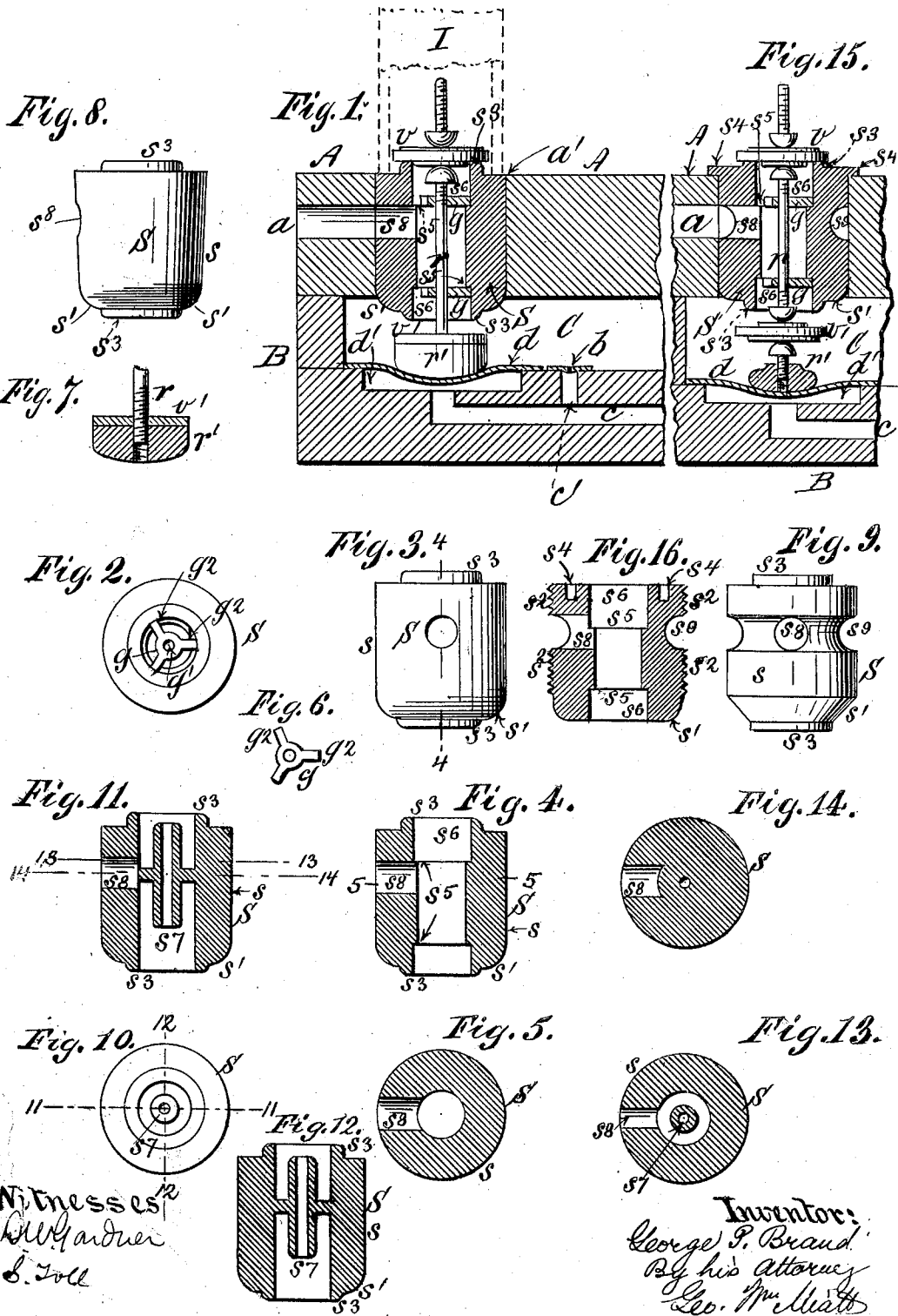


No. 835,775.

PATENTED NOV. 13, 1906.

G. P. BRAND.  
PRIMARY PNEUMATIC VALVE.  
APPLICATION FILED JAN. 31, 1905.



# UNITED STATES PATENT OFFICE.

GEORGE P. BRAND, OF NEW YORK, N. Y.

## PRIMARY PNEUMATIC VALVE.

No. 835,775.

Specification of Letters Patent.

Patented Nov. 13, 1906.

Application filed January 31, 1905. Serial No. 243,464.

