

Aug. 15, 1933.

C. C. FRANCIS ET AL

1,922,941

APPARATUS FOR THE AUTOMATIC ADMINISTRATION OF MEDICATION

Filed April 16, 1930 . 2 Sheets-Sheet 1

Fig. 1.

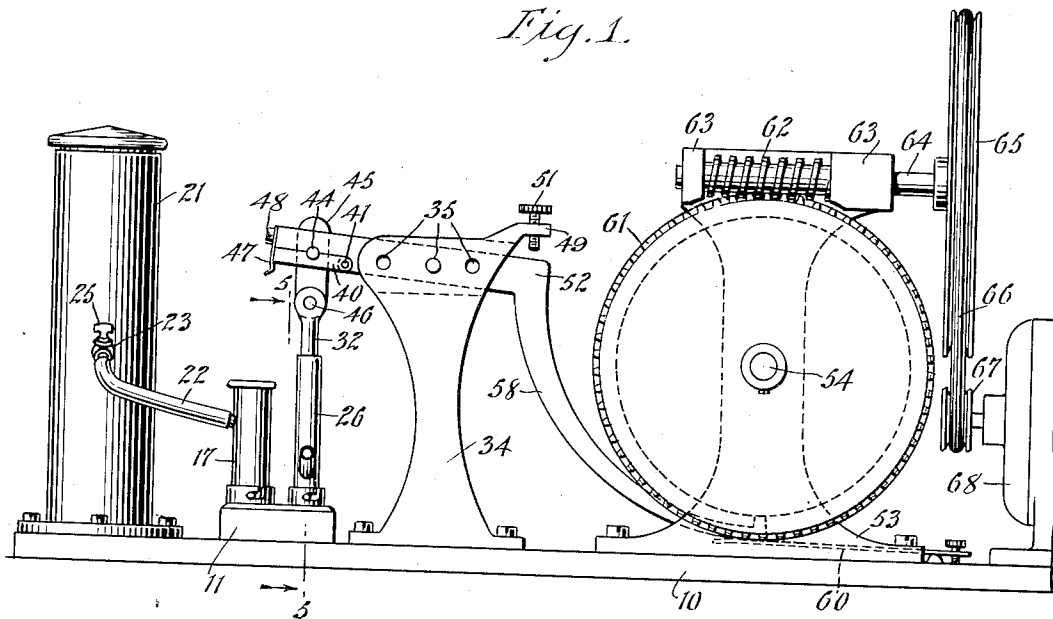
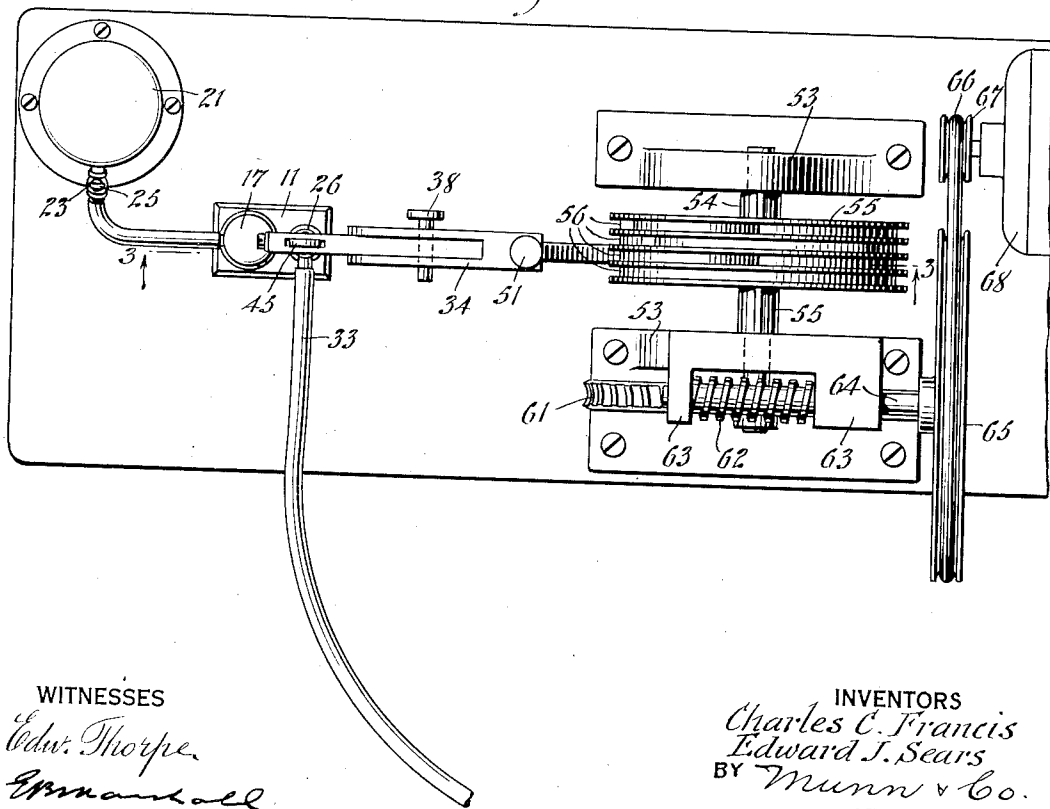


