

APPLICATION FILED APR. 2, 1909.

4 SHEETS—SHEET 1.

This technical drawing illustrates a mechanical assembly in cross-section. The central component is a vertical shaft or piston rod, labeled with b^1 , b^2 , and b^3 at different sections. This shaft is housed within a complex structure labeled a . At the top, a curved, dome-like component is shown. To the left, a curved duct or pipe, labeled j , is connected to the main assembly. Various internal features and components are labeled with letters: f (top left), a^1 , a^2 , a^3 , a^4 , a^5 , a^6 (various internal parts and seals), e (a horizontal component), d (a circular feature at the bottom right), and c (a small component on the right). The drawing uses hatching to indicate different materials or cross-sections of the components.

E. B. Franzoni
M. E. Bunnell

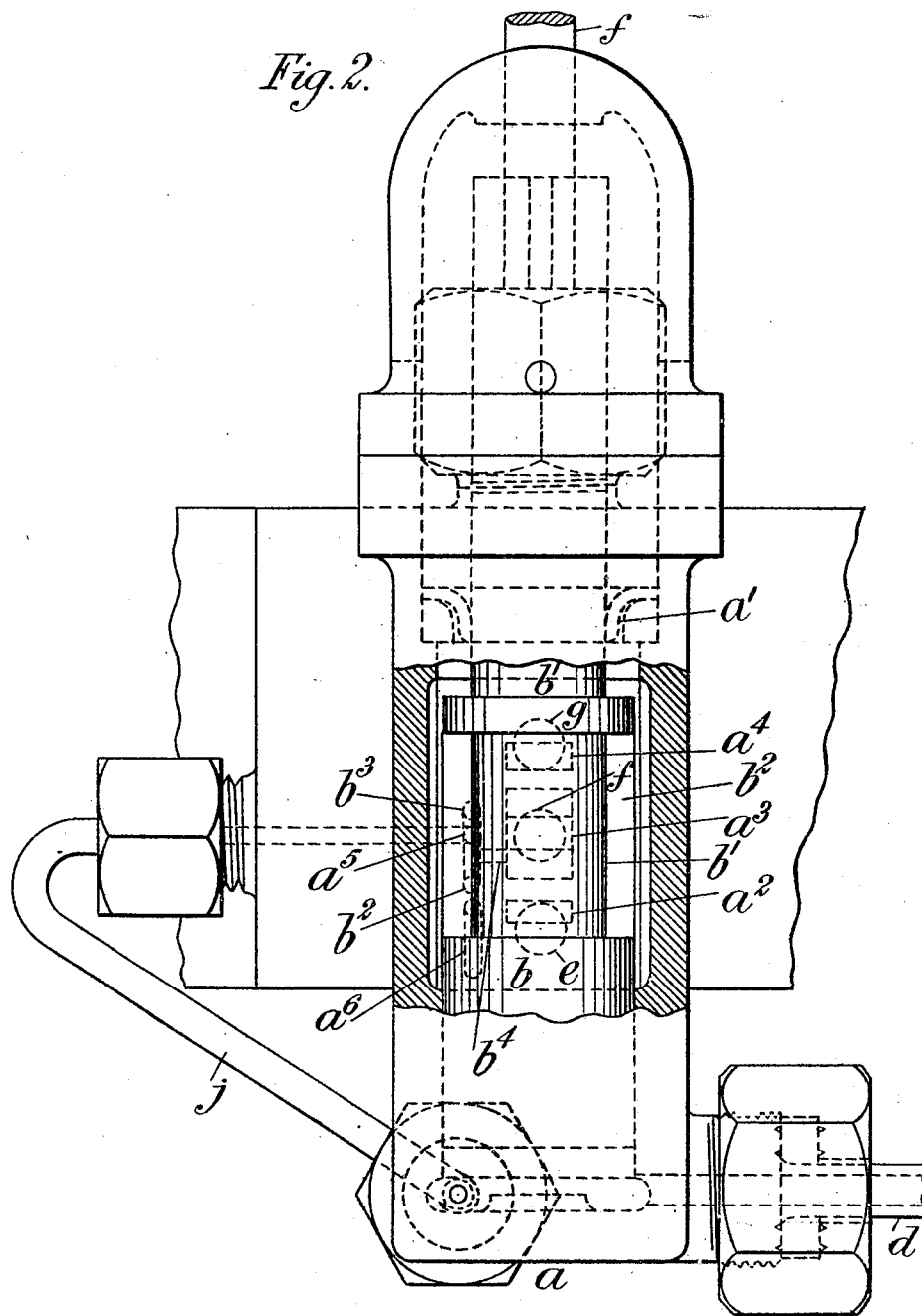
J. L. Brewster & W. P. Brewster
Of their Attorneys
Baldwin & Wright

