March 24, 1936. C. E. ANDERSON 2,034,690

EMERGENCY SHUT-OFF VALVE

Filed Oct. 14, 1933 2 Sheets-Sheet 1

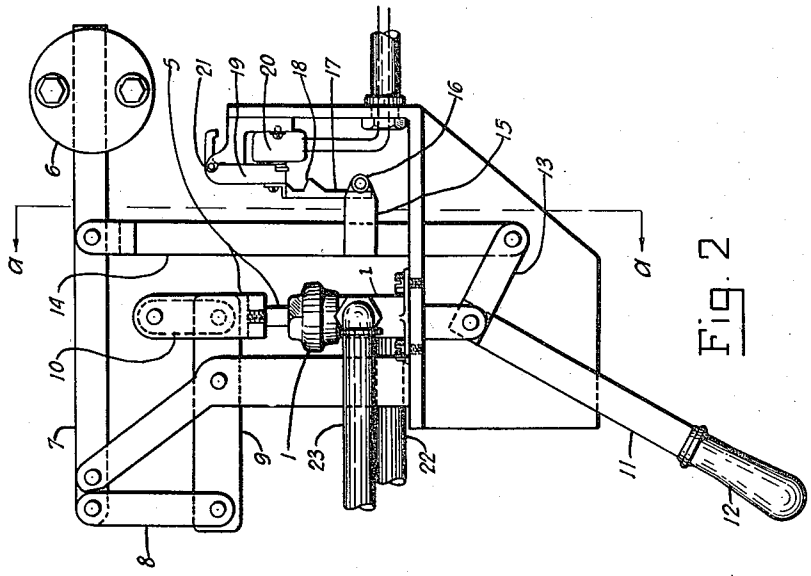


Fig. 2

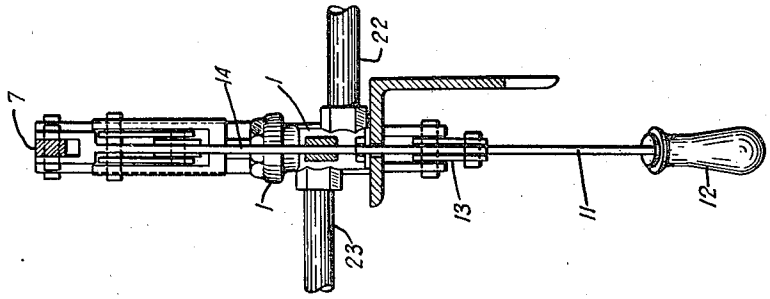


Fig. 3

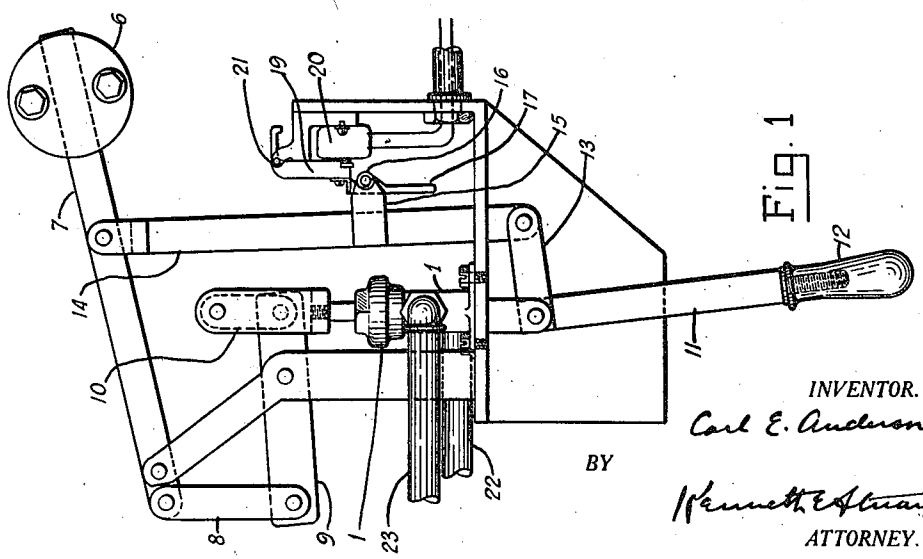


Fig. 1

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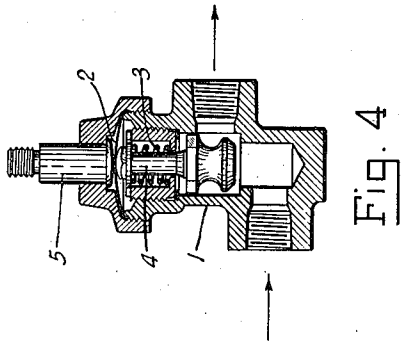