Fig. 2.



WITNESSES

*Edw. Thorpe*

*Emmanuel*

INVENTORS

*Charles C. Francis*  
*Edward J. Sears*

BY *Munn & Co.*  
ATTORNEYS

Aug. 15, 1933.

C. C. FRANCIS ET AL

1,922,941

APPARATUS FOR THE AUTOMATIC ADMINISTRATION OF MEDICATION

Filed April 16, 1930

2 Sheets-Sheet 2

Fig. 3.

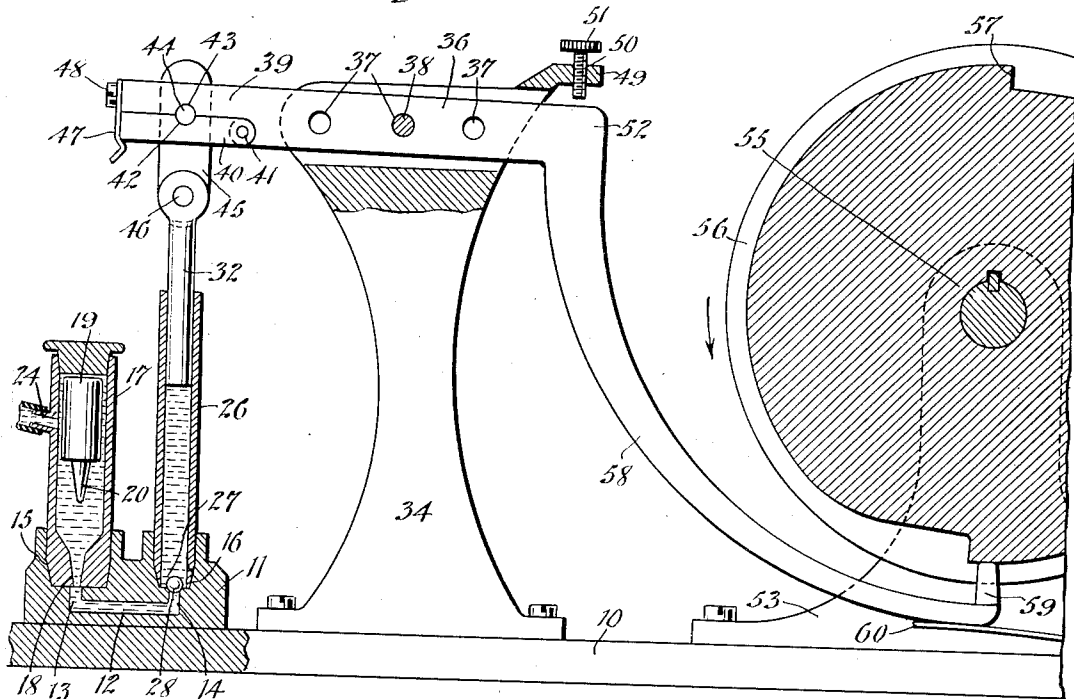


Fig. 4.

