

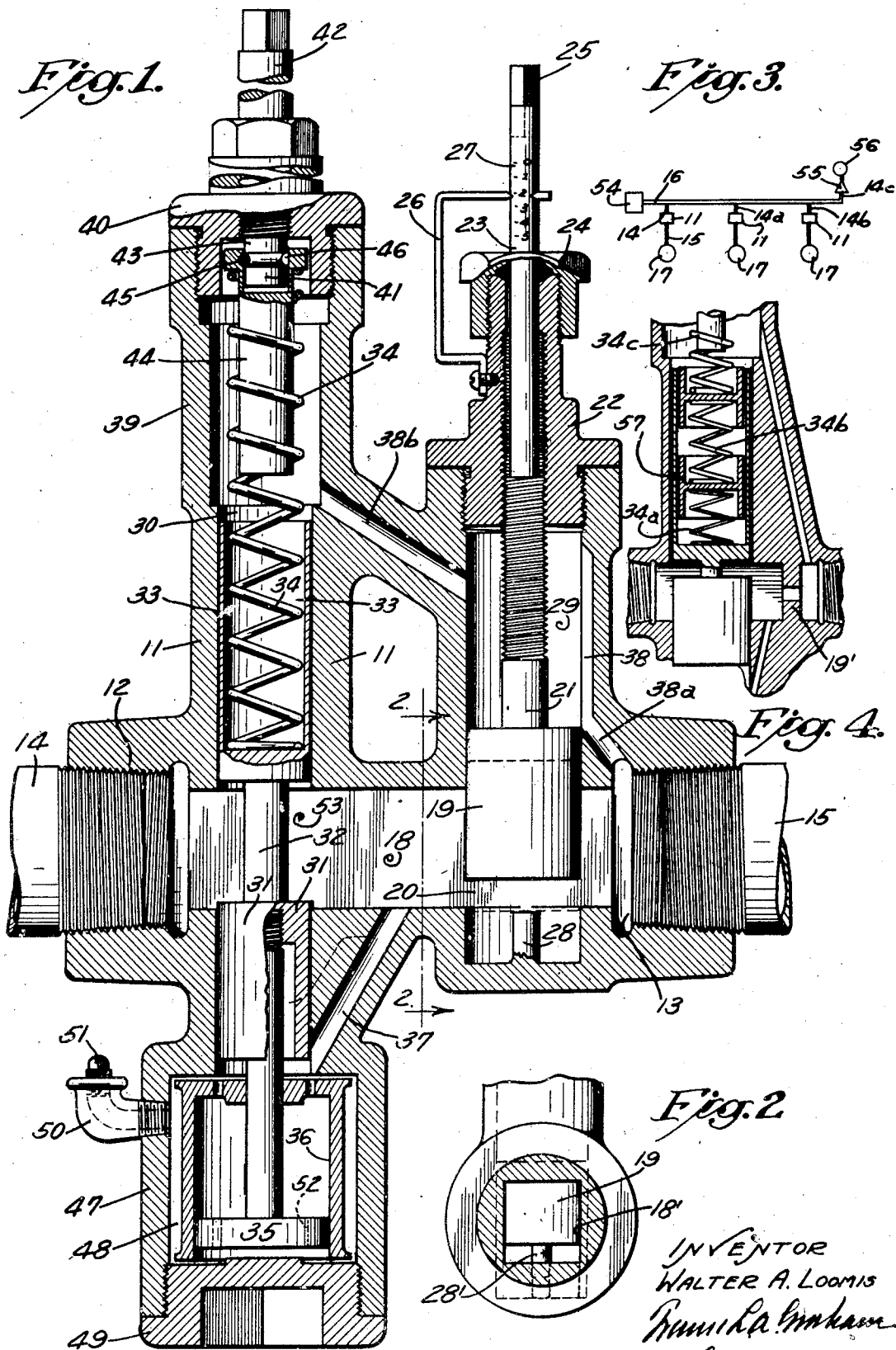
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W. A. LOOMIS

VOLUME CONTROL

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WALTER A. LOOMIS, OF LOS ANGELES, CALIFORNIA.