*To all whom it may concern.*

Be it known that I, GEORGE P. BRAND, a citizen of the United States, residing in the city of New York, borough of Manhattan, county and State of New York, have invented certain new and useful Improvements in Primary Pneumatic Valves, of which the following is a specification sufficient to enable others skilled in the art to which the invention appertains to make and use the same.

My invention relates to what are known as "primary" valves for use in pneumatic apparatus and is designed to afford means whereby the two valves may be mounted upon and adjusted, tested, and regulated with accuracy with relation to their seats on the common valve-seat body prior to the insertion of said valve-seat body into the valve-board. Heretofore such valves have been mounted directly and individually in the valve-board and after all were so mounted had all to be tested simultaneously, rendering it difficult to locate a loose valve unless the leak was very perceptible. Thus the testing and adjusting of the valves was a long and tedious operation and was never wholly successful, since it is practically impossible to get all of the individual valves in a valve-board absolutely tight under such conditions. I obviate this difficulty and save much time, labor, and expense in the operation of "valving" by the use of an independent, adjustable, interchangeable, and detachable duplex valve-seat body, to which the valves may be quickly and conveniently applied and set in readiness to be inserted in the valve-board at any time without further adjustment or regulation in so far as the relation of the valves to their seats is concerned. Furthermore, I secure each of my duplex primary valve-seat bodies and valves in position in the valve-board without the aid of extraneous appliances, such as screws or the like, each being preferably so formed externally that it may be readily driven into any of a series of suitable bores formed for its reception in and through the valve-board.

My invention also includes certain other details of construction, hereinafter described and claimed specifically.

I herein show my duplex primary valve-seat and valves as arranged vertically and as a matter of convenience describe them in that position, it being understood that I do not limit myself in this respect and that they

may be arranged horizontally or at any intermediate angle, if desired.

In the accompanying drawings, Figure 1 is a sectional elevation illustrating the practical application of one of my duplex primary valve-seat bodies and its valves to pneumatic chest work of well-known construction. Fig. 2 is an elevation of the upper end of the duplex seat-body; Fig. 3, a side elevation of the same. Fig. 4 is a central vertical section upon plane of line 4 4, Fig. 3. Fig. 5 is a transverse section upon plane of line 5 5, Fig. 4. Fig. 6 is a detail view of one of the guides. Fig. 7 is a sectional detail of the butt valve, showing means of adjustment. Figs. 8 and 9 show modifications in the peripheral structure of the duplex valve-body. Fig. 10 is a top view of a modified form of duplex valve-seat body; Fig. 11, a section taken upon plane of line 11 11, Fig. 10; Fig. 12, a section taken upon plane of line 12 12, Fig. 10; Fig. 13, a section taken upon plane of line 13 13, Fig. 11; Fig. 14, a transverse section taken upon plane of line 14 14, Fig. 11. Figs. 15 and 16 are sectional views illustrating modifications of structure.

The above views show the parts upon a scale larger than that usually employed in practice, so as to facilitate illustration.

Only sufficient of the pneumatic chest-work is indicated symbolically herein to show the relation of my duplex primary valve-seat body to adjoining parts, A being the valve-board consisting of a single solid piece in which is formed the cylindrical bore  $a'$  and the duct or port  $a$ , leading to a pneumatic, and B the bottom board or portion of the chestwork containing the tension-chamber C, tracker-board duct  $c$ , bleed  $b$ , and duct  $c'$ , and the diaphragm  $d$  and its chamber  $d'$ .

The duplex valve-seat body S is preferably though not necessarily made of metal and is essentially or substantially cylindrical in the main. For instance, its peripheral surface  $s$  may be made to taper or converge slightly (say one eight-thousandth of an inch, more or less) or may be cylindrical for three-fourths or more of its length. In either case the lower edge  $s'$  is chamfered, beveled, or rounded off or otherwise reduced in diameter as compared with the main portion of the body to facilitate its introduction into the bore  $a'$ , formed in the valve-board A for its reception, said

bore being of slightly (say nine one-thousandths of an inch) less in diameter than the greatest diameter of the duplex valve-body S to insure a "drive fit."

5 The convergent peripheral form of duplex valve-seat body is illustrated in Fig. 8, the pitch or conical taper being, however, necessarily exaggerated therein. In Fig. 16 still another modification of peripheral structure  
10 is shown in which the duplex seat-body has a cylindrical portion formed with a relatively fine screw-thread  $s^2$ . In this case if a sufficiently-fine peripheral male screw-thread is formed upon the duplex seat-body it may be  
15 relied upon to form its own female screw-thread by displacement of the material composing the surface of the bore  $a'$ , thereby forming a very tight compact joint between the parts.

