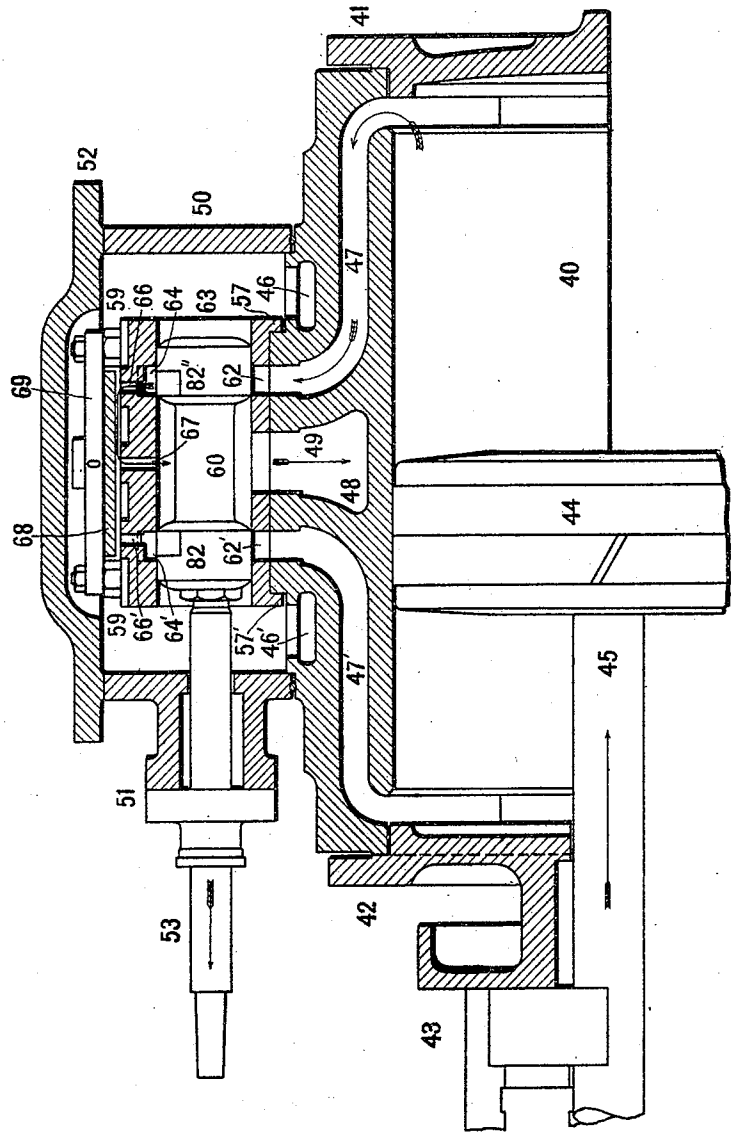


Fig. 1

WITNESSES:

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INVENTOR.

Thomas Tripp.

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T. TRIPP.

BALANCED VALVE.