Fig. 4

Fig. 5

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UNITED STATES PATENT OFFICE

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EMERGENCY SHUT-OFF VALVE

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4 Claims. (Cl. 8—2)

My invention relates more particularly to means for automatically cutting off the admission of a fluid, such as a chemical reagent, to contact with a second fluid, which may be flowing in a conduit, in the event of any one of a number of possible emergencies, such as stoppage of said flow. Either of said fluids may be liquid or gaseous. My invention is generally applicable in processes involving the bringing together of two or more fluid streams, one or more of which may be of an expensive, noxious or dangerous character. An example of the use of my invention is in the control of chlorine and carbon monoxide in the production of phosgene. I will describe my invention, however, with particular reference to the case of a continuous stream of chlorine mingling and reacting with a continuous stream of paper pulp, as in the process of bleaching described in co-pending application Serial Number 547,755. In the process of said application, the stream of pulp is kept in motion by a pump and the chlorine is admitted under pressure. In the event of stoppage of the pump, if the chlorine were allowed to continue to flow it would eventually escape from the apparatus and cause great inconvenience throughout the mill.

My invention will be better understood by reference to the drawings in which:

Figure 1 is a side elevation of my shut-off valve and the mechanism for operating it, in the open position,

Figure 2 is a side elevation of the same in closed position,

Figure 3 is an end elevation of the same in open position sectioned along the line *a—a* of Figure 2,

Figure 4 is a detail of the valve proper, in section, and in the open position,

Figure 5 is a diagram showing my valve in relation to a typical paper pulp bleaching installation.

Referring to the figures, 1 is the valve proper. In order to eliminate the friction of a stuffing box, I prefer to use a valve of the "packingless" type. In this case the packing is replaced by a diaphragm 2. The valve stem 4 is normally raised by the spring 3, opening the valve to flow, the diaphragm 2 yielding to permit this. Alternatively, the valve may be closed by the plunger 5, bearing upon the outside of the diaphragm 2.

The plunger 5 is actuated to close this valve by the weight 6, acting thru the lever 7, link 8, lever 9 and link 10. The purpose of this train of levers and links is to multiply the effect of the weight 6 fifteen or twenty times. In this way, a moderate weight is made to exercise a very great pressure to close the valve 1 and hold it closed against the chlorine, which may be under as great a pressure as 150 lbs. per square inch.

The weight 6 is raised and the valve 1 opened by means of the lever 11, operated by the handle 12 and acting thru the bell crank extension 13 and link 14.

The link 14 is provided with an extension 15 carrying a roller 16 which in the raised or open position is adapted to engage the cam 18 carried by the pawl 17 which forms an extension to the armature 19 of the electromagnet 20.

The armature 19 is pivoted at 21 and the face of the cam 18 is sloped at such an angle that the roller will push the pawl 17 to the left and roll off the cam 18 under the pressure of the weight 6, provided no resistance is offered by movement of the pawl 17. When the electromagnet 20 is energized however, it attracts the armature 19 with sufficient force to prevent the weight 6 from forcing the pawl and armature to the left. The mechanism is therefore held in the position in which valve 1 remains open. Chlorine is admitted to valve 1 thru the pipe 22 and carried from it to the process thru pipe 23.

Referring now to Figure 5:

24 is an electric motor driving pump 25 which takes paper pulp from pipe 26 and delivers it to pipe 27, whence it flows thru reactor pipe 28, retention tower 29, pipe 30, control box 31 and pipe 32 to the stock chest. Chlorine is admitted thru pipe 23 at the point 33 to react with the lignin of said paper pulp to bleach the same. After a proper interval to permit the reaction to take place, milk of lime is admitted thru the pipe 34 at the point 35. Where pipe 27 makes a return bend, a flanged extension or dome 36 is formed therein. The dome 36 is provided with a cover 37, between which and the flange of the dome is clamped a diaphragm 38. The space above the diaphragm 38 is connected by the pipe 39 to a metal bellows (not shown) operating the mercury contact switch 40 housed in the box 41. A pipe 42 connects the pipe 34 to the metal bellows (not shown) of a similar mercury contact switch 43 housed in the box 44. The details of the mercury contact switch are not shown as this is a well known commercial device and forms no part of the present invention. It is sufficient to state that in the position of mercury switch 40 contact is established between two points by a globule of mercury and in the position of mercury tube 43 such contact is broken. The pur-

pose of diaphragm 38 is to prevent pulp from entering pipe 39. The corresponding pipe 42 needs no such protection as the milk of lime will not obstruct it and pulp is prevented from entering it by the milk of lime.