20 Where the peripheral screw-thread is formed upon the duplex seat-body, the latter is formed with key-nicks  $s^4$  or equivalent means for engagement with a suitable driving-tool. One advantage of the peripheral  
25 screw-thread is that it enables me to either insert or withdraw the duplex seat-body without removing the valve-board from the bottom board B, and, furthermore, and more important still, it enables me by external means  
30 and without removing the parts to adjust the internal relation of the lower end of the valve-rod  $r$  or its butt  $r'$  with accuracy with relation to the diaphragm  $d$ . When it is considered  
35 that in practice the throw or play of the valves is only approximately one thirty-second of an inch, the necessity for delicacy of adjustment in this respect is obvious, since any deviation from an exact adjustment of  
40 the butt  $r'$  and valve-rod  $r$  with relation to the diaphragm  $d$  would interfere with the proper action of the latter.

The upper and lower extremities of the duplex valve-body S are each formed with a valve-seat  $s^3$ , preferably annular in form, for  
45 seating the valves  $v$   $v'$ , which are mounted adjustably upon the valve-rod  $r$ . Instead of being in the form of projecting annular flanges, as shown in all of the figures of the drawings except Fig. 16, said seats  $s^3$  may be  
50 flush with the ends of the duplex seat-body S, as shown in said Fig. 16, if preferred.

The butt  $r'$  on the inner end of the valve-rod  $r$  for contact with the diaphragm  $d$  may abut against or be attached to the lower side  
55 of the inner valve  $v'$ , or it may be independently adjustable on the end of the valve-rod  $r$ , as shown in Fig. 15, in which figure the duplex seat-body S is shown as formed with an annular flange  $s^4$ , which rests against the upper  
60 surface of the valve-board A, when the duplex seat-body S is driven home into the bore  $a'$ , thereby gaging and limiting the position of said duplex seat-body. In applying this form of duplex seat-body the valves  
65  $v$   $v'$  are first adjusted upon the valve-stem  $r$

with relation to each other, so as to afford the requisite extent of play or motion with relation to their seats, and the butt  $r'$  is then  
adjusted with relation to the upper valve  $v$ , so as to fully seat the latter when the diaphragm  $d$  is deflated. In the absence of the  
70 shoulders  $s^4$  the adjustment of the valves  $v$   $v'$  and the butt  $r'$  when the latter is practically integral with the lower valve  $v'$ , as in the other figures of the drawings, is effected by  
75 first adjusting the upper valve  $v$  approximately upon the stem  $r$ , the lower valve  $v'$  and butt  $r'$  being adjusted upon the inner end of the rod  $r$  to limit and prescribe the degree of valve movement or play, and the butt  $r'$  is  
80 then adjusted with relation to the diaphragm  $d$  by regulating the position of the duplex seat-body S within the bore so as to seat the upper valve  $v$  squarely when the diaphragm is deflated. By providing as herein set forth  
85 for the accurate adjustment of the butt  $r'$  with relation to the outer valve  $v$  and the diaphragm  $d$  when deflated I am enabled to compensate for inevitable variations in construction no matter how slight the same may  
90 be, and thus insure the prompt action of the valves. Provision may be made for these adjustments in any suitable manner, as by male threads on the valve-rod, a female thread in the butt, and by the use of leather  
95 washers in the usual manner and as illustrated in the accompanying drawings. The valve-rod  $r$  may also be guided and centralized by any suitable means. Internal shoulders  
100  $s^5$   $s^6$  may be formed within the body of the duplex seat, against which may be forced close-fitting guide-pieces  $g$ , having a central opening  $g'$  for the passage of the valve-rod  $r$  and radial arms  $g^2$   $g^2$  for engagement with the said shoulders  $s^5$   $s^6$  and with the sides of the  
105 central longitudinal duct  $s^6$ , as shown in Figs. 1 and 2, or in boring the air-duct  $s^6$  a central perforated core or sleeve  $s^7$  may be left for the guidance and support of the valve-rod, as illustrated in Figs. 10 to 14, inclusive.