J. L. & W. P. BRUNTON.
HYDRAULIC VALVE.
APPLICATION FILED APR. 2, 1909.

932,955.

Patented Aug. 31, 1909.
4 SHEETS—SHEET 2.

Fig. 2.



Witnesses

C. B. Franzone.
M. E. Bunell

Inventors

J. L. Brunton & W. P. Brunton
By their attorneys
Pauline Wright

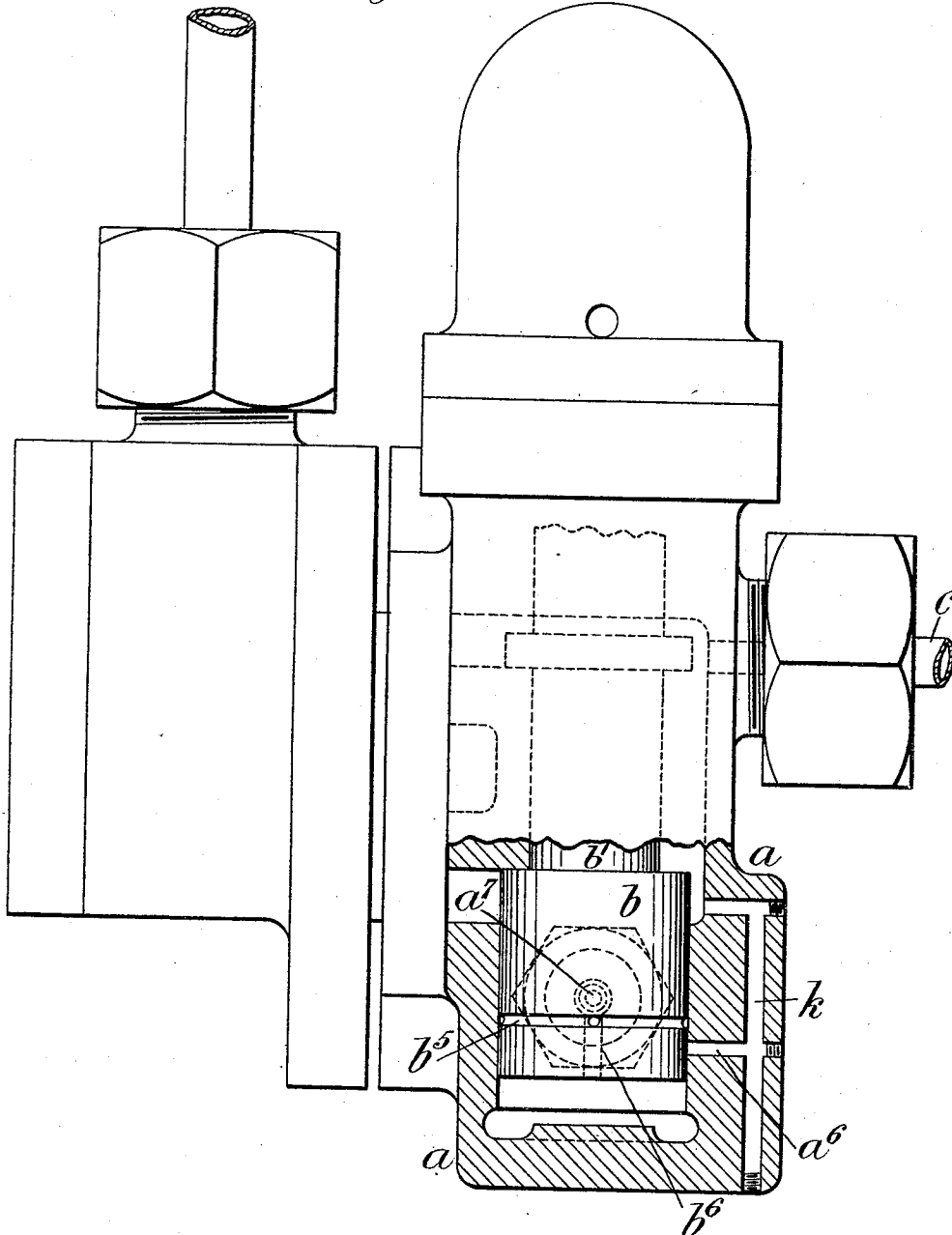
J. L. & W. P. BRUNTON.
HYDRAULIC VALVE.
APPLICATION FILED APR. 2, 1909.