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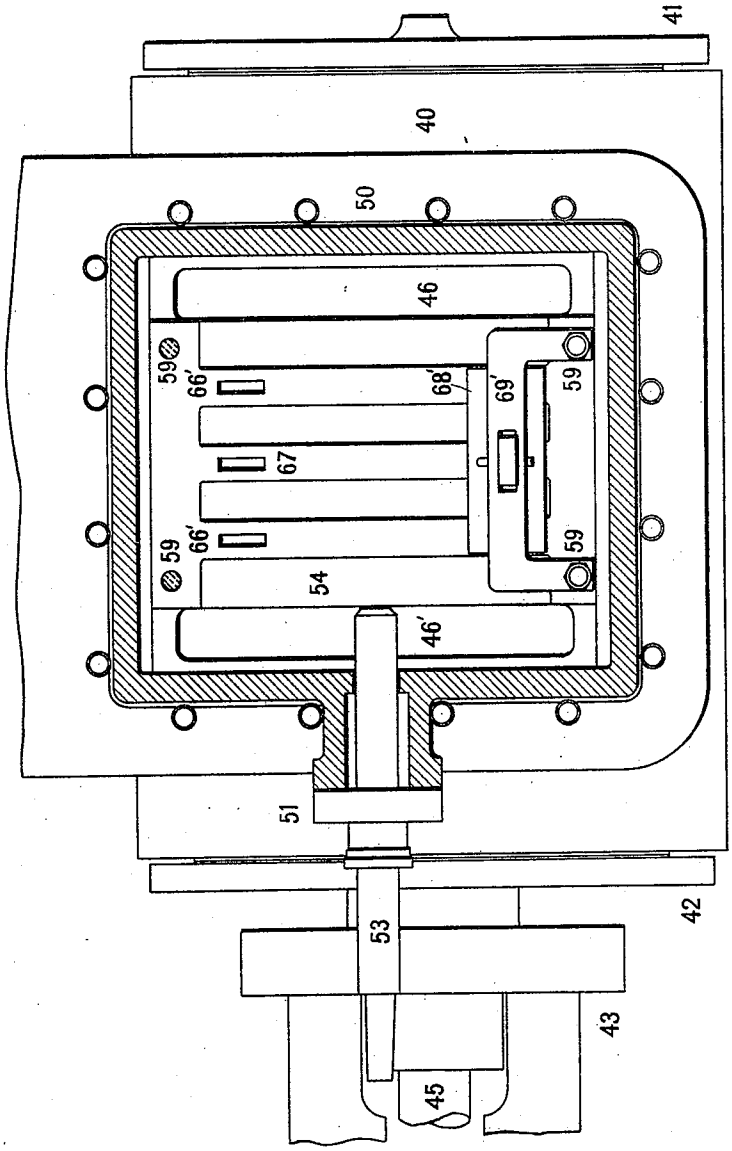


Fig-2

WITNESSES:

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T. TRIPP.

BALANCED VALVE.

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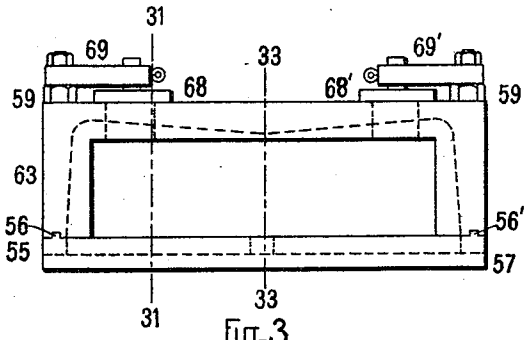


Fig-3

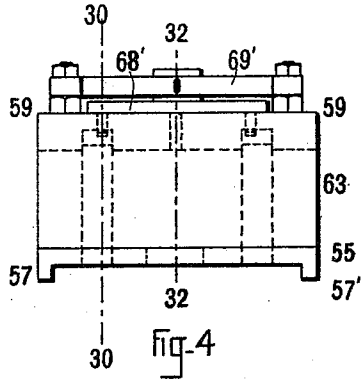


Fig-4

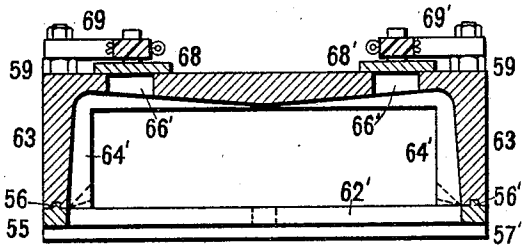


Fig-5

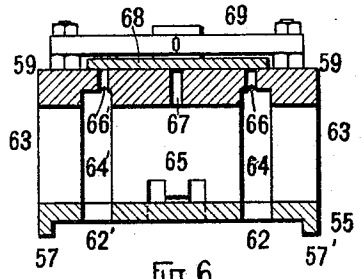


Fig-6

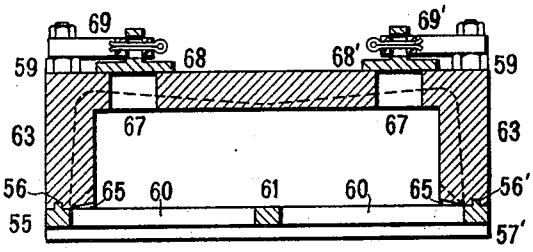


Fig-7

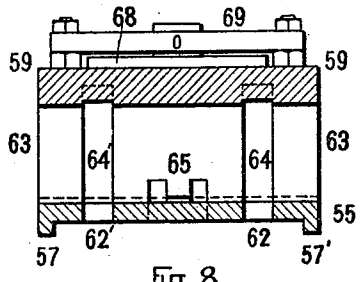


Fig-8

WITNESSES:

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T. TRIPP.

