R. JANNEY.

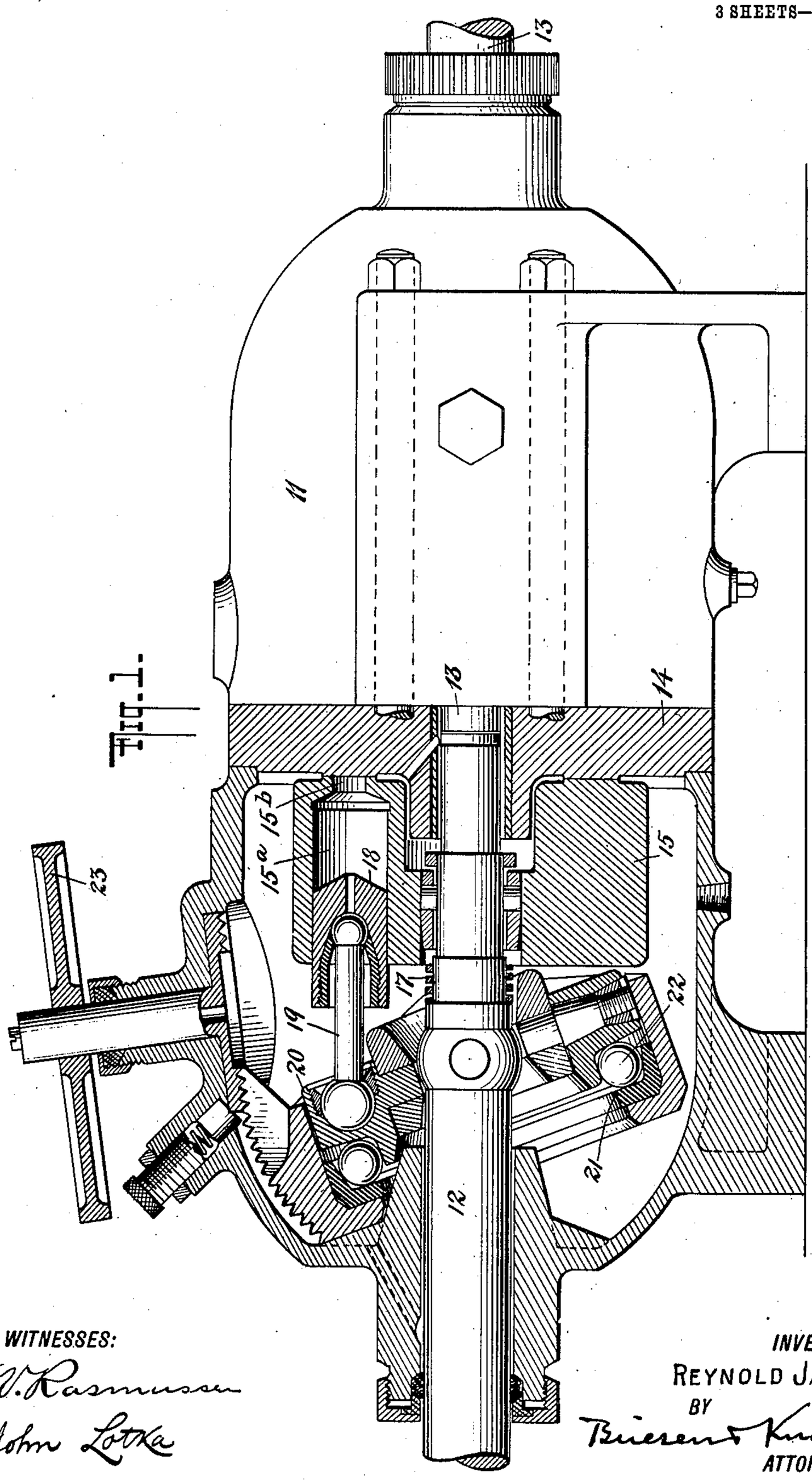
PRESSURE DEVICE.

APPLICATION FILED JUNE 12, 1908.

951,278.

Patented Mar. 8, 1910.

3 SHEETS—SHEET 1.



WITNESSES:

G. V. Rasmussen

John Lotka

INVENTOR

REYNOLD JANNEY

BY

Bierens & Knauth

ATTORNEYS

R. JANNEY.

PRESSURE DEVICE.