932,955.

Patented Aug. 31, 1909.

4 SHEETS—SHEET 3.

Fig. 3.



Witnesses

E. B. Frangoni.
M. E. Russell

Inventors

J. L. Brunton & W. P. Brunton
By their Attorneys
Baldwin Wright

J. L. & W. P. BRUNTON.
HYDRAULIC VALVE.
APPLICATION FILED APR. 2, 1909.

932,955.

Patented Aug. 31, 1909.
4 SHEETS—SHEET 4.

Fig. 4.

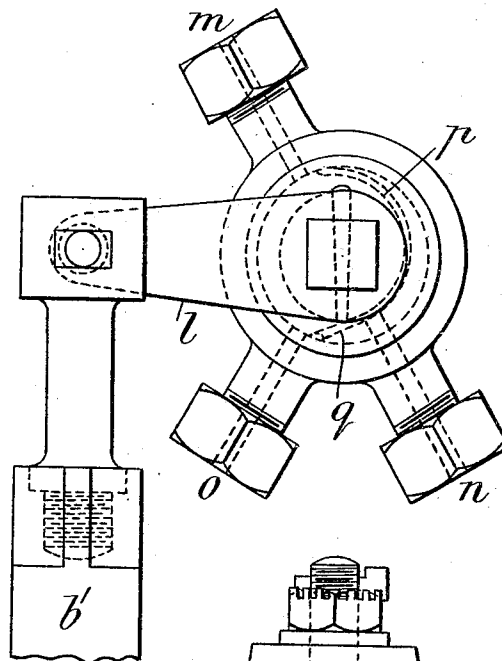
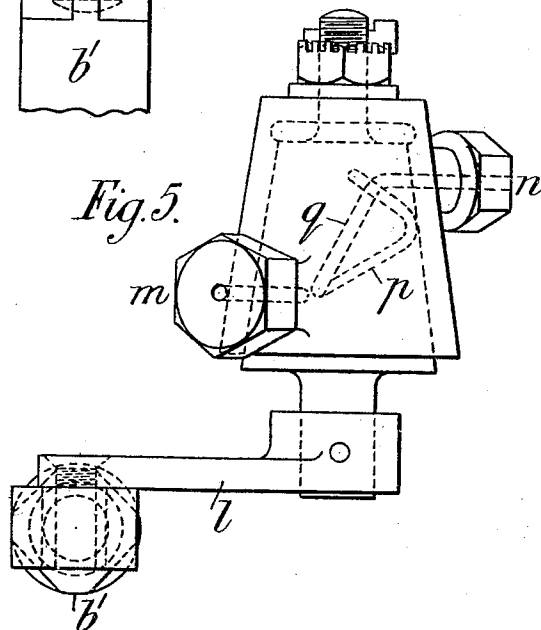


Fig. 5.