BALANCED VALVE.

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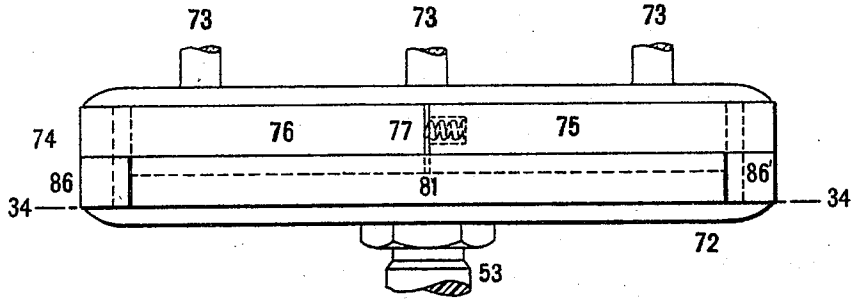


Fig-10

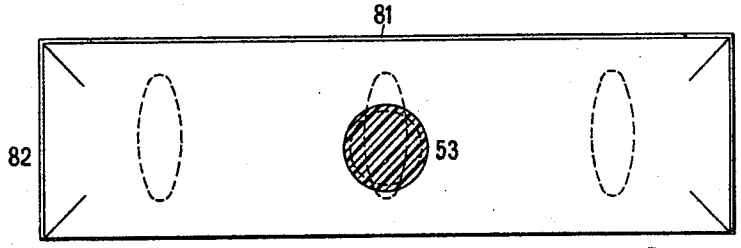


Fig-9

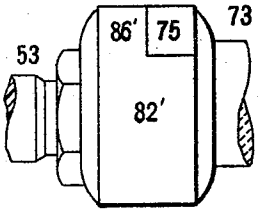


Fig-11

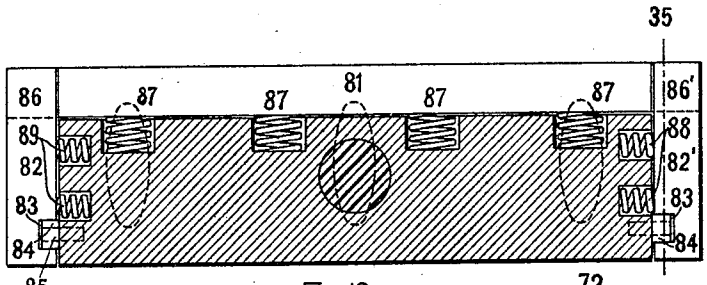


Fig-12

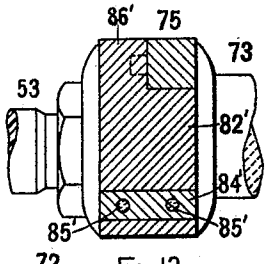


Fig-13

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T. TRIPP.

BALANCED VALVE.

No. 457,884. Patented Aug. 18, 1891.

