

May 19, 1925.

1,538,643

I. LUNDGAARD

FLUID PROPORTIONING APPARATUS

Filed April 21, 1919

2 Sheets-Sheet 1

Fig. 7

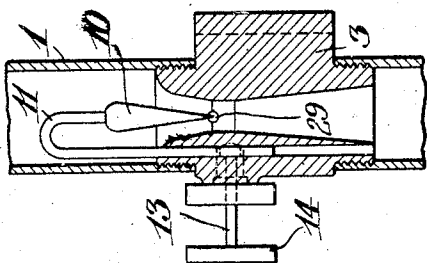


Fig. 8

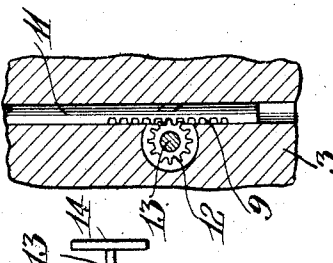


Fig. 1

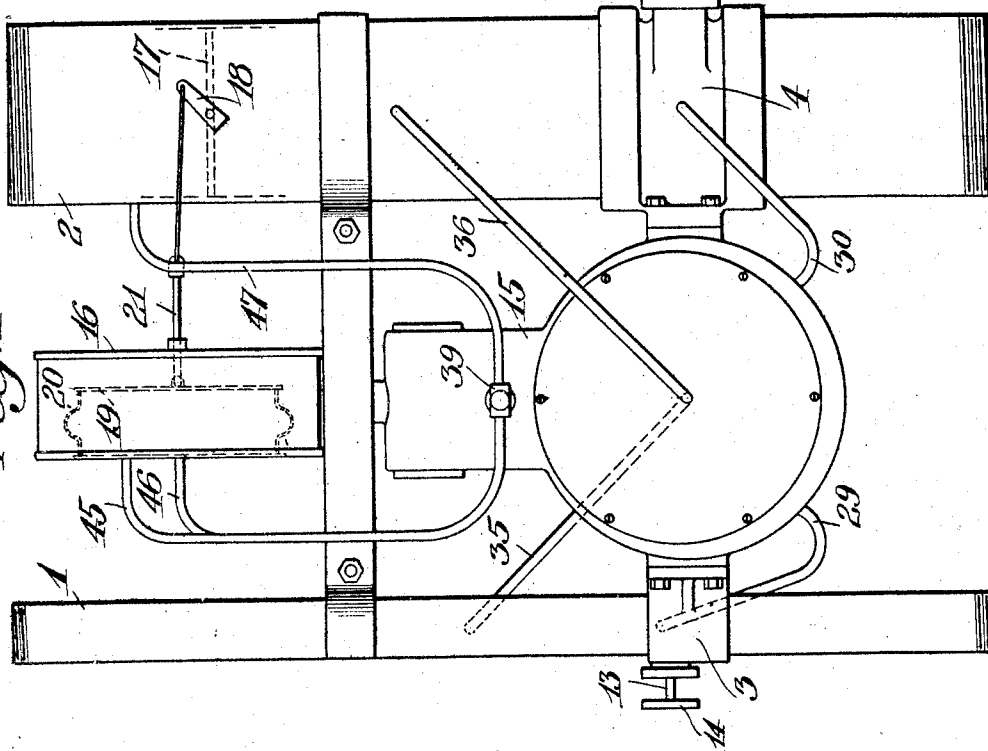
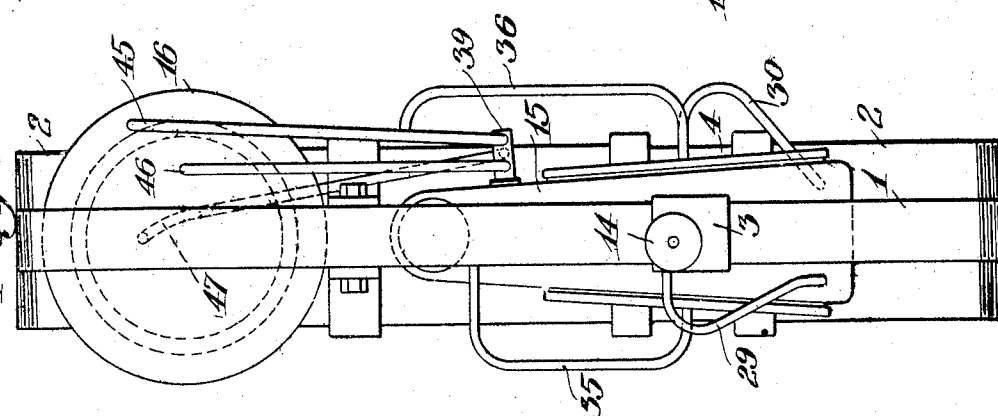