VOLUME CONTROL.

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Although my present invention is referred to as a volume control device, it should be understood at the outset that this invention relates not only to means for maintaining a predetermined and substantially uniform pressure differential over a fixed orifice, as for the purpose of delivering uniform volumes from a pressure main, or the like, per unit of time, but to methods for maintaining the indicated differences in pressure, and consequent uniformities in volume delivered, and also to systems in which the mentioned means and methods may be employed.

It is an object of this invention to provide a flow-control device adapted to be easily inserted in any pipe delivering air, gas or the like, for the purpose of substantially predetermining the rate of delivery of the mentioned fluid therethrough; and a preferred embodiment of my invention, being effective to maintain, within reasonable limits of uniformity, a prescribed difference in pressure may be relied upon to deliver, in like periods of time, quantities of fluid differing only in proportion as the density of the fluid, if elastic, may fluctuate during said periods of time.

Since the installation of an embodiment of my invention in each of a plurality of laterals from a main may be effective to prevent any one of a plurality of laterals from "hogging" a supply of air or other fluid delivered therethrough, my organization may be effective to maintain a substantially uniform pressure in a main, and thereby to assure the delivery of substantially uniform quantities of the fluid through a given lateral in all equal intervals of time, so long as adjustment remains unchanged and the total input into the main is kept substantially up to the total of withdrawals therefrom.

It is a further object of this invention to provide an organization or system comprising or employing units of the general character described, each unit preferably comprising not only a manually adjustable obstruction in the form of a hand valve but also a pressure-controlled valve so constructed and associated therewith that, the respective manual valves, in laterals leading from a common main, being once set to deliver desired volumes of fluid thereto at the required rates and pressures, a drop in the pressure in any lateral is effective partially

or entirely to close the pressure-controlled valve of the unit at the entrance to or elsewhere in that particular lateral; and any diminution in the rate of withdrawal of fluid through any lateral, with a consequent increase in pressure therein, may be similarly effective to produce a compensatory adjustment of the pressure-controlled valve, maintaining a substantially uniform pressure differential across an orifice, fixed in length, between the inlet and the outlet of each unit.

It is an object of this invention to provide an organization, of the general character referred to, suitable for use in delivering identical or different quantities of air, gas, or the like, under the same or under different pressures, from a single main to two or more oil wells, or to two or more separate drifts in a mine, or to two or more tools or sets of tools, the use of the mentioned units being effective to assure that even though one well may be disposed to "run wild" or a hose may be broken or disconnected, or one or more valves may be thrown wide open for such a purpose as the ventilation of a mine drift, and satisfactory delivery of air or other gas to the remaining wells or drifts or tools may reliably be continued. In the sense indicated my mentioned units may be accurately referred to as "maximum-demand fittings", predetermining the upper limit of withdrawal of fluid, per unit of time.

Other objects of my invention will be understood from the following description of a typical embodiment thereof, taken in connection with the appended claim and the accompanying drawings, in which

Fig. 1 may be regarded as a vertical section through a unit illustrating one form of my invention.

Fig. 2 may be regarded as a transverse section on a reduced scale, this view being taken as if on line 2-2 of Fig. 1, to illustrate a preferred type of orifice and optional details hereinafter mentioned.

Fig. 3 is a diagram illustrating a system in which units of the general type shown in Fig. 1 may advantageously be employed.

Fig. 4 illustrates an alternative or optional spring construction hereafter referred to.

Referring to the details of that specific embodiment of my invention illustrated in Fig. 1, 11 may be a main casting, forming the body of a volume control unit, this cast-

ing being provided with an inlet opening at 12 and with an outlet opening at 13, inlet and outlet pipes 14 and 15 being shown as broken away. These pipes may be regarded as parts of a lateral leading from a main 16 to an oil well 17, or the like, as in Fig. 3.