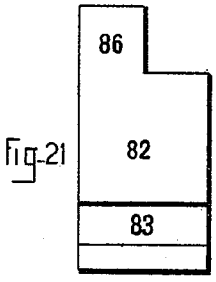


Fig-21

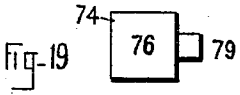


Fig-19

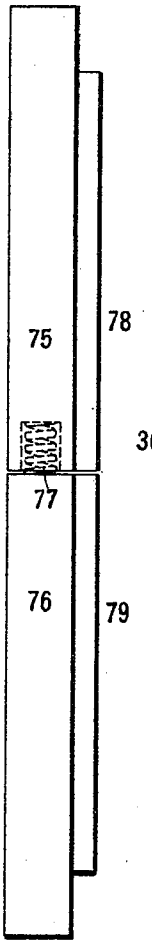


Fig-17

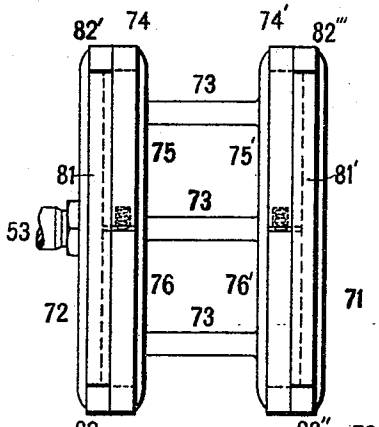


Fig-14

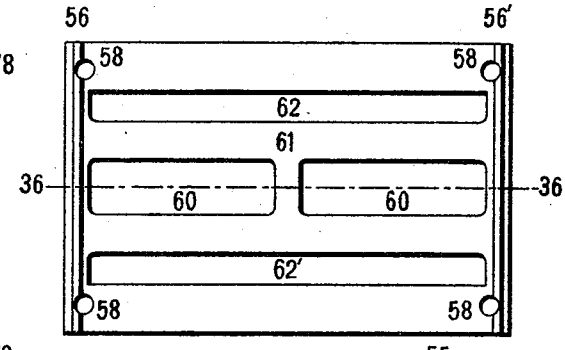


Fig-15

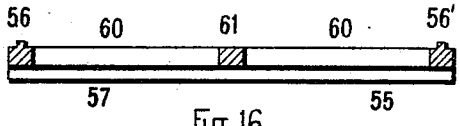


Fig-16

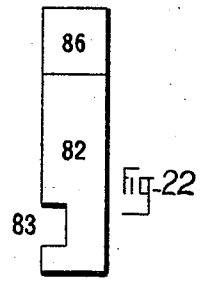


Fig-22

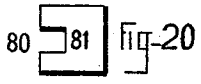


Fig-20

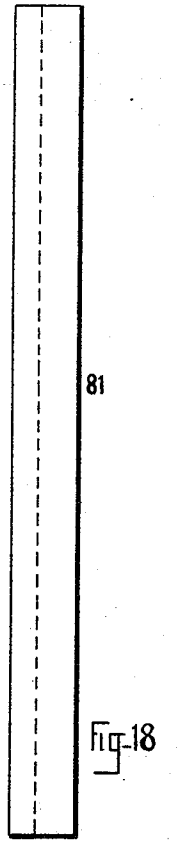


Fig-18

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UNITED STATES PATENT OFFICE.

THOMAS TRIPP, OF AVON, MASSACHUSETTS.

BALANCED VALVE.

SPECIFICATION forming part of Letters Patent No. 457,884, dated August 18, 1891.

Application filed April 6, 1891. Serial No. 387,871. (No model.)

To all whom it may concern:

Be it known that I, THOMAS TRIPP, a citizen of the United States, residing at Avon, in the county of Norfolk and State of Massachusetts, have invented a new and useful Balanced Valve, of which the following is a specification.

My invention relates to balanced valves for use upon engines, especially of the locomotive class, and the objects of my improvements are to construct a valve that, while it can be readily applied to locomotives in use, will greatly increase the efficiency of the locomotive as to its speed, economical steam consumption, safety, and ease of operating, and I attain these objects by constructing the valve so it will present about double the area of ports for steam admission and exhaust on the short travel of the valve as compared with the common slide or piston-valve, and by the use of relief-ports and relief-plates all dangerous pressures are prevented and the valve is balanced, strong, and durable, and it is provided with packings of a special construction and arrangement.

My invention is also designed as an improvement of the compound balanced valve, as set forth in my application for Letters Patent filed June 3, 1889, Serial No. 312,961.

