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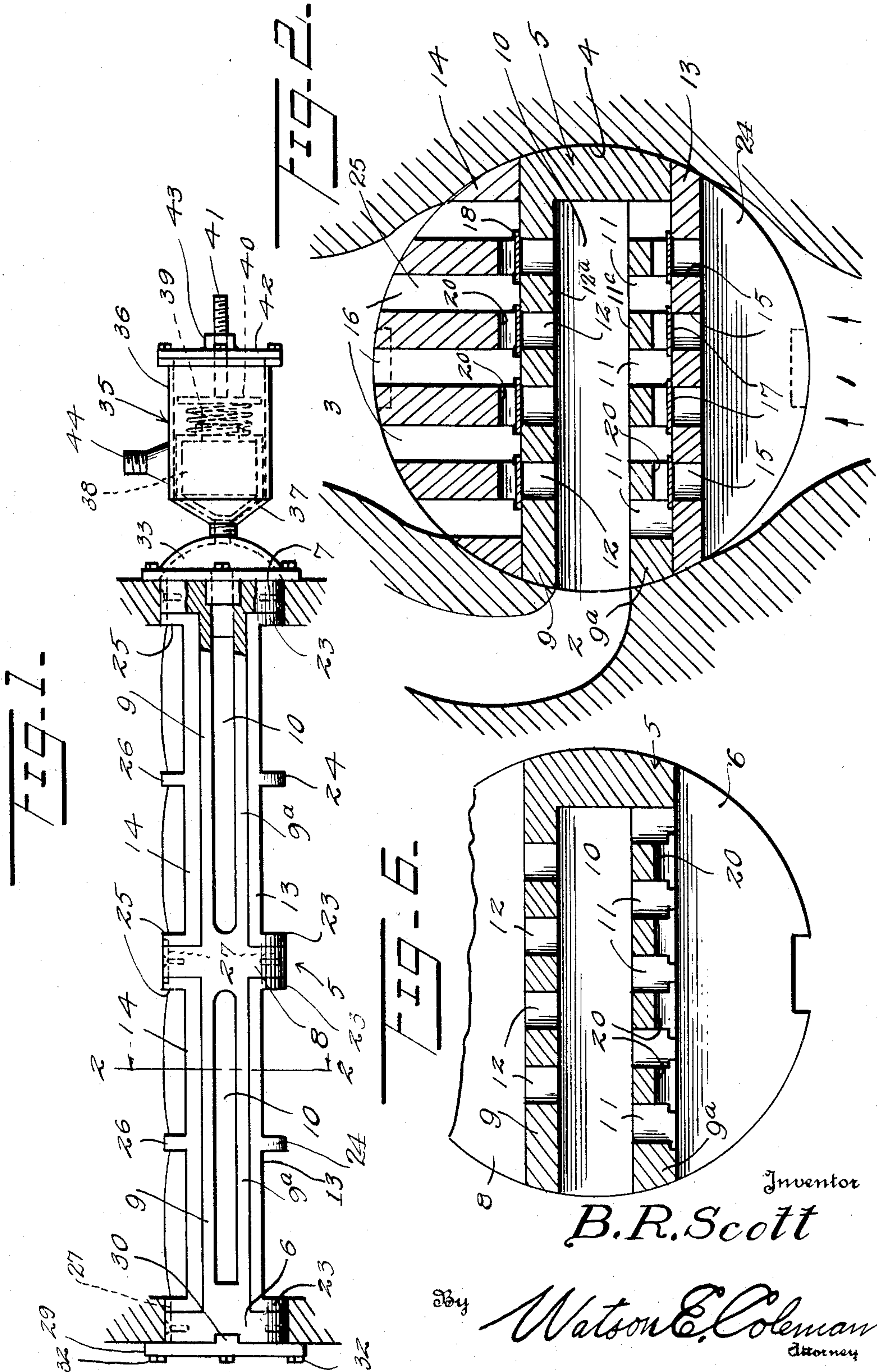
B. R. SCOTT

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BREATHER VALVE FOR AIR COMPRESSORS