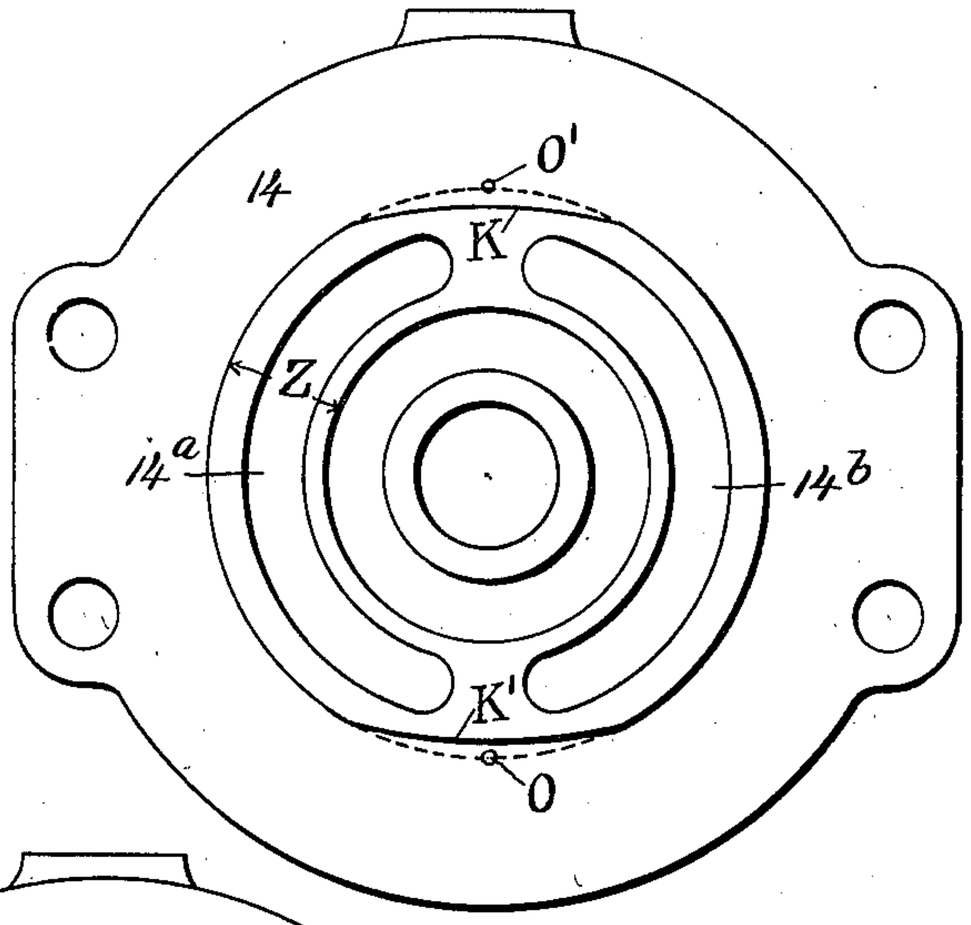
APPLICATION FILED JUNE 12, 1908.

951,278.

Patented Mar. 8, 1910.

3 SHEETS—SHEET 2.

Fig. 2.