Figure 1 represents the valve-chamber in vertical section through the relief-ports and the valve in side elevation, as applied to a locomotive cylinder of standard type which is shown in partial sectional view. Fig. 2 is a full plan of Fig. 1, except that the saddle portion of the cylinder is broken off. One of the relief-plates and its stop is removed in order to show the relief-ports, and the steam-chest cover being removed the steam-chest is shown in section. Fig. 3 represents the valve-chamber in end elevation, and Fig. 4 is a side elevation of the same. Fig. 5 is a sectional view of Fig. 4 on line 30 30. Fig. 6 is a sectional view of Fig. 3 on line 31 31. Fig. 7 is a sectional view of Fig. 4 on line 32 32. Fig. 8 is a sectional view of Fig. 3 on line 33 33. Fig. 9 represents the back valve-head in front elevation upon an enlarged scale. Fig. 10 is a plan of Fig. 9, and Fig. 11 is a side elevation of the same. Fig. 12 is a sectional view of Fig. 10 on line 34 34. Fig. 13 is a full sectional view of Fig. 12 on line 35 35. Fig. 14 represents the valve in plan. Fig. 15 represents in plan the bottom plate of the valve-chamber or false valve-seat, and Fig. 16 is a sectional view of Fig. 15 on line 36 36. Fig. 17 represents in plan upon an enlarged scale one of the male top packing-pieces of the valve, and Fig. 18 represents in plan upon an enlarged scale one of the female top packing-pieces of the valve. Fig. 19 is an end elevation of Fig. 17, and Fig. 20 is an end elevation of Fig. 18. Fig. 21 represents one of the side packings of the valve in rear elevation, and Fig. 22 is an end elevation of Fig. 21.

The locomotive-cylinder represented, of a standard type, is of a common and well-known construction, and it is provided with the following: cylinder 40, front head 41, back head 42, having stuffing-box 43, piston 44, having piston-rod 45, main supply-ports 46 and 46′, steam-admission ports 47 and 47′, steam-exhaust port 48, valve-seat 49, steam-chest 50, having valve-stem stuffing-box 51, steam-chest cover 52, and valve-stem 53, all of which are constructed, connected, and are to be operated in the usual manner.

The valve-chamber 54 is provided with the bottom plate or false valve-seat 55, which may or may not be fastened to the valve-chamber. This plate is provided with the following: ledges or tongues 56 and 56′, which fit into grooves in the valve-chamber, as shown, lips 57 and 57′, which are designed to hold the plate in its longitudinal position upon the valve-seat 49, holes 58, through which the bolts 59 pass, which fasten the valve-chamber to the cylinder 40, steam-exhaust port 60, which is separated by the bridge 61, and steam-admission ports 62 and 62′. The port 60 is the same size and coincides with the port 48, and the ports 62 and 62′ are the same size and coincide with the ports 47 and 47′, respectively.

The main portion of the valve-chamber 63 is provided with the secondary ports 64 and 64′, which are directly over the admission-ports 62 and 62′, respectively, each secondary port extending around the inside of the main portion of the valve-chamber, as represented. The cuts 65, which are directly over the exhaust-port 60, are provided for the purpose of preventing any obstruction in the full area of the exhaust-port 60. The relief-

ports 66 extend from the secondary port 64 through the main portion of the valve-chamber, and in the same manner the relief-ports 66′ extend from the secondary port 64′, and the relief-ports 67 extend through the main portion of the valve-chamber, starting at a point directly over the exhaust-port. The relief-ports on one side of the valve-chamber are provided with the relief-plate 68, and the relief-ports on the other side are provided with the relief-plate 68′. The relief-plates 68 and 68′ are respectively provided with the relief-plate stops 69 and 69′, which are secured to the valve-chamber by means of the bolts 59. The relief-plate stops are designed to guide and limit the lifting movements of the relief-plates. The bolts not only serve to fasten the stops to the valve-chamber, but they pass through the valve-chamber and firmly secure it to the cylinder valve-seat 49. The valve 70 is provided with the front valve-head 71 and a back valve-head 72, which are joined together by the rods 73. The back valve-head is provided with the valve-stem 53. The packings for each head are alike, except that they are rights and lefts.