Filed Oct. 13, 1931

2 Sheets-Sheet 1



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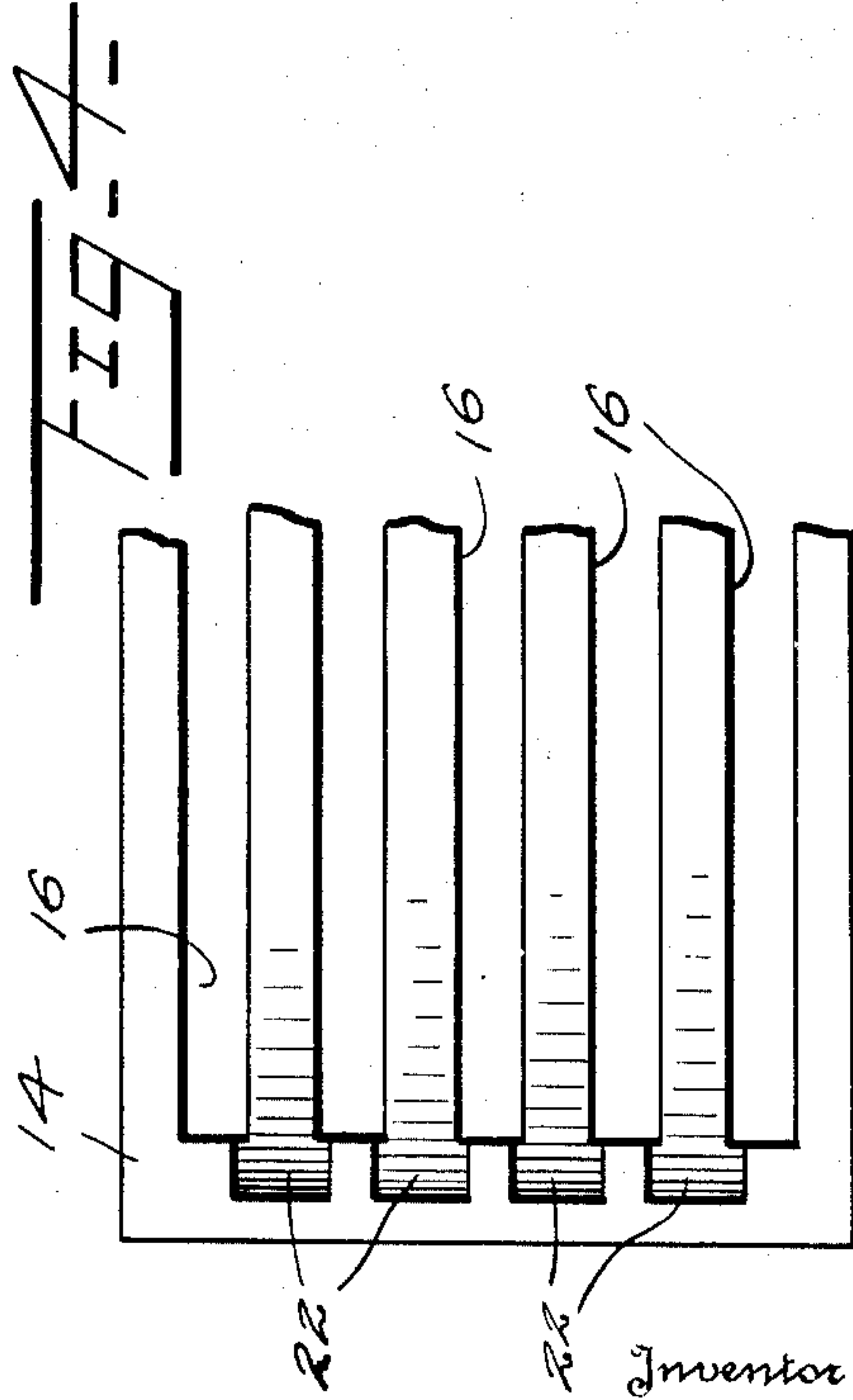
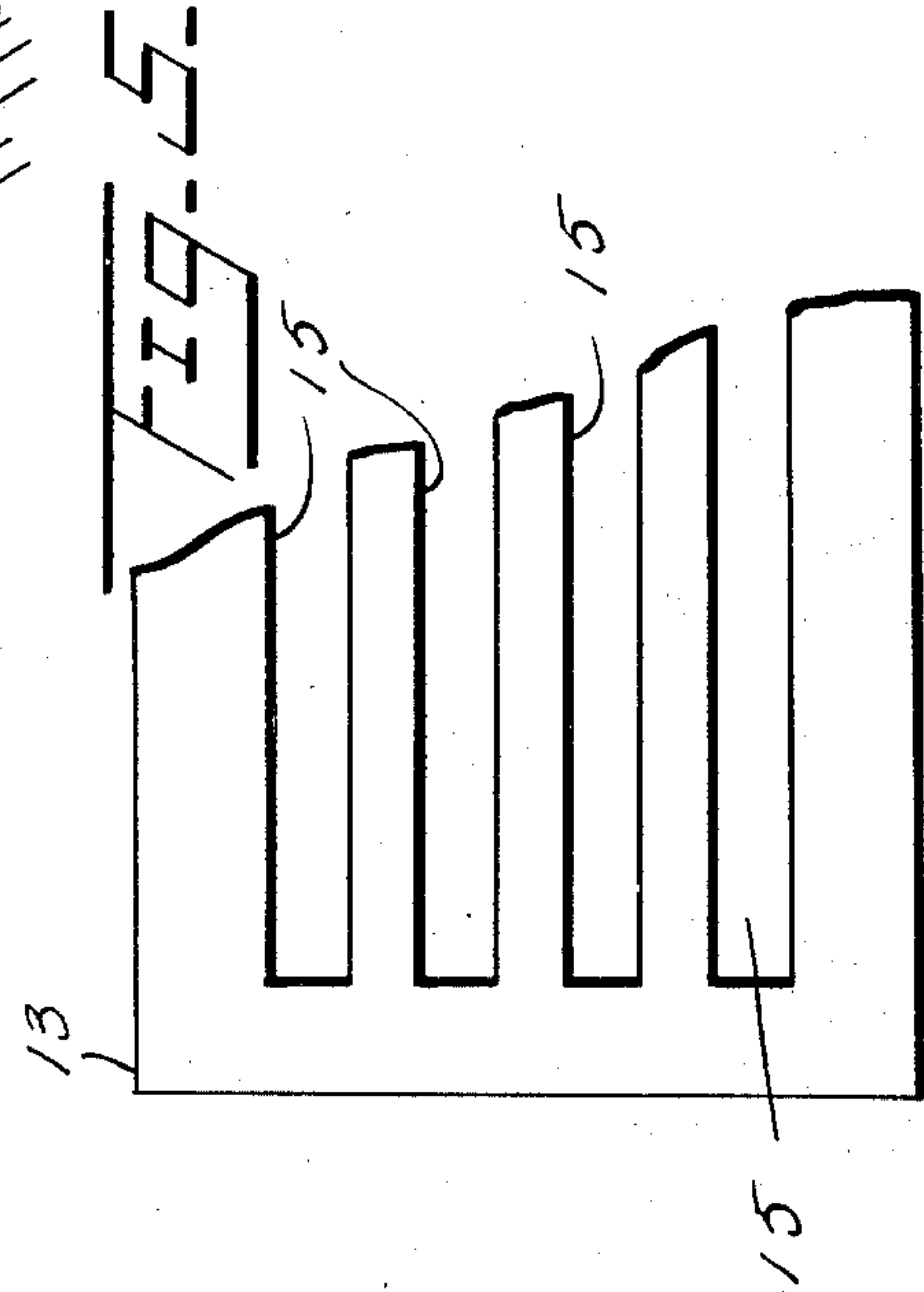
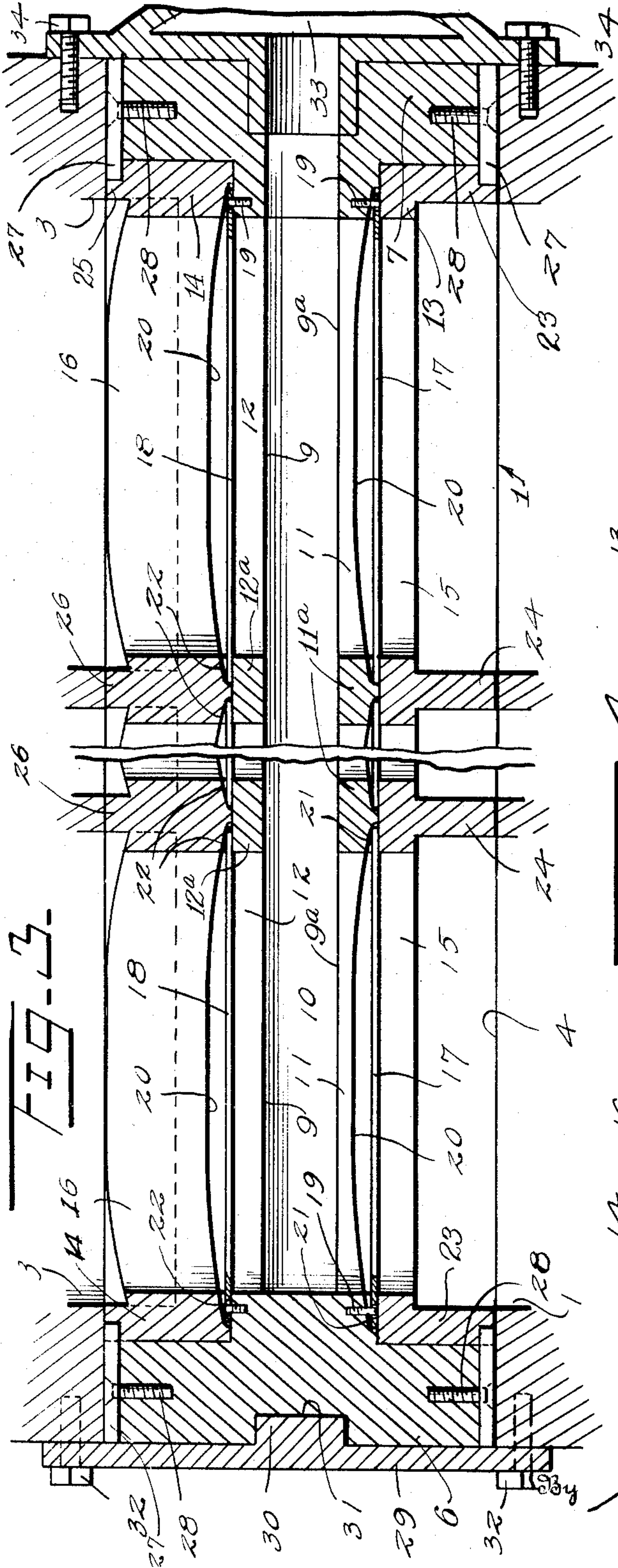
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BREATHER VALVE FOR AIR COMPRESSORS