If preferred, the central longitudinal duct  $s^6$  in the seat-body S may be free and unobstructed, and the valve-rod for a suitable portion of its length may be made to fit said duct  
110  $s^6$  loosely, so as to centralize the valves without unduly impeding communication with the tension-chamber. In either case the duplex seat-body S is formed with a lateral duct  $s^8$  for connecting the air-duct  $s^6$  with the passage  
115  $a$  in the valve-board A, by which communication is had with the pneumatic. The valve-body may also be formed with a peripheral annular groove  $s^9$ , communicating with the lateral duct  $s^8$ , so as to establish and maintain communication with the passage  
120  $a$  in the valve-board when the lateral duct  $s^8$  does not coincide with the said passage  $a$ . This admits of the placing of the valve-body without special care and admits of the adjustment of the valve-body axially, as where  
130

the latter is formed with a peripheral screw-thread, without obstructing communication with the pneumatic.

Reference has heretofore been made to the use of a suitable key or instrument for driving the duplex seat-body S into the bore *a'* when said body is formed with a peripheral screw-thread. In the other forms of peripheral structure a plain tubular instrument I may be used to drive the duplex seat-body S into or out of a bore *a'* in the valve-board A, as indicated by dotted lines in Fig. 1, or any other implement that will insure a suitable distribution of pressure, it being understood that the valve-board is first detached from the bottom board when it is desired to drive a duplex-seat body out of its bore, so as to give access to the under side of said seat-body, except where the latter is formed with a peripheral screw-thread, as hereinbefore set forth, when the said seat-body may be readily removed by unscrewing it from the bore by the use of means externally applied and without separating the parts of the chest-work.

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

1. In pneumatic apparatus, the combination of a solid one-piece valve-board formed with a smooth-surfaced cylindrical bore extending through it, said board being also formed with an air-duct communicating laterally with said cylindrical bore, and a detachable duplex valve-seat body adapted to be driven without axial rotation into or out of said cylindrical bore in the valve-board, said valve-seat body being formed with an external valve-seat at each extremity with a central passage between said valve-seats and with a lateral port opening into said central passage and communicating with the said air-duct formed in the valve-board.

2. In pneumatic apparatus, the combination of a solid one-piece valve-board formed with a smooth-surfaced cylindrical bore extending through it, said board being also formed with an air-duct communicating laterally with said cylindrical bore, and a detachable duplex valve-seat body formed with a smooth peripheral surface and adapted to be driven without axial rotation into or out of said cylindrical bore in the valve-board, said valve-seat body being formed with an external valve-seat at each extremity with a central passage between said valve-seats and with a lateral port opening into said central passage and communicating with the said air-duct formed in the valve-board.

3. In pneumatic apparatus the combination of a solid one-piece valve-board formed with a smooth-surfaced cylindrical bore ex-

tending through it said board being also formed with an air-duct communicating laterally with said cylindrical bore, and a detachable duplex valve-seat body formed with a smooth peripheral surface which is slightly convergent toward its driving end, the greater diameter of said valve-body being slightly in excess of the diameter of the cylindrical bore formed for its reception in the valve-board, said valve-seat body being adapted to be driven without axial rotation into said cylindrical bore and being formed with an external valve-seat at each extremity, with a central passage between said valve-seats and with a lateral port opening into said central passage and communicating with the said air-duct formed in the valve-board, for the purpose described.

4. In pneumatic apparatus, the combination of a solid one-piece valve-board formed with a smooth-surfaced cylindrical bore extending through it, said board being also formed with an air-duct communicating laterally with said cylindrical bore, and a detachable duplex valve-seat body formed with a smooth peripheral surface and adapted to be driven without axial rotation into or out of said cylindrical bore in the valve-board, said valve-seat body being formed with an external valve-seat at each extremity with a central passage between said valve-seats, and with a lateral port opening into said central passage and into an annular groove formed in the periphery of the valve-body, said lateral port and said annular groove communicating with the said air-duct formed in the valve-body, for the purpose described.

5. In pneumatic apparatus, the combination of a bottom board formed with a tension-chamber, a diaphragm in said tension-chamber, a conduit communicating on one side of said diaphragm with a source of intermittent air-supply, a solid one-piece valve-board formed with a smooth-surfaced cylindrical bore extending through it, said board being also formed with an air-duct communicating laterally with said cylindrical bore and with a pneumatic, and a detachable duplex valve-seat body adapted to be driven without axial rotation into or out of said cylindrical bore in the valve-board, said valve-seat body being formed with an external valve-seat at each extremity with a central passage between said valve-seats and with a lateral port opening into said central passage and communicating with the said air-duct formed in the valve-board.

GEORGE P. BRAND.

Witnesses:

GEO. WM. MIATT,  
D. W. GARDNER.