Witnesses

E. B. Franzoni
M. E. Russell

Inventors

J. L. Brunton & W. P. Brunton
By their Attorneys
Baldwin Wright

UNITED STATES PATENT OFFICE.

JOHN LOCKHART BRUNTON AND WILLIAM PATON BRUNTON, OF LIVERPOOL, ENGLAND.

HYDRAULIC VALVE.

932,955.

Specification of Letters Patent.

Patented Aug. 31, 1909.

Application filed April 2, 1909. Serial No. 487,540.

To all whom it may concern:

Be it known that we, JOHN LOCKHART BRUNTON and WILLIAM PATON BRUNTON, engineers, subjects of the King of Great Britain, both residing at 5 Marine Crescent, Waterloo, Liverpool, in the county of Lancaster, England, have invented new and useful Improvements in Hydraulic Valves, of which the following is a specification.

10 This invention relates to hydraulic valves of the class in which a slide is fixed to a differential piston working in a hydraulic cylinder one end of which is always open to the water supply which acts on the smaller area of the piston. The slide works on three ports in the side of the cylinder, two of the ports opening into pressure supply pipes fed from the cylinder while the third port is an exhaust port. The valve is operated by allowing the water under pressure to enter the other end of the cylinder also and act on the larger area of the piston as well as on the smaller area. When the valve is in either of its two extreme positions one of the first mentioned pipes is supplied with water under pressure from the cylinder while the other is connected to the exhaust. Valves of this class are used for working the watertight doors in ships' bulkheads. In such valves it is sometimes desirable to hold the piston and slide in their mid position so that the water is cut off from both of the supply pipes leading from the cylinder. The difficulty however arises that if either the piston or the valve supplying the water to the larger area of the piston leaks, the piston moves in one direction or the other.

According to this invention two small ports are made in the cylinder (in addition to those above mentioned) one being connected to the supply and the other to the exhaust and a long piston is employed which always covers these ports. A groove is made around the piston and this groove is connected by a small passage to the larger face of the piston. When the piston moves slightly in one direction from its mid position the groove comes over the small exhaust port so that any water leaking past the piston can escape without materially moving the piston. Similarly when the piston moves slightly in the other direction from its mid position the groove comes over the supply port so that any small leakage past the valve is made good. In place of the piston itself

acting as a valve to open and close the small ports a slide valve operated by the piston may be used. The same result may be obtained by a plug cock or double beat valve connected to the piston by rods or links. 60

Figure 1 is a vertical central section and Fig. 2 is an elevation partly in section of a hydraulic valve of the type referred to modified in accordance with the present invention. Fig. 3 is a sectional elevation of a modification. Fig. 4 is a plan and Fig. 5 an elevation of another modification. 65

In Figs. 1 and 2 *a* is the hydraulic cylinder having in it a piston *b*. A rod *b'* is fixed to the piston *b* so that the effective area of the top of the piston is less than that of the bottom. The rod *b'* passes out of the cylinder *a* through a cup leather *a'*. The top of the cylinder *a* is always supplied with water under pressure by the pipe *c* and water under pressure can be supplied at will to the bottom of the cylinder by the pipe *d*. 70

b² is a D slide valve fixed to the piston *b* and *a²* *a³* *a⁴* are ports in the cylinder connected respectively to pipes *e* *f* and *g*, *e* and *g* being pipes for supplying water under pressure to any desired places and *f* being the exhaust pipe. In the position shown the piston *b* is about midway of its stroke and the pipes *e* *f* and *g* are all closed. So far the apparatus is of ordinary construction and no further description is necessary. 80

b³ is a D shaped passage formed in one side of the slide *b²* and *b⁴* is another passage formed by a groove in the face of the slide which extends from the plane of the passage *b³* into the exhaust cavity in the valve *b²*. 85