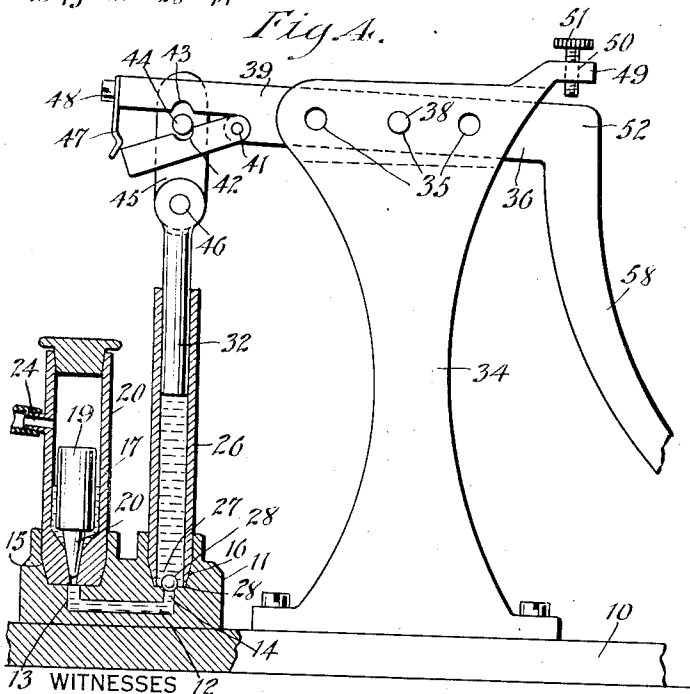
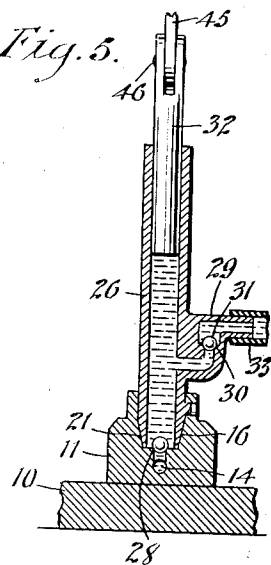


Fig. 5.



13 WITNESSES 12  
*Chas. Thayer*  
*E. B. Marshall*

INVENTORS  
*Charles C. Francis*  
*Edward J. Sears*  
 BY *Munn & Co.*  
 ATTORNEYS

## UNITED STATES PATENT OFFICE

1,922,941

## APPARATUS FOR THE AUTOMATIC ADMINISTRATION OF MEDICATION

Charles C. Francis and Edward J. Sears,  
New York, N. Y.

Application April 16, 1930. Serial No. 444,834

15 Claims. (Cl. 128—214)

The invention has for one of its objects to provide an apparatus which will serve to administer periodically medication to a patient.

Another object of the invention is to provide in such an apparatus means to regulate the operation of the apparatus with reference to the intervals between treatments, and also with reference to the quantity of the medicament administered.

Another object of the invention is to provide an apparatus which will periodically pump the medicament for administration to the patient, and which has means to prevent any fluid or substance other than the medicament to pass from the apparatus to the patient.

Still another object of the invention is to provide means to render the apparatus inoperative when the medicament in the apparatus is substantially exhausted.

Still another object of the invention is to construct the apparatus of parts which may be quickly and conveniently disassembled for cleansing and sterilization.

Other objects of the invention will appear in the following specification in which the preferred form of the invention is described.

In the drawings similar reference characters refer to similar parts in all the views, of which

Figure 1 is a view showing the apparatus in side elevation,

Fig. 2 is a plan view of Fig. 1,

Fig. 3 is an enlarged fragmentary side elevation of the apparatus in section,

Fig. 4 is a fragmentary sectional view illustrating the means for disconnecting the lever from the piston operating means, and

Fig. 5 is an enlarged sectional view on the line 5—5, Fig. 1.

In the treatment of patients suffering from pneumonia and other diseases it is often advisable or necessary to administer medication periodically and in pneumonia the medicament is usually administered intravenously. It is the present practice for the nurse to administer the medicament at intervals, but these intervals are usually so long that the action of the medicament varies very considerably from the time when it is administered to the period just before the next administration of the medicament.

With our apparatus this uneven action of the medicament is avoided, for not only is it possible to administer automatically dosages of the medicament at short intervals, but the quantity of the medicament in each dose may, therefore, be relatively small.