A transverse orifice 18, may extend directly between the inlet opening 12 and the outlet 13; and I consider it advantageous to give this orifice or passage a rectangular outline, substantially as shown at 18' in Fig. 2, in order that equal movements of a movable obstruction, such as the plunger 19 of a hand valve, may have equal effects in varying the area of an opening 20, through which a fluid must pass in advancing toward the outlet 13.

The valve or plunger 19 may advantageously be provided with a stem 21 threaded for engagement with an elongated cap or plug 22, an extension 23 of the said stem preferably passing through a gland 24 and being externally provided with a hand wheel or squared end 25, to facilitate longitudinal adjustment by a relative rotation of said stem in a known manner; and precision means may optionally be provided, as by the attachment of an indicating pointer 26 to the cap or plug 22 and the provision of suitable graduations 27 upon the stem extension 23.

In order at the same time to provide suitable clearance and to limit the inward or closing movement of the obstruction 19, in case the same is rendered movable in the general manner described, I may optionally leave a central projection or tit 28 standing in the bottom of the bore provided for said movable obstruction; or, as shown in Fig. 2, a projection or tit 28' may be provided upon the end of the mentioned movable choke member 19'.

Coming now to the more important unique features of my invention, in addition to the chamber 29, in which the obstruction 19 may be movable substantially at right angles to the transverse passage 18, I may provide a bore or chamber 30, shown as extending substantially parallel with the chamber or bore 29 and of special design, disposing therein a pressure-controlled valve organization comprising a pair of interconnected cylindrical bodies, fitting within said bore.

The transversely movable flow-controlling valve element 31 of my pressure-controlled valve organization may be one of a pair of cylindrical bodies shown as connected by a reduced or rod-like section 32, adapted to extend across the passage 18 even when the valve element 31 occupies its extreme open position. Both the cylindrical flow-controlling valve element 31 and the associated cylindrical body 33 may advantageously be cupped or chambered at the outer end thereof, the body 33 being shown as providing a

movable stop and housing for a compression spring 34, and the body 31 being shown as rigidly connected with a plunger 35, movable in a dash pot 36, to damp the movements thereof, preventing erratic oscillations.

Whether chambered or not, the outer ends of the respective cylindrical members 31 and 33 are intended to be exposed to opposite and different fluid pressures. A duct or channel 37 is so positioned as to transmit fluid pressure from an "inner" region of the transverse passage 18 on (the inner side of the obstruction 19) to the "lower" end of the cylinder 31; and ducts or channels 38, 38^a and 38^b, or their equivalents, are so positioned as to transmit a lower pressure from the "outer" portion of the said passage to the "upper" end of the cylinder 33.

Whether or not the respective actual or virtual exposures of the outer ends of the mentioned interconnected cylinders are substantially equal, an approximate balance of pressure may be readily obtained by any suitable means, such as a compression spring 34, for which any suitable adjusting means may be provided. In order to permit the employment of a compression spring of suitable length, I may advantageously provide a housing 39 therefor, this housing being shown as closed at its "upper" end by a threaded cap 40, through which extends a rod 41, squared at its outer end 42 and rotatably connected at its inner end 43 with a longitudinally extending cylindrical guide 44, serving as an adjustable stop and as a means for retaining and centering the spring 34. The guide 44 may be connected with the inner end of the rod 41 by means such as a pin or pins 45 engaging an annular groove 46; or any preferred alternative device may be employed to provide effective means for adjusting the pressure of the replaceable spring 34, or its equivalent, when said spring is rendered adjustable. According to the conditions and objects of a particular installation, a stronger or weaker spring may be substituted at 34.