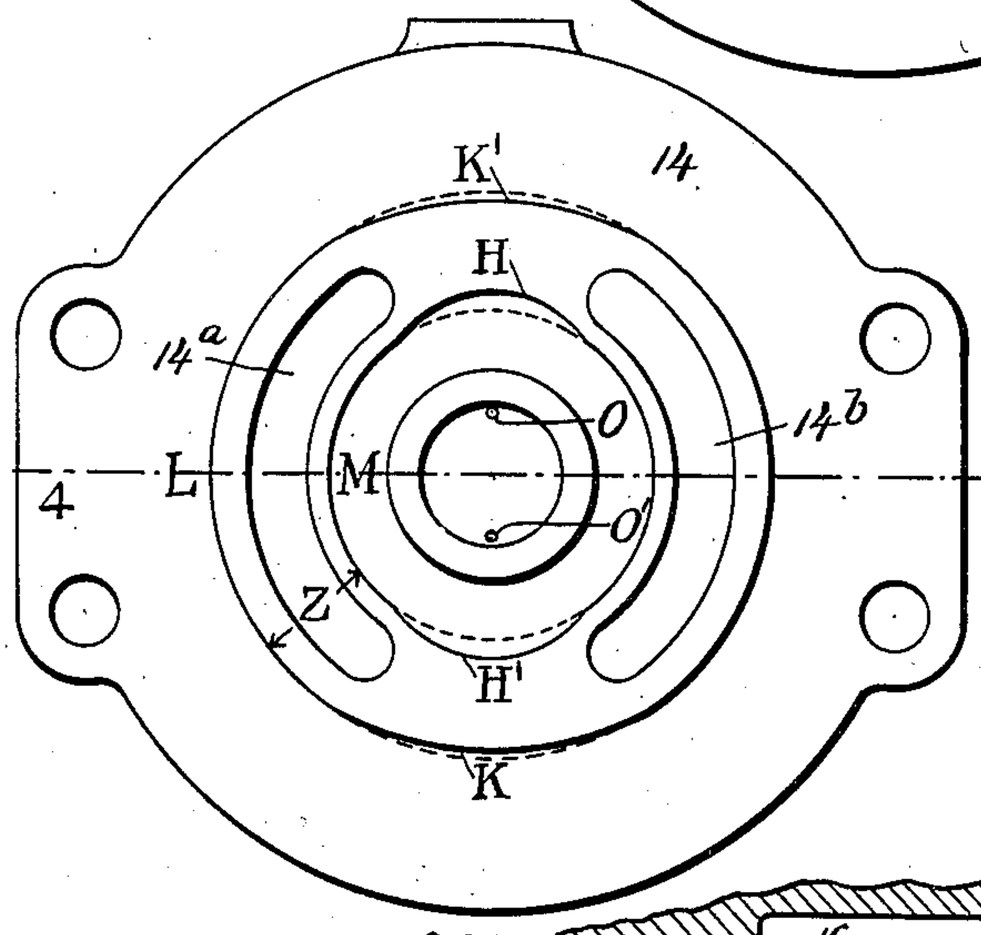
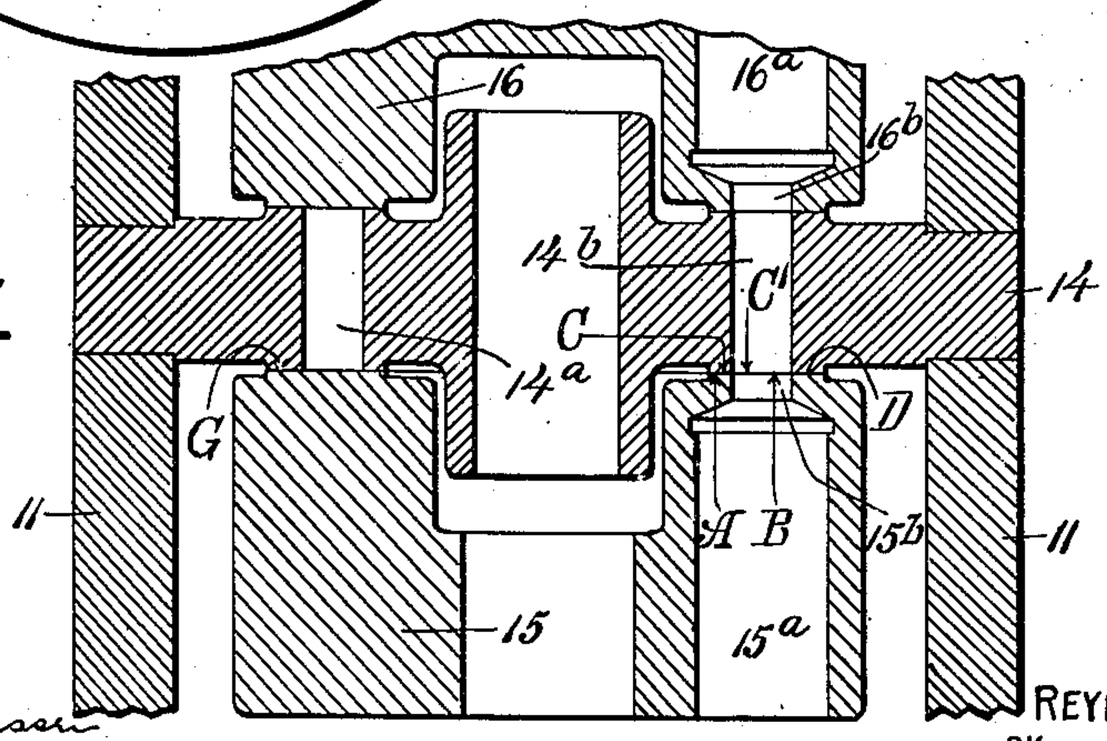


Fig. 3.