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2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

1,961,676

## BREATHER VALVE FOR AIR COMPRESSORS

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Application October 13, 1931, Serial No. 568,623

6 Claims. (Cl. 277-61)

This invention relates to air compressors, and more particularly to air compressors of that type having Corliss and poppet valves.

5 The invention has for one of its objects to increase the efficiency of such compressors, to reduce to the minimum the cost of operating such compressors, and to reduce to the minimum the noise incident to the operation of such compressors.

10 To attain the foregoing and other objects, the nature of which will appear as the description proceeds, the invention comprehends the removing of the Corliss and poppet valves from such compressors and substituting therefor a single  
15 breather valve free of moving parts requiring lubrication and mechanical operation.

The invention is hereinafter more fully described and claimed, and illustrated in the accompanying drawings, wherein:—

20 Figure 1 is a view partly in side elevation and partly in vertical section illustrating the application of the breather valve to an air compressor;

Figure 2 is a sectional view on an enlarged scale taken on the vertical plane 2—2 of Figure 1 and  
25 extending transversely through the breather valve and a fragmentary portion of the air compressor;

Figure 3 is a sectional view on an enlarged scale taken on a vertical plane extending centrally and longitudinally through the breather  
30 valve and fragmentary portions of the air compressor;

Figure 4 is a bottom plan view of a fragmentary portion of one of the caps for holding the discharge valve strips in place in the cage of the  
35 breather valve;

Figure 5 is a top plan view of a fragmentary portion of one of the caps for holding the intake valve strips in place in the cage of the breather valve, and

40 Figure 6 is a sectional view taken on a plane extending vertically and transversely through the cage of the breather valve.

Referring in detail to the drawings, and particularly to Figure 2, 1 designates one of the intake or suction ports, 2 one of the combined suction and discharge ports, and 3 one of the compressed air discharge ports of an air compressor of well-known construction. The air compressor has a cylindrical valve chamber 4 with the lower  
50 side of which the intake or suction ports communicate, with the inner lateral side of which the combined suction and discharge ports communicate, and with the upper side of which the compressed air discharge ports communicate.

55 My improved breather valve is mounted within

the chamber 4 and consists of three parts, namely a body 5 and caps 13 and 14 disposed on each side of the body 5. The body 5 has at its ends the circular heads 6 and 7 and at its middle a medial head 8.

60 Extending from the end heads 6 and 7 to the annular medial head 8 are the upper and lower walls or webs 9 and 9<sup>a</sup> defining between them a chamber 10 as shown in Figure 2, this chamber being open on one side of the valve, this opening registering with the cylinder port 2, the  
65 chamber 10 being closed at its opposite end as shown in Figure 2. Each of the webs 9<sup>a</sup> is provided with a plurality of longitudinally extending slots 11 extending entirely through the webs. 70 Each of the webs 9 is provided with a plurality of longitudinally extending slots 12 which are preferably in staggered relation to the slots 11 in the lower web 9<sup>a</sup>. The chamber 10 defined by the webs 9 and 9<sup>a</sup> is disposed diametrically  
75 to the heads 6, 7 and 8. It will be seen from Figure 2 that the heads 6, 7 and 8 of the body 5 have exterior faces conforming to the curvature of the valve chamber 4 and fit the valve chamber 4 snugly so as to prevent any passage  
80 of air therearound.

Applied to the upper face of the web 9 are caps 14. These caps as shown in Figure 1 are disposed between each end head 7 or 6 and the middle head 8. The under face of the body 5  
85 is also provided with two caps 13 extending between the middle head 8 and the end heads 6 and 7 respectively. The caps 14 are provided with the longitudinally extending slots 16 which extend straight downward from the upper circular surface of the cap to the inner face thereof,  
90 the inner faces of the cross bars which define these slots 16 being recessed at 20, these cross bars being disposed immediately over the slots 12 of the body. The cap 13 is also provided  
95 with a plurality of slots 15 which register with the cross bars between the slots 11 as shown most clearly in Figure 2, these cross bars 11<sup>a</sup> being recessed upon their under faces as at 20. It will be understood that the slots 11 and 15  
100 constitute suction ports while the slots 12 and 16 constitute discharge ports. The intake ports 11 and 15 are under the control of valve strips 17 which are located between the caps 13 and the web 9<sup>a</sup> and which normally seat against the  
105 upper sides of these caps in position to close the suction ports 15. The discharge ports 12 and 16 are under the control of valve strips 18 which are located between the caps 14 and the web 9 and which normally seat against the upper  
110



sides of the web 9 in position to close the discharge ports 12.