Fig. 2



Witnesses:

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Fig. 4

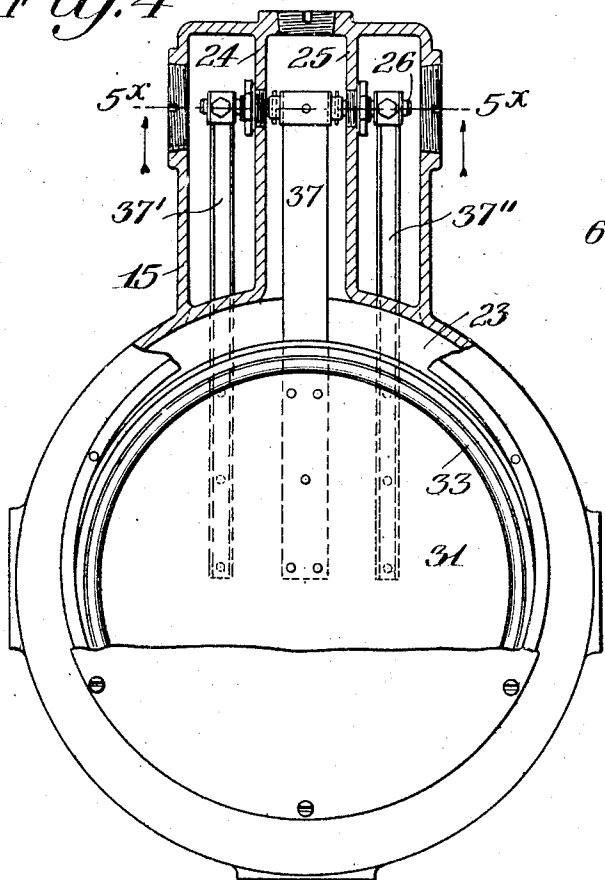


Fig. 3

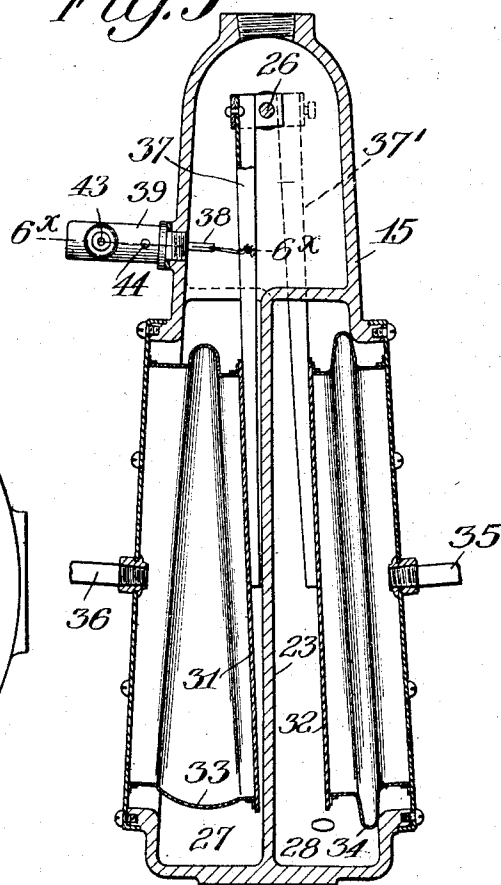


Fig. 5

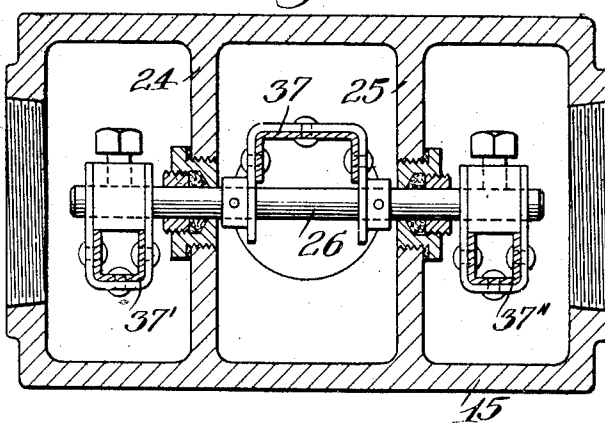
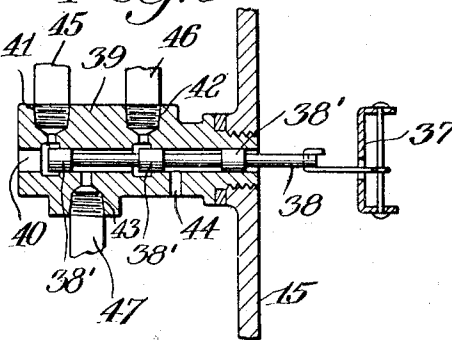


Fig. 6



Witnesses:

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Patented May 19, 1925.