Fig. 4.



WITNESSES:

G. V. Rasmussen

John Lobka

INVENTOR

REYNOLD JANNEY

BY

Briesen & Knauth

ATTORNEYS

R. JANNEY.

PRESSURE DEVICE.

APPLICATION FILED JUNE 12, 1908.

951,278.

Patented Mar. 8, 1910.

3 SHEETS—SHEET 3.

FIG. 5.

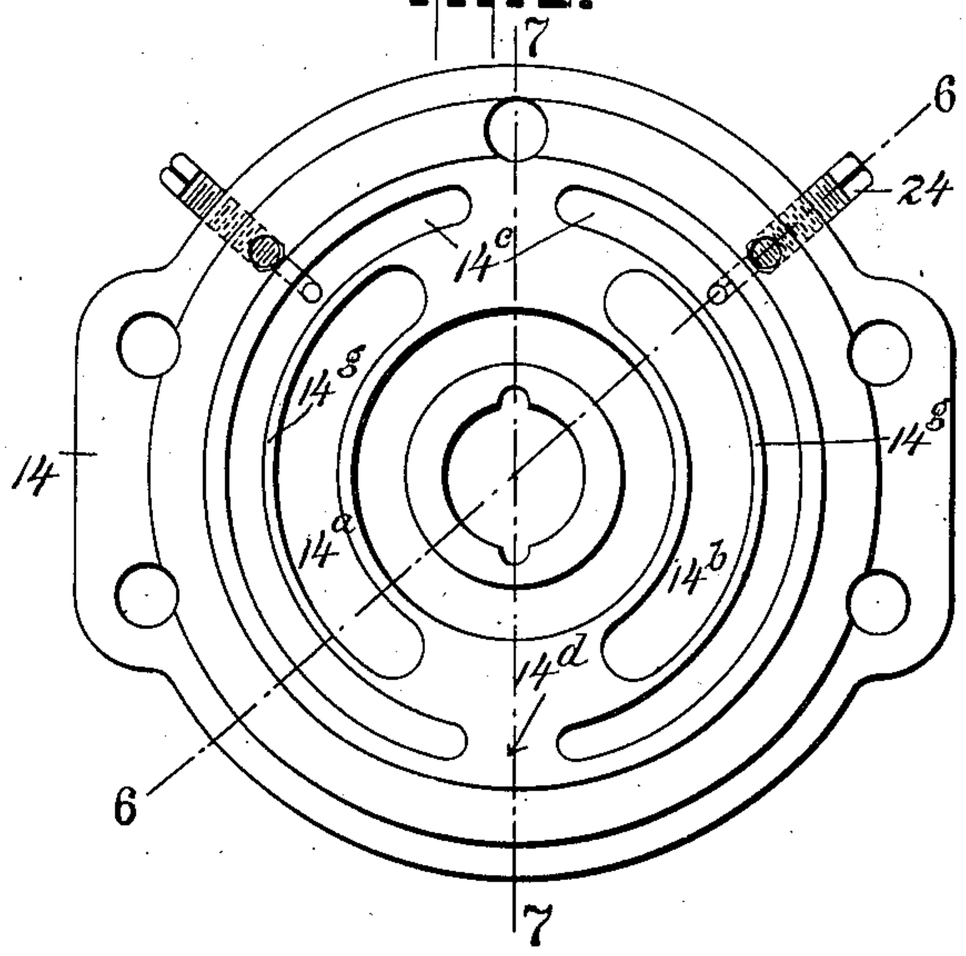


FIG. 6.