By referring to the drawings it will be seen that preferably the several parts of the apparatus are mounted on a base 10 which has an upwardly extending base portion 11 which is preferably detachable from the base 10 for the purpose of cleansing and sterilization. This base portion 11, as illustrated in Figs. 3 and 4, has a passage 12 leading from an inlet 13 to an outlet 14, the base portion 11 having a tapered opening 15 at its inlet 13 and a tapered opening 16 at its outlet 14. Fitting the tapered opening 15 in the base portion 11 there is a container valve member 17 which has an outlet 18 communicating with the inlet 13. Disposed in this container valve member 17 there is a float valve 19 which has a needle member 20 at its bottom for seating in the outlet 18 to close the said outlet.

While the container valve member 17 may be used to store the medicament which is to be used, we prefer to provide a main container 21, illustrated in Fig. 1 of the drawings, which communicates with the container valve member 17 by means of a tube 22 which leads from an outlet 23 in the main container 21 to an inlet 24 in the container valve member 17. This tube 22 may be disengaged from the main container 21 and the container valve member 17 and may be sterilized with the container valve member 17, and if desired the main container 21 may also be sterilized. Preferably the main container 21 has a valve 25 at its outlet 23.

Fitting the tapered opening 16 in the base portion 11 there is a cylinder 26 which has an inlet 27 which communicates with the outlet 14. There is preferably a ball valve 28 in the cylinder 26 which seats at the inlet 27, as illustrated in Figs. 3, 4 and 5 of the drawings. The cylinder 26 also has an outlet 29 with a valve seat 30, a ball valve 31 being provided for closing the valve seat 30 to prevent any back flow of a fluid through the said outlet 29. Disposed in the cylinder 26 there is a piston 32.

Not only is it possible to remove the cylinder 26 from the base portion 11 for sterilization purposes, but the tube 33 which normally extends from the outlet 29 may also be removed so that it may be cleansed and sterilized.

Mounted on the base 10 there is a standard 34 with a plurality of orifices 35, there being a lever 36 provided with one or more orifices 37, which makes it possible to dispose a pivot pin 38 through any desired orifice 35 and through one of the orifices 37 to regulate the arms of the lever 36. At the load arm 39 of the lever 36 there is a finger 40 pivoted at 41, the finger 40 having a

bearing portion 42 which with a companion bearing portion 43 in the body of the lever 39 forms a bearing in which a bearing pin 44 is normally disposed, the said bearing pin being secured to a link 45 which is pivoted at 46 to the piston 32. The finger 40 is held in normal position by means of a leaf spring 47 which is secured to the body of the lever arm 39 at 48. The standard 34 has a flange 49 with a threaded orifice 50 in which is disposed a screw 51, the screw 51 being in position to engage an arm 52 of the lever 36 to limit the upward movement of the said lever arm 52.

As will best be seen by referring to Fig. 2 of the drawings, there are two additional standards 53 extending upwardly from the base 10, these additional standards having bearings in which is journaled a shaft 54, a drum 55 being keyed to the said shaft 54 and being mounted to slide along the shaft. This drum 55 has a plurality of grooves 56, the drawings illustrating four of such grooves, but it will be understood that the drum 55 may be constructed with any desired number of grooves.

There are cams 57 in these grooves 56, one of the grooves being preferably provided with one of these cams 57, a second groove being preferably provided with two cams, a third groove being preferably provided with three cams, and a fourth groove being preferably provided with four cams, but it will be understood that any desired number of the grooves 56 may be employed in connection with the drum 55 and there may be any desired number of cams in one or more of the grooves.

The arm 52 of the lever 36 has an extension 58 which terminates in a finger 59 which may be disposed for traveling in any desired groove 56, it being possible to slide the drum 55 along the shaft 54 so that the desired groove will be positioned at the said finger 59.

The arm 58 at the finger 59 is held against the drum 54 at a groove by means of a spring 60. The shaft 54 beyond one of the standards 53 has a worm wheel 61 with which meshes a worm 62 journaled in bearings in an upper portion 63 of one of the said standards 53, the shaft 64 of the worm 62 extending beyond the said bearings and having secured thereto a pulley 65 which is connected by means of a belt 66 with a pulley 67 on a motor 68.