a⁵ is a port in the cylinder *a* which is connected by a pipe *j* to the bottom of the cylinder and *a⁶* is a groove or passage formed in the wall of the cylinder. The piston *b* is kept almost stationary in its mid position in the following manner:—If by reason of leakage or any other cause the piston begins to descend, the upper end of the passage *b³* comes into communication with the port *a⁵* and its lower end into communication with the passage *a⁶*. Water under pressure now passes from the upper end of the cylinder by the passages *a⁵* and *b³*, port *a⁵* and pipe *j* into the lower end of the cylinder causing the piston to rise again. Similarly if the piston begins to rise owing to leakage past it or from any other cause the passage *b⁴* is put into communication with the port *a⁵* and 110

the exhaust port a^3 and the surplus water from the lower end of the cylinder escapes directly to the exhaust by the pipe j , port a^5 , passage b^4 , port a^3 , and pipe f , and the piston is forced down again by the pressure on its top.

Fig. 3 shows a modified arrangement. a^6 is a port connected by a passage k to the upper end of the cylinder and a^7 is an exhaust port.

b^5 is a groove around the piston and b^6 is a vertical groove connected to it. As shown the piston is in its mid position and the groove b^5 is between the ports a^6 and a^7 . If the piston descends water is supplied from the upper end of the cylinder to the lower end by the passage k , port a^6 , and grooves b^5 and b^6 . If the piston rises the surplus water from the lower end of the cylinder escapes to the exhaust by the groove b^6 and port a^7 .

Figs. 4 and 5 show a modification in which the piston rod b^7 is connected to and operates the lever l of a three way cock. m , n and o are pipes connecting ports in the shell of the cock to the upper end of the cylinder, its lower end and the exhaust respectively. When the piston moves downward from its mid position water is supplied from the upper end of the cylinder to its lower end by the pipe m , groove p in the plug of the cock, and pipe n , and when the piston rises the lower end of the cylinder is put into communication with the exhaust by the pipe n , groove q in the plug, and pipe o .

In the preceding description it has been assumed that it is desired to hold the piston stationary in its mid position but it will be obvious that by suitably varying the positions of the subsidiary ports &c. it can be held in any desired position.

The subsidiary ports and passages above described are small as they are desired to come into operation only when the piston is moving very slowly owing to leakage and they are therefore practically inoperative when the piston is moving rapidly from one end of the cylinder to the other in the ordinary working of the hydraulic valve.

What we claim is:—

1. The combination with a hydraulic valve comprising:—a cylinder, a valve face in the cylinder, a differential piston in the

cylinder, a slide valve moving with the piston and working on the valve face, a pipe constantly supplying fluid under pressure to the end of the cylinder containing the smaller area of the piston, a pipe supplying at will fluid under pressure to the other end of the cylinder, and two pressure supply pipes and an exhaust pipe leading from the valve face:—of means operated by the movement of the piston for automatically compensating for creeping of the piston due to leakage when the piston is at mid-stroke or in some predetermined position intermediate the ends of its stroke.

2. The combination with a hydraulic valve comprising:—a cylinder, a valve face in the cylinder, a differential piston in the cylinder, a slide valve moving with the piston and working on the valve face, a pipe constantly supplying fluid under pressure to the end of the cylinder containing the smaller area of the piston, a pipe supplying at will fluid under pressure to the other end of the cylinder, and two pressure supply pipes and an exhaust pipe leading from the valve face:—of means for supplying fluid to and allowing it to escape from the portion of the cylinder containing the larger end of the piston when the latter is moving slowly.

3. The combination with a hydraulic valve comprising:—a cylinder, a valve face in the cylinder, a differential piston in the cylinder, a slide valve moving with the piston and working on the valve face, a pipe constantly supplying fluid under pressure to the end of the cylinder containing the smaller area of the piston, a pipe supplying at will fluid under pressure to the other end of the cylinder, and two pressure supply pipes and an exhaust pipe leading from the valve face:—of means for putting the two ends of the cylinder into communication with each other when the piston is in one predetermined position and for putting the end of the cylinder containing the larger end of the piston into communication with the exhaust when the piston is in another predetermined position.

JOHN LOCKHART BRUNTON.

WILLIAM PATON BRUNTON.

Witnesses:

AUG. PIERCE,
H. WILLIAMS.