The back valve-head 72 (represented upon an enlarged scale by Figs. 9, 10, 11, 12, and 13, the packing-pieces for which are represented by Figs. 14, 15, 16, 17, 18, 19, 20, 21, and 22) is constructed as follows: The male top packing-piece 74 is composed of the two pieces 75 and 76, which are forced in opposite directions by the spiral spring 77, and they are respectively provided with the tongues 78 and 79, which are designed to slide within the groove 80 of the female top packing-piece 81. The side packing-piece 82 is provided with the groove 83, which fits over the tongue 84, which is pinned to the back valve-head by the pins 85, and it is also provided with the projection 86, which is designed to be opposite one end of the packing-piece 81. In a like manner the side packing-piece 82′ is provided with the groove 83′, which fits over the tongue 84′, which is pinned to the back valve-head by the pins 85′, and it is also provided with the projection 86′, which is designed to be located opposite the other end of the packing-piece 81′. Both valve-heads being alike the front valve-head 71 is provided with the top packing-pieces 74′ (composed of two pieces 75′ and 76′) and 81′ and with the side packing-pieces 82″ and 82‴. Three sets of spiral springs for each valve-head are provided to press the packings against the inner walls of the valve-chamber, as represented in Fig. 12. The first set 87 are placed beneath the top packing-pieces. The second set 88 are placed against one of the side packing-pieces, and the third set 89 are placed against the other side packing-piece.

The parts are assembled, as represented by Figs. 1 and 2, and the valve is intended to be operated by means of the valve-stem and the usual connections. It will be noticed that the width of the valve-face is less than the length of the ports, therefore there will be an open connection or port between each of the secondary ports and the cylinder. In operation, assuming the length of either of the ports 62 or 62′ to be sixteen inches and the width and height of the valve to be respectively fourteen inches and four inches, the area of the port for steam admission presented by a one-sixteenth-inch travel of the valve would be as follows: The distance around the valve, fourteen inches times two equals twenty-eight plus eight inches (4′ × 2) equals thirty-six inches times one-sixteenth-inch opening equals two and one-quarter square inches of port for steam admission. This area of opening, two and a quarter inches, is more than double that presented by the same travel of a common slide-valve which would be as follows: Width of the valve sixteen inches times one-sixteenth of an inch equals one square inch of port. The same would be true under the same conditions of either valve-head and the same increased port would be presented for exhaust as for steam admission.

It is very desirable for the economic use of steam in cylinders of steam-engines, especially in cylinders of locomotives running at high speed, that the steam should be admitted as quickly as possible and exhausted freely. These desirable results I obtain by the use of my valve, for the reasons above given.

It is highly desirable that excessive pressures, which occur under certain well-known conditions within, especially, locomotive-cylinders, should be relieved. Referring to Fig. 1 and assuming that the direction of travel and positions of the valve and piston are as represented, it will be observed that any excessive pressure produced within the front end of the cylinder would be relieved into the exhaust-port, as indicated by arrows, through ports 47, 62, 64, 66, and 67, by the lifting of the relief-valves, which lift from their seats whenever the pressure within the cylinder is greater than the pressure within the steam-chest. This relieving of excessive pressures prevents accidents to the cylinder, such as the blowing out of the cylinder-head.

For ease of manufacture and maintenance it is desirable that the valve-heads should be of rectangular section and that the packings should be strong, tight, and well constructed, and that effective means should be provided for maintaining the effectiveness of the valve-packings when subjected to wear. This desired effectiveness of the valve-packings is accomplished by the use of the valve-packings represented and previously described, which are arranged and operated as follows: The side packing-pieces are held in their respective vertical positions by means of the tongues pinned to the valve-body, upon which the side packing-pieces are free to slide in horizontal lines when pressed outward by the spiral springs. These tongues make steam-tight horizontal joints between the valve-body and the side packing-pieces. The top pack-

ing-pieces are firmly secured together in their vertical position by means of the tongue and groove, the use of which permits the male top packing-pieces to be pressed outwardly in horizontal lines by the spiral spring placed between the pieces, and at the same time the top packing-pieces are pressed upwardly by the set of spiral springs used for the purpose of making a tight joint between the top packing-pieces and the valve-chamber. The top of each side packing-piece is recessed to receive the rectangular end of one of the top packing-pieces. This construction and arrangement permits the making of a tight joint at the corner of the valve, for the reason that as the valve-packings wear a space would be left between the top of the side packing-piece and the valve-chamber—as the side packing-piece has no vertical adjustment or movement—if it were not for the fact that the end of the top packing-piece has both a vertical and horizontal adjustment and movement, thereby making tight joints at the upper corners of the valve. The tongue-and-groove arrangement of the top packing-pieces permits a double use, one use or duty being as above stated, the other being to prevent the catching of the pieces when traveling over the ports, each port being wider than either of the top packing-pieces; but both pieces being vertically united by means of the tongue and groove, and as their united width is greater than the width of the port over which they pass or reciprocate, they have no tendency to catch on the ports. It will be observed that the male top packing-pieces are placed on the exhaust side of the valve. This arrangement is for the purpose of preventing the pieces from being forced horizontally apart, except by the pressure or power of the spiral spring used for that purpose.