The dash pot 36 may be secured in any suitable way, as by positioning the same in a lower housing 47, providing a chamber 48 shown as closed at its lower end by a plug 49 and, in order to facilitate the withdrawal of any liquids, such as oil collected from natural gas delivered through the passage 18, the described position and construction of the dash pot being preferably such as to assure its remaining constantly filled, means such as a draw-off nipple or elbow 50, shown as projecting laterally from the housing 47 and as closed by a plug 51, may optionally be provided. Whenever sediment accumulates, the plug 51, or its equivalent, may be momentarily removed; but it should be understood that my unit may, if desired, be

used in positions other than the upright position with reference to which the terms "upper" and "lower" are above used.

It should be understood that any fluid admitted through the duct 37, or its equivalent, may be admitted with equal freedom to opposite sides of the plunger 35 in the dash pot 36, this plunger being employed, whether or not provided with vertical passages 52, merely to effect a steadying of the pressure-controlled valve with which it is shown as rigidly connected; but any excess of pressure applied through the duct 37 (in controlled communication with the inlet pipe 14) is intended promptly to effect a proportionate closing of the opening 53, by the valve element 31. Similarly, any fall in pressure in the outlet pipe 15, or its equivalent, must be effective (this pipe being in communication, by way of the passage 38, 38^a and 38^b, with the chamber 30, through which pressure is applied to the "upper" end of the chambered cylinder 33) must also be effective partially to close the opening 53 controlled by said valve element 31; whereas any increase in pressure in the pipe 15, or any diminution in pressure in the pipe 14, must be effective to withdraw or depress the valve element 31, increasing the opening at 53; and the adjustment of the rods 23 (with which the choke valve plunger or movable obstruction 19 may be integral) and 41 (serving to predetermine the pressure applied by the spring 34, or its equivalent) may be relied upon to assure the maintenance of a constant pressure differential across the mentioned fixed orifice, or its equivalent.

As suggested in Fig. 3, in which 16 has been referred to as a main, assuming said main to be maintained at a suitable pressure by means such as a compressor 54, any desired number of laterals 14, 14^a, 14^b may be reliably fed therefrom, one of my described control units 11 being interposed in each lateral, or optionally in each lateral except, for example, the last. Thus, whenever it is important to maintain a substantially constant pressure in the main 16, or its equivalent, every outlet therefrom may advantageously be provided with a separate control unit of the character above described, and these control units may be set to deliver widely different quantities of fluid at widely different pressures; but, when the total supply or total consumption of fluid is quite irregular, I may optionally provide all but one

of the laterals from a main with a unit of the character described, a single lateral, as the lateral 14^c, being optionally carried directly (with or without a check valve 55) to any suitable means 56 for the use or storage of a variable excess.

It will be obvious that my entire unit might be built up from separate fittings; and that when my unit is to be used under conditions standardized in every respect, a mere fixed obstruction 19', might serve in place of the movable choke element 19, and no provision need be made for adjustment or substitution of the spring 34, or its equivalent. On the other hand, when a considerable range of adjustability is desired, I may optionally employ means such as a tapered spring, to which the novel construction shown in Fig. 4 is equivalent. In this form, in which I may use cupped washers 57, a weak spring section 34^a, is first compressed, a stronger section 34^b coming into action after the weak unit 34^a has substantially reached the limit of its compression, a still stronger section or sections 34^c being the last to yield.

Although I have above described, with mentions of optional details or alternatives, but a single type of unit illustrating my invention, and but a limited number of uses for the same, it should be understood that various features of my invention may be independently used, and also that various modifications may be made, by those skilled in the arts to which this case relates, without involving the slightest departure from the spirit and scope of my invention, as the same is indicated above and in the following claim.

I claim as my invention:

A flow-control device comprising a body provided with an inlet and with an outlet, there being a communicating orifice between said inlet and said outlet, provided with means for predetermining the extent of an opening therethrough; a pressure-controlled valve to vary the flow of a fluid through said orifice; and means, dependent upon the difference in pressure on opposite sides of said opening, for so moving said valve as to maintain a substantially constant pressure differential across said orifice,—said valve moving means being provided.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 2nd day of March, 1925.

WALTER A. LOOMIS.