The valve strips 17 and 18 are made from spring steel, and are connected each at one end 5 to the upper face of the webs 9 and 9<sup>a</sup> by a pin 19, the other end of the valve strips being free of connection with the web and the caps 13 and 14. As before stated, the cross bars of the lower web 9<sup>a</sup> defining the slots 11 are cut away 10 upon their under faces as at 20, these cut away portions being in the form of arcuate recesses 20 to the end that the valve strips 17 may move upwardly during the suction strokes of the compressor pistons. The heads 6, 7 and 8 are provided with seats 21 for the reception of the ends 15 of the valve strips 17, and the caps 14 are provided with recesses 22 for the reception of the ends of the valve strips 18, the recesses and the pins 19 positively holding the valve strips against 20 lateral or longitudinal displacement. The caps 13 are provided at their lower sides with terminal flanges 23 and intermediate flanges 24 which have curved outer edges conforming to the curvature of the heads 6, 7 and 8 and which contact 25 with the wall of the valve chamber 4. The caps 14 are also provided with terminal flanges 25 and intermediate flanges 26 which have arcuate peripheries contacting with the wall of the valve chamber 4. The caps 13 and 14 are secured 30 to the cage 5 by strips 27 which are recessed in the heads 6, 7 and 8 and in the heads 23 and 25 and which are secured to said first heads by machine screws 28.

The breather valve is secured against rotation 35 within the valve chamber 4, and one end of the valve chamber closed by a plate 29. The plate 29 provided with a boss 30 which engages in a recess 31 formed in the head 6 of the valve cage 5, is secured to the air compressor by 40 screws 32.

The other end of the valve chamber 4 is closed by a hollow head 33 which is secured to the air compressor by cap screws 34 and which is provided with a tubular extension entering the adjacent 45 passage 10 of the breather valve to establish communication between the compressor and the interior of the head. This head carries an unloader 35 for the breather valve. The unloader 35 comprises a cylinder 36 secured to and 50 communicating at one end with the cap. This end of the cylinder is of conical formation, as shown at 37, to provide a seat for the conical portion of a valve 38 slidably mounted in the cylinder. The valve is held normally seated by a 55 coil spring 39 positioned between the valve and the head 40 of a screw 41. The screw 41 is engaged with the cap 42 of the cylinder 36 to permit it to be adjusted to increase or decrease the tension of the spring 39, the screw being held in adjusted position by a nut 43 engaged therewith 60 and contacting with the outer side of the cap. The cylinder 36 is provided with a discharge nipple 44 which when the valve 37 is unseated is in communication with the adjacent passage 10 65 of the valve.

The operation of the breather valve may be stated to be as follows:—During the suction strokes of the pistons of the compressor, the valve strips 17 are in raised suction port uncovering 70 position and the valve strips 18 are in lowered or discharge port closing position, with the result that air will pass through the breather valve from the intake or suction port 1 to the combined suction and discharge port 2 of the 75 compressor.

During the discharge strokes of the pistons, the valve strips 17 will be in lowered or suction port closing position and the valve strips 18 will be in raised or discharge port uncovering position, 80 with the result that the air will pass through the breather valve from the combined suction and discharge port 2 to the compressed air discharge port 3 of the compressor. The movements of the valve strips 17 and 18 are limited by the webs 85 9<sup>a</sup> and 9 and the caps 13 and 14. The valve strips 17 and 18 are the only moving parts of the valve, and they do not require lubrication in order to insure their functioning properly, and they function without any mechanical connection between 90 them and the moving part of the compressor. It will thus be understood that the cost of oil and grease and the cost of electric current required by those compressors having Corliss and poppet valves are avoided. Furthermore, the valve strips 95 17 and 18 during their operation make little or no noise as compared with the noise made by the Corliss and poppet valves. The concave lower side of the web 9<sup>a</sup> and the concave lower sides or faces 20 of the caps 14 permit the valve strips 100 17 and 18 to move into positions where they will fully uncover the suction and discharge ports of the breather valve. The cage 5 and the caps 13 and 14 are of such simple construction as to be readily cast and finished in lathes. After these 105 parts have been finished the valve strips 17 and 18 may be readily applied to the cage and thereafter the caps may be readily applied and secured to the cage.