The wiring diagram of Figure 5 indicates clearly that a circuit is established between two of the conductors of the three phase motor 24, thru the two mercury contact switches 40 and 43 in circuit with each other and with the electromagnet 20 and another electromagnet 45 adapted to operate the armature 46 and break contact at 47 the function of which will be explained later.

The operation of the apparatus is as follows:

The motor 24 is first started, establishing a flow of pulp thru the pipe 27 and building up a hydraulic pressure upon diaphragm 38, owing to the resistance of the pipe etc. beyond this point. The pressure upon diaphragm 38 moves the mercury contact switch 40 to the circuit-closing position as shown. The stream of milk of lime is then started by opening a valve (not shown) in the pipe 34. This builds up a pressure in the pipe 42 and moves the mercury contact switch 43 to its circuit-closing position. (In Figure 5 the tube 43 is shown in the open position). The handle 12 is then moved to the position of Figure 1, turning on the chlorine, the flow of which is regulated by a needle valve (not shown). The process will then continue so long as the pump runs and there is pulp in the pipe and the supply of milk of lime is maintained. If, however, the supply of pulp or lime should fail one or both of the mercury contact switches will move to the circuit-breaking position, thus de-energizing the magnet 20 and permitting the weight 6 to close chlorine valve 1. The same result will follow interruption of the power supply to the electric motor 24. At the same time, the electromagnet 45 is de-energized allowing the spring 48 to close the contact 47 and operate the motor horn 49. Thus any interruption of the normal working of the process will instantly cut off the admission of chlorine and sound an alarm.

In Figure 5 the apparatus is shown as if the pump were running but the supply of milk of lime had failed, thus cutting off the admission of chlorine.

It should be observed that the apparatus may be adjusted so that the reduced pressure in the pipe 27 resulting from an abnormally thin pulp consistency will trip the mercury switch 40.

It will be obvious that many modifications of this system are possible and that it may readily be adapted to any chemical process involving the use of dangerous or noxious reagents.

What I claim is:

1. Apparatus comprising pressure-tight conduits adapted to bring together two continuous fluid streams, a valve adapted to interrupt one of said streams, manual means for opening said valve, a latch adapted in one position to lock said valve wide open, means responsive to back-pressure created by resistance to flow of the other of said streams and adapted when acted upon by said back-pressure to maintain said latch in locking position and means for shifting said latch to its unlocking position and tightly closing said valve upon cessation of said back-pressure, as by interruption of said last mentioned stream.

2. Apparatus comprising pressure-tight conduits adapted to bring together two continuous fluid streams, a valve adapted to interrupt one of said streams, manual means for opening said valve, a latch adapted in one position to lock said valve wide open, an electromagnet adapted when energized to maintain said latch in locking position; a switch and source of electrical energy in circuit with said electromagnet, means responsive to back-pressure created by resistance to flow of the other of said streams and adapted when acted upon by said back-pressure to close said switch, thereby energizing said electromagnet and means for shifting said latch to its unlocking position and tightly closing said valve when said electromagnet is de-energized, upon cessation of said back-pressure, as by interruption of said last mentioned stream.

3. Apparatus comprising pressure-tight conduits adapted to bring together two continuous fluid streams, a valve adapted to interrupt one of said streams, pump means for maintaining the other of said streams, an electric motor for driving said pump means, an electromagnet in shunt with said electric motor and adapted when energized to maintain said valve wide open, a source of electrical energy in circuit with said electric motor, whereby said electromagnet is energized when said motor is in operation, and means for tightly closing said valve when said electromagnet is de-energized, as upon failure of the electric current operating said electric motor.

4. Apparatus comprising pressure-tight conduits adapted to bring together two continuous fluid streams, a valve adapted to interrupt one of said streams, pump means for maintaining the other of said streams, an electric motor for driving the same, manual means for opening said valve, a latch adapted in one position to lock said valve wide open, an electromagnet adapted when energized to maintain said latch in locking position, a source of electrical energy in circuit with said electric motor, said electromagnet in shunt with said electric motor, whereby said electromagnet is energized while said electric motor is in operation, and means for shifting said latch to its unlocking position and tightly closing said valve when said electromagnet is de-energized, as upon failure of the electric current operating said electric motor.

CARL E. ANDERSON.