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A. J. BARNEBL, JR

1,447,007

VALVE

Filed Mar. 5, 1921

Fig. 1,

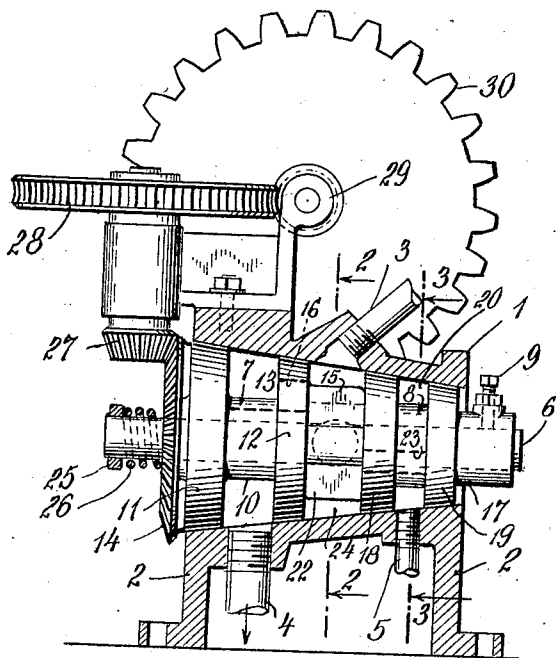


Fig. 2,

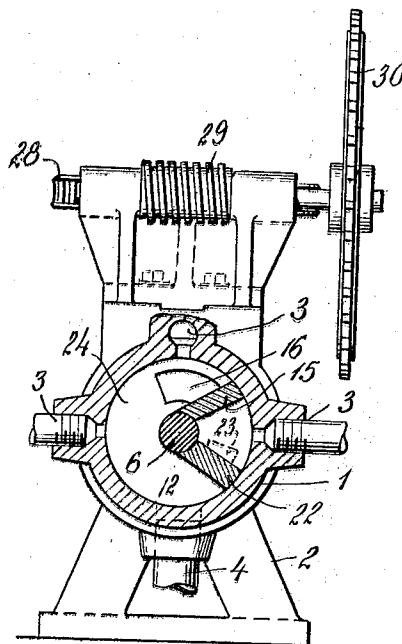


Fig. 3,

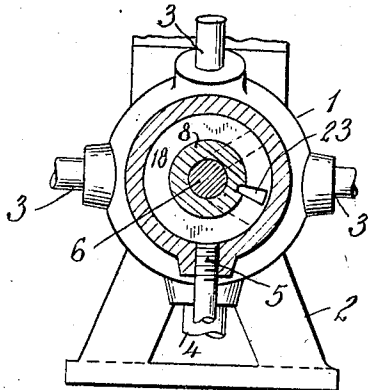


Fig. 4,

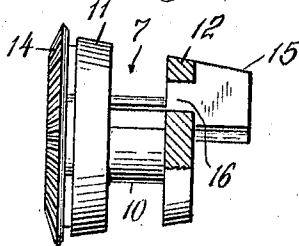


Fig. 7,

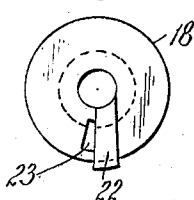


Fig. 5,

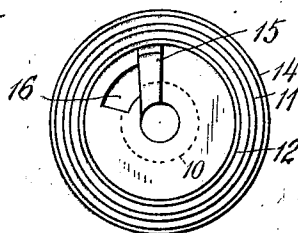
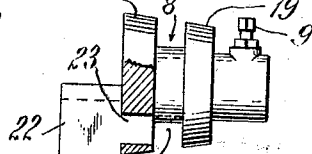


Fig. 6,



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By his Attorneys

Pennie, Davis, Marwin & Edwards

UNITED STATES PATENT OFFICE.

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VALVE.

Application filed March 5, 1921. Serial No. 449,781.

To all whom it may concern:

Be it known that I, AUGUST JOSEPH BARNEBL, Jr., residing at Newark, in the county of Essex, State of New Jersey, have
5 invented certain new and useful Improvements in Valves; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it
10 appertains to make and use the same.

This invention relates to a valve, and more particularly to a rotary valve, designed to place a given conduit in alternating communication with two other conduits.

15 In certain types of continuous filters, such, for example, as those used in the Dorr classifiers, shown and described in U. S. Patent No. 996,624, the direction of the pressure against the filtering medium is periodically
20 reversed in order to break up the deposit of solids which otherwise would tend to choke it. In the case of suction filters, such as those referred to, the usual practice is to alternate the suction periods with short
25 periods of blowing, the ratio of these periods to each other varying with different materials and with different physical conditions of the same material. The object of the present invention is to design a valve which
30 will automatically put the filters in alternating communication, first with a suction pump, and then with an air compressor, the relative durations of suction and blowing being variable to suit conditions.