1,538,643

UNITED STATES PATENT OFFICE.

IVAR LUNDGAARD, OF ROCHESTER, NEW YORK, ASSIGNOR TO RATIOMETER CORPORATION, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

FLUID-PROPORTIONING APPARATUS.

Application filed April 21, 1919. Serial No. 291,783.

To all whom it may concern:

Be it known that I, IVAR LUNDGAARD, a citizen of the United States, and a resident of the city of Rochester, county of Monroe, and State of New York, have invented certain new and useful Improvements in Fluid-Proportioning Apparatus; and I do declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference numerals marked thereon.

My invention relates to fluid proportioning apparatus and is in the nature of an improvement on the apparatus disclosed in my Patent No. 1,333,986, dated March 16, 1920. The object of my present invention is to provide improved means for supplying two or more fluids in certain constant and predetermined relative quantities in a given interval of time. More particularly, the object of my invention is to provide a simple apparatus susceptible of a wide range of application which is efficient in operation, accurate, and simple in construction. A still further object of my invention is to provide means for producing a proportional flow of fluids in two conductors in such a manner that the relative proportions delivered by the two conductors can be adjusted and thereafter will automatically maintain such relative proportion. To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claim at the end of the specification.

In the drawings:

Figure 1 is a front elevation of a device illustrating one method of carrying out my invention;

Figure 2 is a side elevation of the same;

Figure 3 is a central vertical section through the housing for the fluid pressure chamber;

Figure 4 is a front elevation of the same partly in section;

Figure 5 is a section taken on the line 5*-5* of Figure 4;

Figure 6 is a section on line 6*-6* of Figure 3, and

Figures 7 and 8 are sections of details showing means for adjusting the flow of fluid through the main conductors.

Similar reference numerals throughout the several views indicate the same parts.

My invention is susceptible of a variety of applications as, for instance, to carburetors for internal combustion engines or to air and gas mixers for gas furnaces and the like, where it is desirable to bring together two or more fluids in constant relative proportion irrespective of the variations in amount.

Referring more particularly to the drawings, I have shown my invention applied to a device for securing a constant proportional mixture of gas and air. I provide two main conductors, 1 for gas and 2 for air, which may lead to a single mixing chamber. Pressure reducing means are provided in each of these conductors at 3 and 4 which I have illustrated as being in the nature of Venturi tubes, in which a throat of reduced cross sectional area is provided. A cone shaped adjustable member 10 is adapted to cooperate with the reduced area to increase or diminish the cross sectional area of the tube at the throat to adjust the rate of flow as related to the differential pressure. Each of the members 10, in the present instance, is mounted on a rod 11 bent over upon itself and slidable in a guideway provided therefor in the wall of the reduced portion of the tube. The rods 11 are provided with racks 9 adjacent their ends with which pinions 12 cooperate for adjusting the members 10 into or out of the throat provided in the tube. Each of the pinions 12 is mounted on a spindle 13 which may be provided with a finger piece 14 for actuating the same. Mounted between the conductors 1 and 2 is a housing 15 and a fluid chamber 16 and mounted in one of the fluid conductors, the air conductor 2 as illustrated in the drawings, is a butterfly valve 17 having an arm 18 on its spindle by which the butterfly valve is operated to open or close more or less completely the passage through the conductor 2. Mounted in the chamber 16 is a diaphragm 19 connected to one of the inner walls of the chamber by means of a bellows 20 of leather or other suitable material. A rod 21 is secured to one of the faces of the diaphragm 19 and is slidably supported in the wall of the chamber 16, and is pivotally connected at its end with the arm 18 of the governing valve 17. Means are provided for actuating the

diaphragm 19 by fluid pressure supplied by one of the main conductors, as for instance, the air conductor 2 in a manner presently to be described.