The pulley 65 is preferably of much greater diameter than the pulley 67 so that the shaft 64 will rotate at a very much slower speed than the motor 68 and the rotation of the drum 55 will be further reduced by the worm 62 in the worm wheel 61.

As will be readily understood, it is possible by means of the pulleys 65 and 67, the belt 66, the worm 62 and the worm wheel 61 to obtain any desired rate of rotation of the drum 55 relatively to the motor 68.

With the rotation of the motor 68 and with the finger 59 disposed in one of the grooves 56, the lever 36 will be operated by the engagement of the finger with the cams 57 and when there is only one cam 57 in the groove 56 the lever 36 will be operated only once with each rotation of the drum 55, but if there are two or more cams in the groove 56 the lever will be operated two or more times with each rotation of the drum.

With each operation of the lever 36 the piston 32 will be moved upwardly to draw the medicament into the cylinder 36 and at the downward movement of the piston 32 the medicament

will be forced through the cylinder outlet 29, all in a manner readily understood.

As the medicament is used and as the reserve in the container valve member 17 reaches a very low level the valve float 19 will move downwardly until finally the needle member seats in the outlet 18 to prevent any further medicament passing through the said outlet. When this takes place the partial vacuum in the cylinder 26 will retard the upward movement of the piston 32, which will free the finger 40 from the body of the lever arm 39 so that the finger will move to the position illustrated in Fig. 4 of the drawings and against the resiliency of the spring 47 to disengage the piston 32 from the lever 36 so that with the further rotation of the drum 55 the piston 32 will not be reciprocated. This construction makes it impossible for any air to pass through the cylinder 26 to its outlet 29 inasmuch as the piston 32 will be rendered inoperative before all the medicament in the valve container member 17 has been used, the remainder of the medicament serving as a water seal at the needle member 20.

As has been stated, the pin 38 may be adjusted in the orifices 35 and 37 so that the lever arm 39 may be lengthened or shortened relatively to the lever arm 52, by which means the length of the stroke of the piston 32 may be regulated so that a predetermined dosage will be forced through the cylinder 26 at each operation of the piston.

As a further means of regulating the piston stroke, the screw 51 is provided which may be turned to a position where it will engage the lever arm 52, as may be desired, to limit the upward movement of the said lever arm 52 and consequently the downward movement of the lever arm 39, which serves to limit the downward movement of the piston 32 by means of the link 45.

What is claimed is:—

1. In an apparatus for the automatic administration of medication, an outlet, a container for a medicament connected with the outlet, means for controlling the flow of the medicament through the outlet, adjustable timing means connected with the first mentioned means to regulate the intervals between the periods when dosages pass through the outlet and means which renders the second mentioned means inoperative when the medicament in the container falls below a predetermined point.

2. In an apparatus of the class described, an outlet, a container for a medicament connected with the outlet, means controlling the flow of the medicament through the outlet, driving means, means connecting the driving means with the first mentioned means which normally operates the first mentioned means, and means which renders the third mentioned means inoperative when the medicament in the container falls below a predetermined level.

3. In an apparatus of the class described, an outlet, a container for a medicament connected with the outlet, means controlling the flow of the medicament through the outlet, driving means, a third adjustable means connecting the driving means with the first mentioned means which normally operates the first mentioned means to regulate the dosages of the medicament passing through the outlet, and means which renders the third mentioned means inoperative when the medicament in the container falls below a predetermined level.

4. In an apparatus of the class described, an

80

85

90

95

100

105

110

115

120

125

130

135

140

145

150

operating member, means for supporting the operating member and for adjusting the normal movement of the operating member to time the action of the operating member, an outlet, a container for a medicament connected with the outlet, means controlling the outlet, means by which the movement of the operating member operates the second mentioned means, means for operating the operating member, and means which renders the operating member inoperative when the medicament in the container falls below a predetermined level.

5. In an apparatus of the class described, a pivoted lever having a finger which normally forms a bearing with the body of the lever, means for holding the finger yieldingly in normal position, an outlet, a container valve member for the medicament having an outlet connected with the first mentioned outlet, a float valve in the container valve member for seating at the second mentioned outlet when the medicament in the container valve member falls below a predetermined level, means controlling the flow of the medicament through the first mentioned outlet, and means normally seated in the bearing and connected with the second mentioned means for operating the latter.