Attention is called to the fact that in my construction, the body 5 of the valve has one continuous longitudinally extending passage 10 extending practically from end to end of the valve and that the webs 9 and 9<sup>a</sup> are longitudinally 110 slotted, that the middle of the valve body is reinforced by the annular head 8 and that as shown in Figure 2 intermediate the head 8 and separating the slots 11 from each other there are the transverse septums 11<sup>a</sup> and 12<sup>a</sup>. The intermediate annular head 8 reinforces the valve so that 115 it will not collapse under pressure and serves also another purpose because it permits the caps to be made in sections so that the cap of one section can be removed and repaired without disturbing the cap of the other section. The caps are also 120 provided with intermediate ribs or septums 26 as shown in Figure 3 which define the ends of the longitudinally extending slots 15 and 16 in the caps, these septums defining the two groups of valve strips and keeping the valve strips in place. These valve strips as shown in Figure 3 rest upon 125 the septums 11<sup>a</sup> and 12<sup>a</sup> and the septums or partitions 24 and 26 rest against the septums 11<sup>a</sup> and 12<sup>a</sup> between the ends of the valve strips, thus preventing any leakage of air between groups of valve strips and also serving as a support 130 for the grids or longitudinally extending bars which define the slots.

By referring to Figure 2, it will be seen that the longitudinally extending partition walls 9 and 9<sup>a</sup> provide for a seal joint between the body and 140 the caps which prevents any leakage around the valve.

The provision of a single longitudinally extending chamber 10 in the body with slots extending longitudinally has a number of advantages over 145 a construction wherein there are provided a plurality of transversely extending chambers, because the air all enters into the one chamber, that is, the central chamber and the pressure equalizes, each valve thus having equal access 150



to air and the same pressure. In my valve, the air goes directly into the central chamber from the suction passage 1 and directly out without having to pass through a plurality of separate chambers.

Where the body of the valve is divided into a number of transversely extending chambers, the air entering one of the chambers has to be taken care of by that one particular group of valve strips in that chamber and should one of these valve strips in that particular chamber stick, the pressure would be greater in that one chamber which would cause friction whereas where there is one chamber extending the whole length of the valve body, the air equalizes and passes out through other valve strips.

It will be noted that in my construction the valve strips 17 and 18 are each held at one end but are free to flex upward under suction, that when the suction or pressure is relieved, the strips return to their flattened form and close the openings which they control. This makes it particularly easy to assemble this valve as the valve strips when laid in place prior to putting on the caps remain in place and do not shift out of place as they would do if springs were used urging these valve strips against their seats. It will be seen that my valve is composed of practically three pieces, omitting from consideration the valve strips, namely the body 5 and the caps 13 and 14. This makes the valve very readily assembled and makes it very easy to put the valve strips in place.

While I have described the principle of the invention, together with the structure which I now consider the preferred embodiment thereof, it is to be understood that the structure shown is merely illustrative and that such changes may be made, when desired, as fall within the scope of the invention as claimed.

What is claimed is:—

1. A breather valve circular in cross section and comprising a body having flat opposed faces and upper and lower caps segmental in cross section adapted to rest flat upon the faces to complete the valve, the body having a single longitudinally extending chamber closed at both ends and at one side face of the body but opening upon the opposite side face of the body, the upper wall of the chamber having longitudinally extending slots defined by longitudinally extending bars, the lower wall of the chamber having longitudinally extending slots defined by longitudinal bars, the outer faces of the last named bars being above the general level of the lower wall, an upper cap having longitudinally extending slots registering with the cross bars of the upper wall and defined by bars disposed between the slots, said bars being cut away on their lower faces, a lower cap having slots registering with the cross bars of the lower wall and valve strips disposed over the slots in the last named cap and over the slots in the upper wall of the body.