5 The housing 15 is divided into two compartments or chambers 27 and 28 by means of a partition 23 which partition is divided at its upper end to form two walls 24 and 25 in which is pivotally supported a shaft or spindle 26. The compartments 27 and 10 28 into which the housing 15 is divided are each connected by means of suitable conductors or pipes 29 and 30 with the throats in the main conductors 1 and 2. Since the fluid pressure at the constricted areas of the conductors is less than in the unobstructed portions of said conductors, the conductors 29 and 30 carry fluids at a pressure somewhat below the normal pressure in the unobstructed main conductor pipes. In each of the 20 chambers 27 and 28 is mounted a fluid pressure diaphragm 31 and 32 connected with opposite inner walls of the chamber by means of the bellows 33 and 34. The diaphragms 31 and 32 are carried on frame members 37, 37' and 37'' rigidly supported on the pivoted member 26 so that both of the diaphragms together with the frame move as a single unit. Communicating with the 30 chambers 27 and 28 and opening into the bellows 32 and 33 are fluid conductors 35 and 36 leading to the main conductors 1 and 2 and to unrestricted portions thereof so that the normal unobstructed pressure in said conductors is communicated within the bellows 33 and 34 or to the opposite sides of the diaphragms 31 and 32 from that to which the fluid from the restricted areas is conducted. The member 37 of the swinging 40 frame by which the diaphragms 31 and 32 are supported is pivotally connected with a slide valve 38. The slide valve 38 operates in a valve casing 39 tapped into one of the walls of the housing 15. The valve casing 39 has a longitudinal opening 40 there-through opened to the atmosphere at its outer end and a plurality of lateral openings 41, 42, 43 and 44 leading therefrom. The opening 44 leads directly to the atmosphere while the openings 41, 42, and 43 are tapped to receive conductor pipes 45, 46 and 47. The conductor pipe 47 leads to one of the main conductors and the conductors 45 and 46 lead to the fluid pressure chamber 16, one opening within the bellows 20 and the other to the outside of said bellows. By this construction it will be noted that the fluid pressure in the chamber 16 produced by fluid lead thereto by the conductors 45 and 46 will operate on opposite sides of the diaphragm 19. Movement of the diaphragm 19 due to variations in the fluid pressure on opposite sides thereof will cause a movement of the governing valve 17 to open or close the same. 65 The valve 38 is adapted to slide in the open-

ing 40 and has three enlarged portions 38' adapted to seal the opening 40, and permitting the free passage of fluid between them. The enlarged portions 38' are so arranged that one of the openings 41 or 42 is always 70 in communication with the atmosphere through the opening 40 or 44, while the other is in communication with the main conductor through the opening 43 and conductor 47. The valve 38 is adapted to operate to connect either of the conductors 45 or 46 with the fluid pressure in the main fluid conductor and to open the other conductor to the atmosphere through the valve casing. By reference to Figure 6, it will 80 be noted that when the valve 38 is in the position here illustrated, the fluid entering the valve casing from the main conductor 2 through the conductor 47 is directed into the conductor 46 and enters the chamber 16 85 within the bellows 20. At the same time the conductor 45 is in communication with the atmosphere through the opening 40 in the outer end of the valve casing. By this arrangement a pressure differential is produced tending to move the diaphragm 19 to the right as viewed in Figure 1. A change in the relative pressures or difference in pressure in the main conductors 1 and 2 will cause some movement of the diaphragms 31 and 32 and the frame on which they are carried causing a corresponding movement of the valve 38. If the valve 38 is moved to the left as seen in Figure 6 the connection 100 through the valve casing from the conductor 47 to the conductor 46 is closed and communication established from said conductor to the atmosphere through the port 44. Simultaneously the opening 40 is closed and communication established between the conductor 47 and the conductor 45, thus establishing direct communication between the 105 main conductor 2 and the chamber 16 said pressure being now applied to the right hand side of the diaphragm 19 tending to move said diaphragm in the opposite direction. 110

The operation of my device is as follows: Fluid from the main conductor 2 taken from the constricted portion 4 is conducted to the chamber 28 through the pipe 30 and from an unobstructed portion of said conductor through the conductor 36 to the opposite side of the diaphragm 32 in the chamber 28. Similarly fluid is conducted to opposite sides 120 of the diaphragm 31 from the main conductor 1. The fluid pressure differential in the two conductors 1 and 2 acts in opposition to move the diaphragms 31 and 32 and the frame connected therewith to actuate the slide valve 38. Actuation of the valve 38 serves to connect one side of the diaphragm 19 with the fluid pressure from the conductor 2 and the other side with the atmosphere through one of the openings 40 or 44 in the 130

valve casing 39. The fluid pressure operating on the diaphragm 19 serves to move the diaphragm to actuate the valve 17 to more or less completely close the passage through the conductor 2. When the pressure differentials of the two conductors are in a state of equilibrium, no motion of the valve actuating mechanism or of its controlling device results and the desired proportional flow exists. Such motion is set up by the automatic instrumentalities described in the effort to restore that equilibrium as soon as any inequality in the rate of flow is reflected in the pressure differential of either conductor.

I claim as my invention:

In a fluid proportioning apparatus, the combination with two conductors each pro-

vided with means for creating differential pressure therein and means for regulating the rate of flow through one of the conductors, of a pressure operated device for actuating said means and a controlling means for said device embodying a casing having two pressure chambers, a rock shaft extending into both chambers, pneumatic devices in the respective chambers connected to the shaft to operate it in opposite directions, said devices being respectively sensitive to the pressure differentials in the respective conductors, and means actuated by the rock shaft for controlling pressure to the actuating devices, said means being located exteriorly of both pressure chambers.

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