35 The valve developed in accordance with the present invention to meet these requirements comprises a shaft or axis bearing four discs spaced apart to define three annular channels, and rotating within a cylindrical or conical
40 casing or seat, the discs making liquid tight contact with the walls of the seat. The central channel communicates with the filter or filters through an opening or openings in the wall of the casing. One of the remain-
45 ing channels communicates with a suction pump likewise through an opening in the casing wall, and the other with an air compressor. The central channel is divided into two noncommunicating sectors of variable
50 size, each of which communicates with one of the outer channels through a passage in the separating disc. As the valve rotates the filters are placed in communication, first with the suction pump and then with the
55 compressor, and the relative durations of

the sucking and blowing periods are determined by the relative arc lengths of the respective sectors.

The accompanying drawing discloses a preferred embodiment of the invention and a study of it will make clear the construction and operation of the valve. In this drawing Fig. 1 is a longitudinal vertical section through the casing showing the valve and its driving mechanism in elevation; 60
65 Fig. 2 is a transverse vertical section taken on line 2—2 of Fig. 1; Fig. 3 is another transverse vertical section taken on line 3—3 of Fig. 1; Figs. 4, 5, 6 and 7 are detail views of certain elements of the valve. 70

The valve structure as a whole comprises a conical seat or casing 1 supported by suitable brackets 2. There are three pipe connections 3 entering the central part of the casing from the several compartments of a 75
80 suction filter box, a fourth pipe connection 4 entering the casing near its larger end and communicating with a vacuum pump and a fifth connection 5 entering the casing at its smaller end and communicating with an air compressor or pump. These elements of the structure are stationary.

The valve proper, which is seated within this casing and controls the communication between the central connections 3 and the 85
90 outer connections 4 and 5, comprises a central shaft 6 upon which are mounted two spool-shaped elements 7 and 8, the former being keyed upon the shaft and the latter being adjustably fixed thereon by means of a set screw 9. The element 7 is made up of a central boss 10 upon which are mounted two 95
100 flanges or discs 11 and 12, defining between them an annular channel 13. These flanges are frusto-conical in shape and conform to the conical face of the casing. Cast integrally with this element and adjacent the disc 11 is a bevel gear 14. A radial lug 15 projects outwardly from the face of disc 12 and forms an integral part of the element. 105
110 Adjacent this lug is an opening 16 which extends through the disc 12, as is clearly shown in Figs. 4 and 5. Element 8 is similar in its construction to element 7 and is made up of a central boss 17 bearing two out-
standing flanges or discs 18 and 19, defining between them a smaller annular channel 20. Projecting from the face of the larger disc 18 is a radial lug 22 and adjacent this lug an opening 23 passes through 110

the disc. Both lugs 22 and 15 are made with inclined outer edges designed to make liquid tight contact with the conical face of the casing. The boss 17 extends beyond disc 19 and furnishes a seat for the set screw 9.

When these two elements 7 and 8 are mounted upon the shaft 6 in the manner shown in Fig. 1, they are spaced apart because of lugs 15 and 22, so that their inner flanges 12 and 18 define a third annular channel 24 between them. This annular channel is, however, divided by the two lugs into two non-communicating sectors, as is clearly shown in Fig. 2. This inner channel 24 and its two sectors communicate directly with three pipe connections 3 which lead to the suction boxes. The outer channels 13 and 20 communicate with the vacuum pump and the air compressor respectively. One sector of the annular channel 24 is in communication through the opening 16 with the channel 13 and the vacuum pump while the other sector is in communication through opening 23 with the channel 20 and the air compressor.

The outer end of the shaft 6 is journaled within a bracket 25, which is secured to the casing by means not shown. An expansion coil spring 26 surrounds the shaft and is held between this bracket and the outer face of bevel gear 14, by means of which the valve is constantly urged toward the smaller end of the casing and hence is kept firmly seated. Wear is automatically taken up by this means.

The valve is slowly rotated through a chain of reducing gears comprising the bevel gear 14, an intermeshing bevel pinion 27, a worm gear 28, a worm 29 and a sprocket wheel 30.

When used in a suction filter system the operation of the valve is as follows: Air is drawn from the suction boxes through connections 3, one of the sectors of annular channel 24, opening 16, annular channel 13 and pipe connection 4. As the valve is rotated the other sector, which is in direct communication with the air compressor communicates successively with each of the pipe connections 3 and places them in communication with the source of compressed air. Thus, for the period during which this sector covers a given pipe connection 3, that compartment of the suction box from which that pipe leads is subjected to a blowing operation. By loosening set screw 9 and turning the element 8 upon the shaft it is possible to vary the relative sizes of these two sectors at will, so that the blowing periods may be increased or decreased to suit conditions. If the valve rotates at a very slow speed, say, once every ten or twenty minutes, the angular relation of the lugs as shown in Fig. 2 will give a blowing period between one and two minutes.