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

1. A valve comprising the valve-heads, each being provided with the side packings having a groove and projection, and the tongue-and-groove top packing-pieces, substantially as and for the purposes set forth.

2. A valve comprising the valve-heads, each of which is provided with packings composed of the top male and female packing-pieces, having together vertical adjustment, the male top packing-piece having both vertical and horizontal adjustment, and the side packing-pieces having horizontal adjustment only, substantially as set forth.

3. In a valve, the top packing-pieces vertically united together by means of a groove and tongues, in combination with the side packing-pieces vertically united to the valve by means of tongues and grooves, substantially as set forth.

4. In a valve, the valve comprising the valve-heads, each being provided with the side packings having a groove and projection, and the tongue-and-groove top packing-pieces, in combination with the valve-chamber provided with the secondary ports, substantially as and for the purposes set forth.

5. In a balanced valve, a valve consisting of the valve-heads, each of which is provided with packing composed of the top male and female packing-pieces, having together vertical adjustment, the male top packing-piece having both vertical adjustment and horizontal adjustment, and the side packing-pieces having horizontal adjustment only, in combination with the valve-chamber having the secondary ports, substantially as set forth.

6. In a balanced valve, a valve the top packing-pieces of which are vertically united together by means of tongue and groove, and the side packing-pieces are vertically united to the valve-head by means of tongues and grooves, in combination with a valve-chamber provided with the secondary ports, substantially as described.

7. In a valve, a valve-chamber having the secondary ports and provided with the relief-ports, plates, and stops, in combination with the valve, consisting of two valve-heads of rectangular section, each head being provided with the side packings having a groove and projection, and the tongue-and-groove top packing-pieces, substantially as and for the purposes set forth.

8. In a valve, a valve-chamber provided with the secondary ports, relief-ports, plates, and stops, in combination with the valve comprising the valve-heads, each of which is provided with packings composed of the top male and female packing-pieces capable of having together vertical movements, the male top packing-pieces capable of both vertical and horizontal movements, and the side packing-pieces capable of having horizontal movements only, substantially as set forth.

9. In a balanced valve, a valve-chamber provided with the secondary ports, relief-ports, relief plates and stops, in combination with the valve having the top packing-pieces vertically united together by means of tongue and groove, and the side packing-pieces vertically united to the valve by means of tongue and grooves, substantially as described.

10. A valve comprising two valve-heads, each of which is provided with the top packing-pieces so constructed and arranged as to operate as one piece when pressed vertically by the spring-pressure against the top of the valve-chamber while the male top packing-pieces are pressed horizontally and outwardly against the sides of the valve-chamber, and the side packing-pieces, each of which is pressed by spring-pressure horizontally against the sides of the valve-chamber, substantially as and for the purposes set forth.

11. In a valve, in combination, a valve-chamber provided with the secondary ports, with a valve, each valve-head of which is provided with the top packing-pieces, so constructed and arranged as to operate as one piece when pressed by the spring-pressure against the top of the valve-chamber, while one of the top

packing-pieces, which is made in two pieces, each of which is pressed outwardly against the sides of the valve-chamber, and the side packing-pieces, each of which is pressed by spring-pressure outwardly against the sides of the valve-chamber, substantially as set forth.

12. In a balanced valve, a valve-chamber provided with secondary ports, relief-ports, and relief plates and stops, in combination with a valve, the valve-heads of which are of rectangular section, each head being provided with the interlocked packing-pieces, which are so constructed as to maintain tight joints between the packings and the valve-chamber, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THOMAS TRIPP.

Witnesses:
CHARLES O. FARRAR,
J. EDWARD PORTER.