6. In an apparatus of the class described, a pivoted lever having a finger which normally forms a bearing with the body of the lever, means for holding the finger yieldingly in normal position, an outlet, a container valve member for the medicament having an outlet connected with the first mentioned outlet, a float valve in the container valve member for seating at the second mentioned outlet when the medicament in the container valve member falls below a predetermined level, means controlling the flow of the medicament through the first mentioned outlet, means normally seated in the bearing and connected with the second mentioned means for operating the latter, a rotary cam member, and a finger on the lever engaging the cam member.

7. In an apparatus of the class described, a cylinder having an inlet and an outlet, a piston in the cylinder, a container valve member for a medicament having an outlet connected with the cylinder inlet, a float valve in the container valve member adapted to seat at the container valve member outlet, a pivoted lever, and yielding means connecting the pivoted lever with the piston for operating the piston.

8. In an apparatus of the class described, a cylinder having an inlet and an outlet, a piston in the cylinder, a container valve member for a medicament having an outlet connected with the cylinder inlet, a float valve in the container valve member adapted to seat at the container outlet, a pivoted lever having a movable finger with which the body of the lever normally forms a bearing, and means normally disposed in the bearing and connected with the piston for operating the piston.

9. In an apparatus of the class described, a shaft, a drum keyed to slide on the shaft, the drum having a plurality of grooves each with one or more cams, a pivoted lever having an arm for engaging the drum at a selected groove, the lever having a finger movable relatively to the body of the lever for forming with the body of the lever a bearing, an outlet, a container valve member for a medicament having an outlet con-

nected with the first mentioned outlet, a float valve in the container valve member for seating at the second mentioned outlet, means for controlling the flow of the medicament through the first mentioned outlet, and means normally journaled in the bearing and connected with the first mentioned means for operating the latter.

10. In an apparatus of the class described, a cylinder having an inlet and an outlet, a container valve member having an outlet connected with the cylinder inlet, a float valve in the container for seating at the container valve member outlet, a piston in the cylinder, a lever having a finger movable relatively to the body of the lever and normally forming therewith a bearing, means normally journaled in the bearing and connected with the piston for operating the latter, a shaft, a drum keyed to slide on the shaft and having a plurality of cam grooves, the lever having an arm for traveling in a selected cam groove, and means to regulate the movement of the lever when operated by its arm in the cam groove.

11. In an apparatus of the class described, a base member having a passage with an inlet and an outlet, the base member at its inlet having a tapered bearing, a container having an outlet with a tapered bearing portion at its outlet normally fitting in the tapered bearing, the base member at its outlet having a tapered bearing, a cylinder having an inlet with a tapered portion at its inlet normally fitting the second tapered bearing in the base member, the cylinder also having an outlet, valve means controlling the cylinder inlet and outlet, and a piston in the cylinder.

12. In an apparatus of the class described, a cylinder having an inlet and an outlet, a piston in the cylinder, an operating member, means for preventing the flow of a fluid through the inlet, and yielding means connecting the operating member with the piston for operating the latter when the inlet is open and which is rendered inoperative when the first mentioned means prevents the flow of fluid through the inlet.

13. In an apparatus of the class described, a cylinder having an inlet, a piston in the cylinder, an operating member, means connecting the operating member with the piston for operating the latter, a container connected with the inlet and means which renders the first mentioned means inoperative when the level of the fluid in the container falls below a predetermined point.

14. In an apparatus of the class described, a cylinder, a piston in the cylinder, a shaft, a drum keyed to slide on the shaft and having a plurality of cam grooves, and means to operate the piston having an arm for traveling in a selected cam groove.

15. In an apparatus for the automatic administration of medication, a pump cylinder having an inlet and an outlet, a container for a medicament connected with the cylinder inlet, a piston in the cylinder, a driving means, adjustable means connecting the driving means with the piston for operating the piston at any one of several predetermined intervals, and means which renders the second mentioned means inoperative when the medicament in the container falls below a predetermined level.

CHARLES C. FRANCIS.  
EDWARD J. SEARS.