It is to be observed that by dividing the suction box into three compartments and using a valve of this description and adjustment there are always two compartments sucking and, of course, never more than one blowing at a given time.

The valve has been described in connection with use in a suction filter system. It was primarily designed for this use and will probably find its greatest usefulness in this connection. There is no intention, however, to limit it to such use and it is well adapted for other purposes. Notable among these is its use as a liquid sampler. When used for this purpose only one of the three pipe connections 3 would be employed, preferably the uppermost one. The liquid to be sampled enters through this pipe, passes into the largest sector of the annular channel 24 and out through pipe 4. This would be the path taken by the bulk of the liquid. The sample would be periodically taken through the smallest sector communicating with pipe 5. The adjustability of the valve would make it particularly well fitted for such use, as the amount of the sample could be varied at will by changing the relative sizes of the two sectors.

It is also possible to employ this valve in connection with the ordinary rotary suction filter. This valve may be used wherever it is required to place a given conduit or conduits in alternating communication with two other conduits.

Although a certain specific embodiment of the invention has been shown and described it is to be understood that the invention is not necessarily limited to these details but that modifications may be made without departing from the spirit of the invention.

I claim:

1. The combination of a casing, three conduits communicating therewith and a rotary valve within the casing which by its rotation places the first conduit in alternating communication with the second and third conduits, and means for adjusting the valve to vary the relative durations of these alternating periods of communication.

2. The combination of a casing, a conduit entering the casing from a suction filter, a second conduit entering the casing from a suction pump, a third conduit entering the casing from an air compressor, and a rotary valve within the casing which by its rotation places the conduit leading to the suction filter in alternating communication with the conduits leading to the suction pump and the compressor.

3. The combination of a casing, a rotary valve within the casing comprising a shaft, a plurality of discs placed along the shaft defining annular channels between them, means dividing one of these channels into

non-communicating sections, each section communicating with one of the other channels, and a conduit leading to each of the channels.

5 4. The combination of a casing, a rotary valve within the casing comprising a shaft, four discs spaced along the shaft defining three annular channels between them, radial partitions dividing the central channel into
10 non-communicating sectors, passages in the adjacent discs connecting each sector with one of the outer channels, and a conduit communicating with each of the three channels.

15 5. The combination of a casing, a rotary valve within the casing comprising a shaft, four discs spaced along the shaft defining three annular channels between them, radial partitions dividing the central channel into
20 non-communicating sectors, means for varying the angle between the radial partitions, passages in the adjacent discs connecting each sector with one of the outer channels, and a conduit communicating with each of
25 the three channels.

6. The combination of a conical casing, a rotary valve within the casing comprising a shaft, a plurality of discs placed along the shaft defining annular channels between
30 them, means dividing one of these channels into non-communicating sections, each section communicating with one of the other channels, a conduit leading to each of the channels, and yielding means normally urging the valve toward the smaller end of the
35 conical casing.

7. The combination of a casing, a rotary valve within the casing comprising a shaft, two spool-shaped elements mounted on the
40 shaft, each having a boss with flanges or discs thereon spaced apart to define an annular channel between them, the two spool-shaped elements being spaced apart upon the shaft to define a third annular channel
15 between their inner flanges, a radial lug projecting outwardly from the inner flange of each spool-shaped element cooperating to divide the inner annular channel into two

non-communicating sectors, a passage in each inner flange adjacent its radial lug and
50 a conduit leading to each of the annular channels.

8. The combination of a casing, a rotary valve within the casing comprising a shaft, two spool-shaped elements mounted on the
55 shaft, each having a boss with flanges or discs thereon spaced apart to define an annular channel between them, the two spool-shaped elements being spaced apart upon the shaft to define a third annular channel
60 between their inner flanges, a radial lug projecting outwardly from the inner flange of each spool-shaped element cooperating to divide the inner annular channel into two
65 non-communicating sectors, means for permitting movement of one of the spool-shaped elements upon the shaft to vary the angular relation between the two radial lugs, a passage in each inner flange adjacent its radial lug, and a conduit leading to each of the
70 annular channels.

9. In a suction filter system of the class wherein the filter is placed in alternating communication with a suction pump and an air compressor, the combination of a casing,
75 a conduit entering the casing from the suction filter, a second conduit entering the casing from the suction pump, a third conduit entering the casing from the air compressor, and a rotary valve within the casing which
80 by its rotation places the conduit leading to the suction filter in alternating communication with the conduits leading to the suction pump and the compressor.

10. The combination of a casing, a plural-
85 ity of conduits entering the casing from a suction filter, a conduit entering the casing from a suction pump, a conduit entering the casing from an air compressor and a rotary valve within the casing which by its rota-
90 tion successively places the conduits leading to the suction filter in alternating communication with the conduits leading to the suction pump and the compressor.

In testimony whereof I affix my signature. 95

AUGUST J. BARNEBL, Jr.