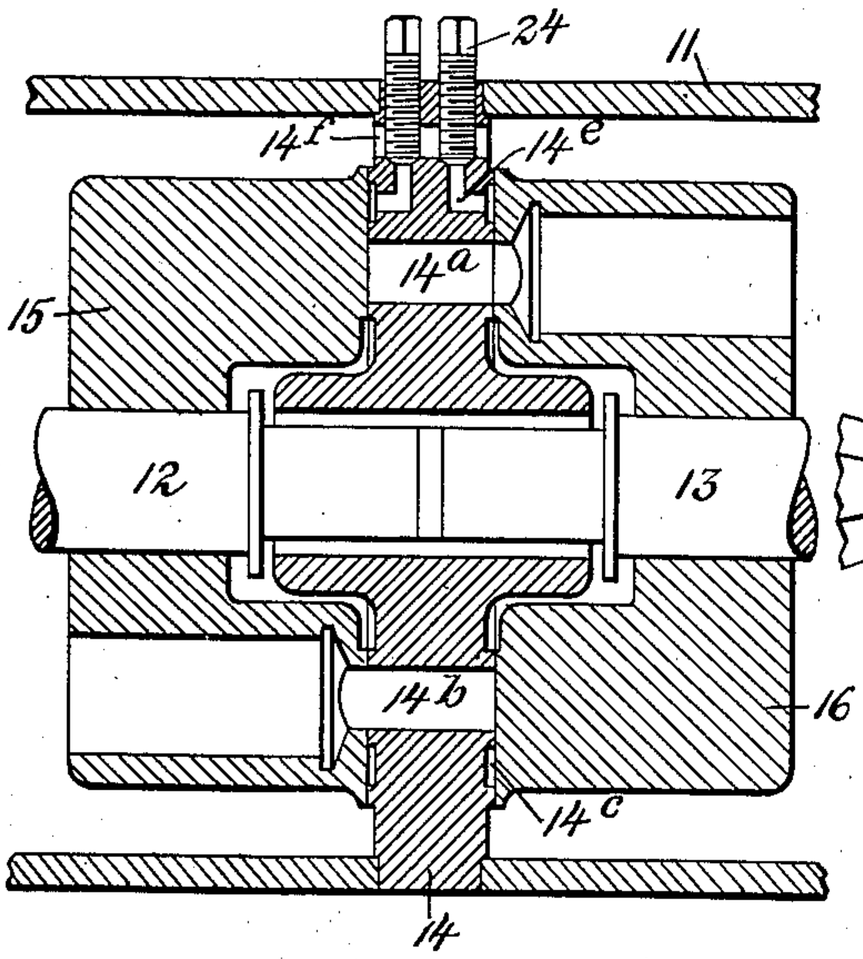
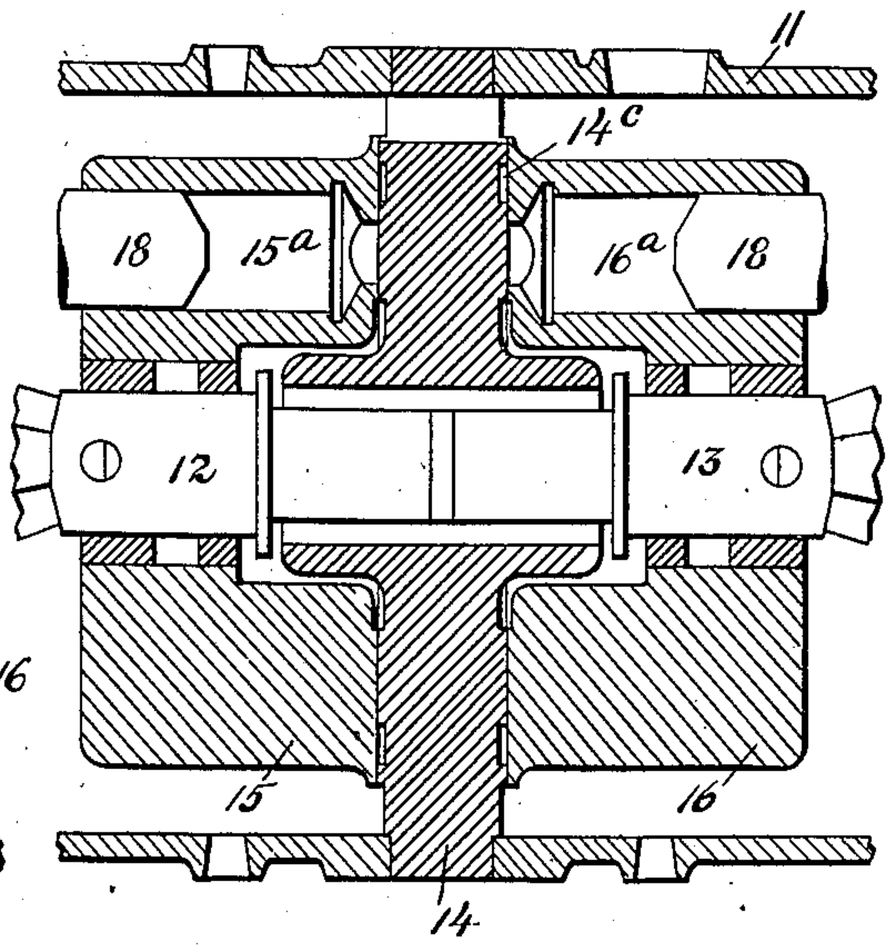


FIG. 7.