2. A breather valve comprising a body having flat upper and lower faces and provided at its ends and intermediate its ends with circular heads and upper and lower caps segmental in cross section adapted to rest flat against the faces and be disposed between said heads to thus complete the valve, said body having a single longitudinally extending chamber closed on one side of the body but opening upon the opposite face of the body, the upper wall of said chamber between the intermediate head and the end heads having longitudinally extending slots defined by longitudinally extending cross bars, the lower

wall of each chamber between the intermediate head and the end heads having longitudinally extending slots defined by longitudinal bars and staggered with relation to the slots in the upper wall, the outer faces of the last named bars being recessed above the general level of the lower face of the wall, the upper cap having longitudinally extending slots registering with the cross bars of the upper wall of the body and vertically extending cross bars defining said slots and extending vertically upward to the upper face of the cap, said cross bars being cut away on their lower faces, and resilient valve strips disposed over the slots in the lower cap and normally resting upon the cross bars of said cap, and valve strips disposed over the slots in the upper wall of the chamber and resting upon the cross bars defining said slots.

3. A breather valve comprising a body having flat upper and lower faces and provided at its ends and at its middle with circular heads and upper and lower caps segmental in cross section adapted to rest flat against the faces and be disposed between said heads to thus complete the valve, said body having a longitudinally extending chamber closed on one side of the body but opening upon the opposite face of the body, the upper wall of said chamber having longitudinally extending slots defined by longitudinally extending cross bars, the lower wall of said chamber having longitudinally extending slots defined by longitudinal bars and staggered with relation to the slots in the upper wall, the outer faces of the last named bars being recessed above the general level of the lower face of the wall, the upper caps having longitudinally extending slots registering with the bars of the upper wall of the body and vertically extending bars defining said slots and extending vertically upward to the upper face of the cap, said bars being cut away on their lower faces, and resilient valve strips disposed over the slots in the upper caps and normally resting upon the cross bars of said upper caps, and valve strips disposed over the slots in the upper wall of the chamber and resting upon the cross bars defining said slots, said strips being retained against outward movement at their ends whereby the middle portion of each strip may bow upward to permit the inlet or discharge of air.

4. A breather valve circular in cross section and comprising a body having flat opposed faces, the body having a single longitudinally extending chamber closed at both ends and at one side face of the body but opening upon the opposite side face of the body, the body having circular end heads and a circular medial head through which the chamber in the body extends, the upper wall of the chamber having a plurality of sets of longitudinally extending slots divided by transversely extending septums, the lower wall of the chamber having a plurality of longitudinally extending sets of slots divided by transversely extending septums, the longitudinally extending bars defined by said slots of the lower wall being cut away on their lower faces, a plurality of upper caps adapted to be disposed between the intermediate head and the end heads, each upper cap having a plurality of sets of longitudinally extending slots defined by longitudinally extending bars, the sets of slots being separated by a transversely extending partition adapted to register with and bear against the corresponding septum of the body, the longitudinally extending bars defining the slots of the



- upper cap being cut away upon their lower faces, a plurality of lower caps adapted to be disposed between the intermediate head and the end heads of the body and having longitudinally extending slots defined by longitudinally extending bars, the slots being divided into two sets by a transversely extending partition registering with and resting against the corresponding septum dividing the slots of the lower wall of the body, the slots of the lower cap registering with the longitudinal bars of the lower wall of the body and valve strips disposed over the slots in the last named caps and over the slots in the upper wall of the body.
5. A breather valve circular in cross section and comprising a body having opposed upper and lower flat longitudinally slotted faces, the body having a single longitudinally extending chamber closed at both ends and at one side of the body but opening upon the opposite side face of the body, upper and lower caps detachably mounted upon the flat opposed faces of the body and having longitudinally extending slots staggered with relation to the slots in the body, valve strips disposed in register over the upper slots of the body and valve strips disposed in register with the slots in the lower cap, the caps extending over the valve strips.
6. A breather valve comprising a body having opposed upper and lower flat faces, each face being formed with a plurality of sets of longitudinal slots divided by transversely extending septums, upper and lower caps detachably mounted upon the flat opposed faces of the body and each having a plurality of series of longitudinal slots, the several series being separated by transversely extending septums, the septums of the caps engaging against the septums of the body, upper valve strips disposed in register with the upper slots in the body and lower valve strips disposed in register with the slots in the lower cap, said caps extending over the valve strips.
- BERT R. SCOTT.

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30	105
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75	150