WITNESSES:

G. V. Rasmussen

John Lotka

INVENTOR

REYNOLD JANNEY

BY

Bierens & Knauth

ATTORNEYS

UNITED STATES PATENT OFFICE.

REYNOLD JANNEY, OF NEW YORK, N. Y.

PRESSURE DEVICE.

951,278. Specification of Letters Patent. Patented Mar. 8, 1910.

Application filed June 12, 1908. Serial No. 438,057.

To all whom it may concern:

Be it known that I, REYNOLD JANNEY, a citizen of the United States, and resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Pressure Devices, of which the following is a specification.

My invention relates to devices in which a fluid and more particularly a liquid under pressure has a tendency to separate two parts or elements provided with surfaces in contact with each other and having one or more passages or ports which lead to and as it were intersect the said surfaces of contact.

The object of my present invention is to secure a very efficient balancing of pressures so as to minimize the tendency to separate the said surfaces by the pressure of the fluid which escapes or leaks between them from the said passages or ports.

Another object of my invention is to provide an adjustable means for balancing the two pressures, one of them tending to separate the said contact surfaces and the other tending to hold them together.

In the accompanying drawings I have illustrated my invention as applied to a variable speed gear, but it will be understood that I do not wish to limit myself to such application.

Figure 1 is a longitudinal section of a machine to which my invention is applied; Fig. 2 is a face view of the contact surface of the stationary element or mid-plate; Fig. 3 illustrates another form of said contact surface; Fig. 4 is a section on line 4—4 of Fig. 3; Fig. 5 is a face view showing still another form of the invention; Fig. 6 is a longitudinal section on line 6—6 of Fig. 5; and Fig. 7 is a section on line 7—7 of Fig. 5.

The variable speed gear to which I have applied my present invention in the embodiment illustrated by the drawings consists of a suitable casing 11, in which are journaled the drive shaft 12 and the driven shaft 13. A mid-plate 14 is located at the center of the casing 11 and this mid-plate is provided with two passages or channels 14^a 14^b extending entirely through it. The ends or orifices of these passages are located in surfaces which are in contact with corresponding surfaces of two rotary barrels 15 and 16 respectively. These barrels are preferably pressed toward the mid-plate by springs 17 and contain cylinders 15^a 16^a, each of which has a reduced port 15^b 16^b leading to the surface along which the barrel is in contact with the mid-plate, said ports being adapted to register periodically with one or the other of the passages or channels of the mid-plate. Each of the cylinders contains a piston 18, arranged to reciprocate toward and from the mid-plate and from these pistons connecting rods 19 lead to rings 20, each of which is connected with the respective shaft 12 or 13 by a universal joint, so that said ring while rotated with the shaft, may assume various angles. The rings 20 rotate on annular races 21, preferably with the interposition of bearing balls 22, and these races are inclined during the operation of the machine. One of these races may be held permanently at the same inclination if desired, but at least one of them should be adjustable to different inclinations, which may be effected by means of a hand wheel 23, suitably geared to the race 21. In practice the machine has various other parts for insuring its efficient operation, but it will not be necessary to illustrate such parts in this application, as they have been described fully in other applications for patents.

The operation is as follows: As the drive shaft 12 rotates it carries one of the rings 20 with it and the inclined race 21 by which said ring is guided compels said ring to travel in an inclined plane relatively to the shaft, thus bringing the outer ends of the connecting rods alternately nearer to and farther away from the corresponding barrel. The pistons are thus caused to reciprocate in the barrel and a suitable liquid, such as oil, contained in the cylinders and in the passages of the mid-plate, is caused to circulate through said passages from one barrel to the other. Thus pistons which are moving toward the mid-plate force the oil into cylinders of the barrel on the other side of the mid-plate and through this pumping action of the driving pistons the cylinder barrel on the driven side of the machine is caused to rotate and this rotation is transmitted to the ring 20 on that side of the machine and to the driven shaft 13.

It will be understood that I do not in this application make any claim to the particular variable speed gear above described which has been explained only to give an illustration of a practical application of my present invention.

It will be obvious that one of the passages, as for instance the passage 14^b is the pressure passage during the operation of the machine and that the oil seeks to escape adjacent to said passage between the contact surfaces of the mid-plate 14 and the rotary barrels 15 and 16. The contact surfaces are preferably annular, as shown in Figs. 2, 3 and 5, being formed as ring-shaped ribs on the barrels and on the mid-plate. Two forces are operative at said contact surfaces, the width of which is indicated as Z in Figs. 2 and 3. One of these forces, which is due to the fact that the ports 15^b 16^b of the cylinders are reduced as compared with the main portion of the cylinder, tends to press the two surfaces into better contact; the other force, due to the pressure of the liquid escaping between the contact surfaces, tends to force such surfaces apart. The separating action is due to the film of liquid escaping between the mid-plate and barrel; owing to the well-known fact that pressure on a body of liquid at one point is transmitted unaltered to all portions thereof, the resultant of the separating forces varies but little in position, as indicated by the short distance between the arrows C, C′ in Fig. 4. On the other hand, the forces tending to bring the barrel toward the mid-plate are represented by the pressure of the oil against the reduced cylinder ends (15^b) in those cylinders which at that time register with the pressure port (14^b). If only two cylinder ports communicate with the mid-plate port, the resultant of the pressure exerted by the two corresponding pistons will be at about the center of a line connecting the centers or axes of the two pistons; when however three cylinder ports communicate with the mid-plate port, the resultant of the pressures will be substantially at the center of gravity (intersection of medians) of the triangle formed by the points indicating the axes of the three cylinders. Obviously, in the latter case, the resultant is nearer to the center of the barrel (axis of rotation) than when only two cylinders are in registry with the mid-plate port. The points at which the resultants of these two forces take effect are not constant, but travel within certain limits as the cylinder ports come into and out of registry with the mid-plate passages. For instance, the resultant of the forces tending to bring the contact surfaces together may be at the point A at the time that the resultant of the forces tending to separate the barrel from the mid-plate is at the point C; at another time the resultant of the forces tending to separate may shift to the point C′ and the resultant of the forces tending to press the barrel toward the mid-plate may shift to the point B.

D indicates the fulcrum whereon the barrel would tend to swing away from the mid-plate, causing the two elements to separate at the point G or elsewhere so as to allow a material and objectionable leakage to take place. The center of pressure tending to force the elements together would not only sometimes be above the plane 4—4, indicated in Fig. 3 and sometimes below it, but would also move toward and away from the fulcrum D to points such as A and B. The forces applied at A or B on one side and at C or C′ on the other side were approximately equal, therefore when the center of resultant pressure was at A, the distance A—D being greater than the distance C—D, the product of the force applied at A multiplied by the arm A—D tending to close the joint at G, was greater than the product of the force applied at C multiplied by the arm C—D tending to open said joint, but when the center of resultant pressure moved to B, the arm B—D being shorter than the arm C′—D, there was a preponderance of pressure tending to open the joint at G.

In order to create a condition such that the arm C—D or C′—D should never be longer than the arm A—D or B—D, there might be adopted any method of increasing the area of the field of low pressure created between the contiguous faces of the rotary barrel and the valve plate 14 in the neighborhood of the points L or M of Fig. 3, or any method of decreasing the area of the high pressure field in the neighborhood of the points H, K′, H′, or K, that is, I might increase the area of the contact surfaces adjacent to the central portions of the mid-plate or valve plate passages, or I might decrease the area of such contact surfaces adjacent to the ends of the valve plate passages, or rather between the ends of said passages. The latter course is preferred and a convenient method of carrying it out is to reduce the width of the lands Z or contact surfaces locally, that is to say only between the adjacent ends of the valve plate passages, such local reduction being, if desired, additional to a reduction of the effective width of the lands Z throughout their entire circumference. This reduction throughout the circumference of the lands may be produced by providing contact surfaces in the form of a raised annular belt of equal radial width in both the rotary barrel and the stationary valve plate, the ports or passages in both of these elements opening out at this surface of mutual contact.

In Fig. 2 I have shown the reduction of the width of the land on the valve plate at the outer margin only, between each pair of adjacent ends of the valve plate passages. This reduction is made by means of arcs K—K′ struck from the centers O—O′ respectively. In the construction shown in Figs. 3 and 4, in which a greater distance intervenes between the ends of the passages

than in Fig. 2, I have reduced the width of the lands or contact surfaces on the valve plate both at the inner and at the outer periphery by means of arcs K and H struck from the center O and arcs K′ and H′ struck from the center O′. This local reduction of the effective width of the lands is applied only to the valve plate and not to the rotary barrels. I may of course employ jointly the two expedients above mentioned, that is an increase of the effective width of the lands adjacent to the central plane 4—4 and a reduction of the effective width of the lands near the ends of the valve plate passages. In the practical carrying out of this feature of my invention, the lands would first be made truly annular as shown by dotted lines in Figs. 2 and 3 and then successive trial cuts would be made from the centers O and O′ until a satisfactory result is obtained, that is until the pressures are properly balanced.

In the form of my invention illustrated by Figs. 5, 6 and 7 I have illustrated an arrangement by which a delicate adjustment of pressures may be obtained so that notwithstanding varying conditions the pressures may be perfectly balanced and I also by this form of my invention avoid the necessity for making trial cuts as described with reference to the first form of my invention. However, I desire it to be understood that the adjustable feature shown in Figs. 5, 6 and 7 may be combined with the reduction or increase of lands described with reference to Figs. 1 to 4. In Figs. 5, 6 and 7 I have assumed the lands to be of uniform radial width, but this, as just explained, is not necessary, as the lands might be increased in width adjacent to the centers of the valve plate passages, or reduced in width near the ends of said passages, or both. As will be seen in Fig. 5, the contact surface of the valve plate is provided exteriorly of the passages 14^a, 14^b with recesses 14^c of segmental form, said recesses being longer than the passages, but still separated from each other by what may be termed bridges, 14^d. Each of these recesses is connected with a small channel 14^e, which leads to an opening 14^f, each of which is controlled by a valve 24 and opens into the interior of the casing 11. Any oil leaking from the passages 14^a or 14^b will pass partly inward, but chiefly outward, both on account of the greater surface and owing to centrifugal action due to the rotation of the barrels. This oil will cross the ridges 14^g from the passages 14^a, 14^b to the recesses 14^c and will thus reach said recesses. From the recesses the oil will pass out through the channels 14^e to the openings 14^f. Now it will be obvious that as the valves 24 are opened more or less, the resistance to the escape of the oil from the chambers or recess 14^c through the channels 14^e will be regulated with great nicety. I can thus adjust in a very accurate way the amount of pressure tending to separate the rotary barrels from the valve plate 14. Should conditions change during the operation of the machine, a mere turning of the valves 24 which are readily accessible from the outside, will be sufficient to adjust the machine to the new conditions. Furthermore, the machine can be constructed complete at the factory and the user can make the necessary adjustments himself.

I claim as my invention:

1. In a pressure device, the combination of two elements in contact with each other along two surfaces and provided with ports or passages adapted to contain a fluid under pressure and leading to said surfaces, the net engaged width varying at different points of said surfaces, and the width of the contact surface being reduced at points of relatively great net engaged width.

2. In a pressure device, the combination of two elements in contact with each other along two surfaces and provided with ports or passages adapted to contain a fluid under pressure and leading to said surfaces, the net engaged width varying at different points of said surfaces, and the width of the contact surface being increased at points of relatively small net engaged width.

3. In a pressure device, the combination of a stationary element and a rotary element in contact with each other along two annular surfaces and provided with ports or passages adapted to contain a fluid under pressure and leading to said surfaces, the width of the contact surface being reduced adjacent to the ends of the passages of the stationary element.

4. In a pressure device, the combination of a stationary element and a rotary element in contact with each other along two annular surfaces and provided with ports or passages adapted to contain a fluid under pressure and leading to said surfaces, the width of the contact surface being reduced adjacent to the ends of the passages of the stationary element.

5. In a pressure device, the combination of two elements in contact with each other along two surfaces and provided with ports or passages adapted to contain a fluid under pressure and leading to said surfaces, one of said elements having a recess or chamber in its contact surface to receive leakage, and a regulatable device for adjustably governing the egress of leakage from said chamber.

6. In a pressure device, the combination of two elements in contact with each other along two surfaces and provided with ports or passages adapted to contain a fluid under pressure and leading to said surfaces, one of said elements having a recess or chamber in its contact surface to receive leakage, and

an adjustable valve controlling an outlet from said chamber.

7. With a pressure device, the combination of a stationary element and a rotary element in contact with each other along two surfaces and provided with ports or passages leading to said surfaces, the stationary element being also provided, exteriorly of its passages, with chambers to receive leakage, and regulatable devices for adjustably governing the egress of leakage from said chambers.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

REYNOLD JANNEY.

Witnesses:
WM. CLARK,
H. D. JAMESON.