

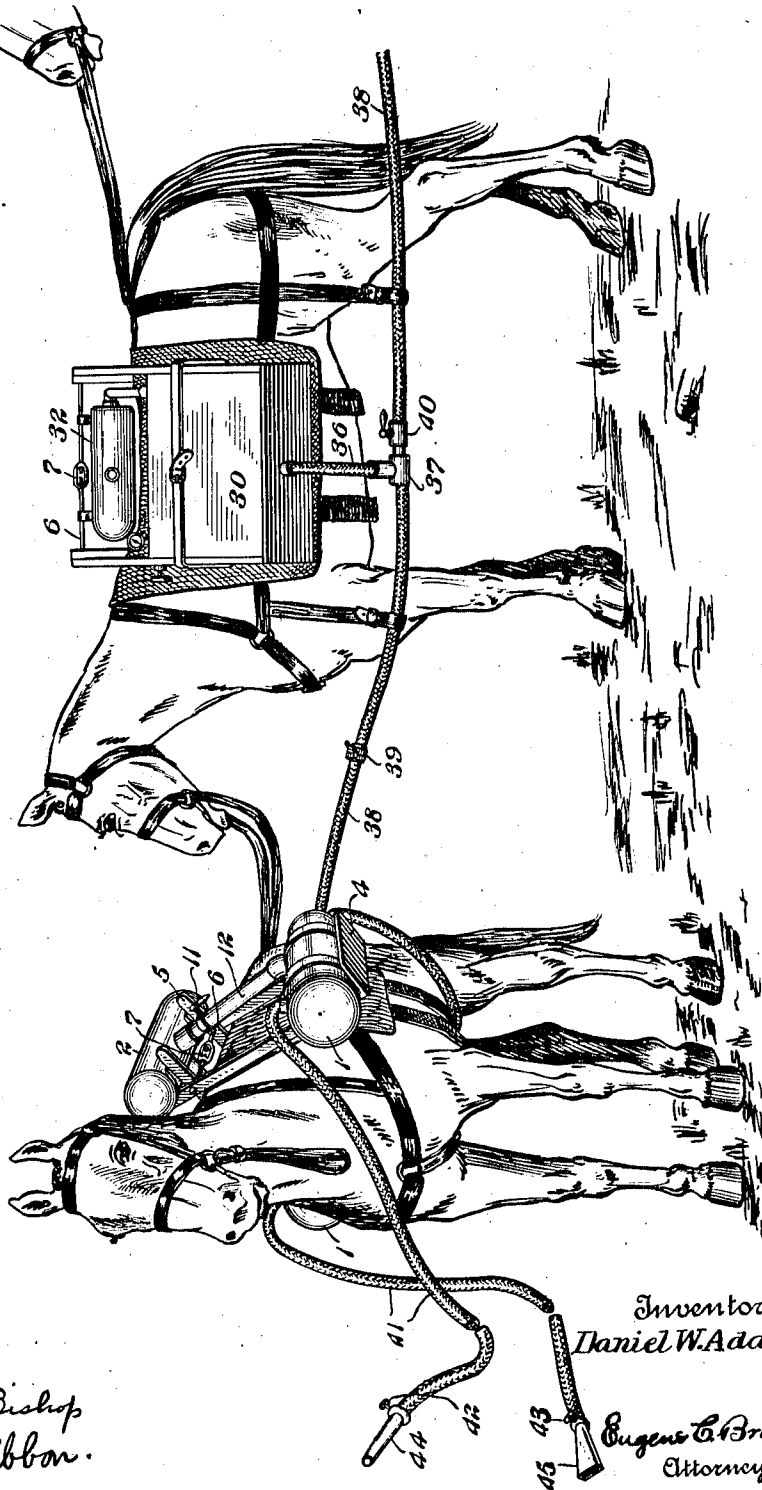
D. W. ADAMS.
 APPARATUS FOR EXTINGUISHING FIRES.
 APPLICATION FILED NOV. 23, 1910.

1,003,853.

Patented Sept. 19, 1911.

4 SHEETS—SHEET 1.

Fig. 1.



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Fig. 2.

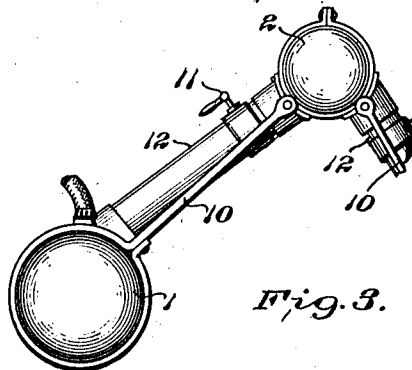
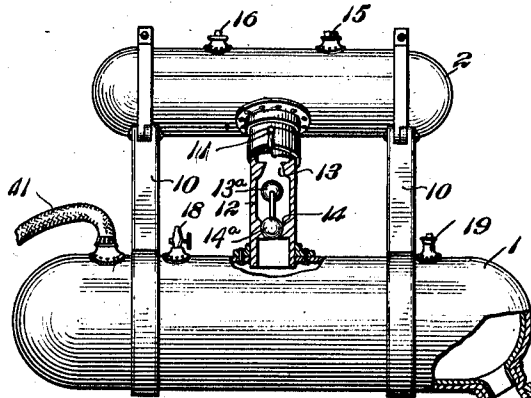


Fig. 3.

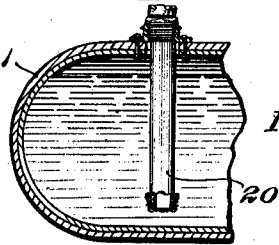


Fig. 5.

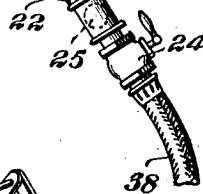


Fig. 6.

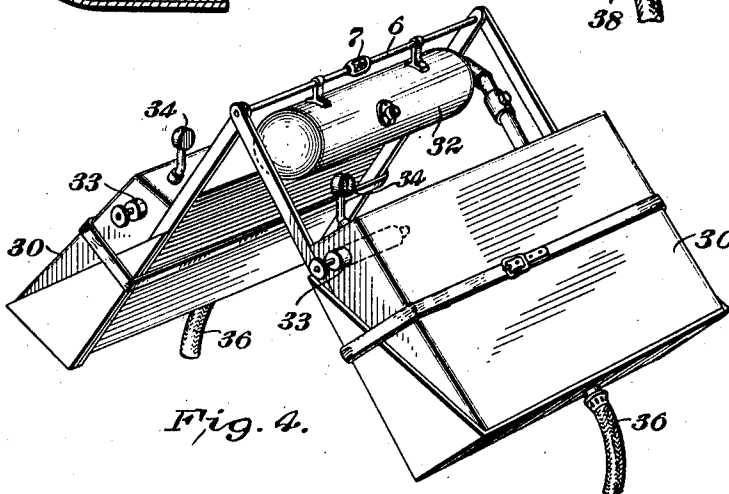


Fig. 4.

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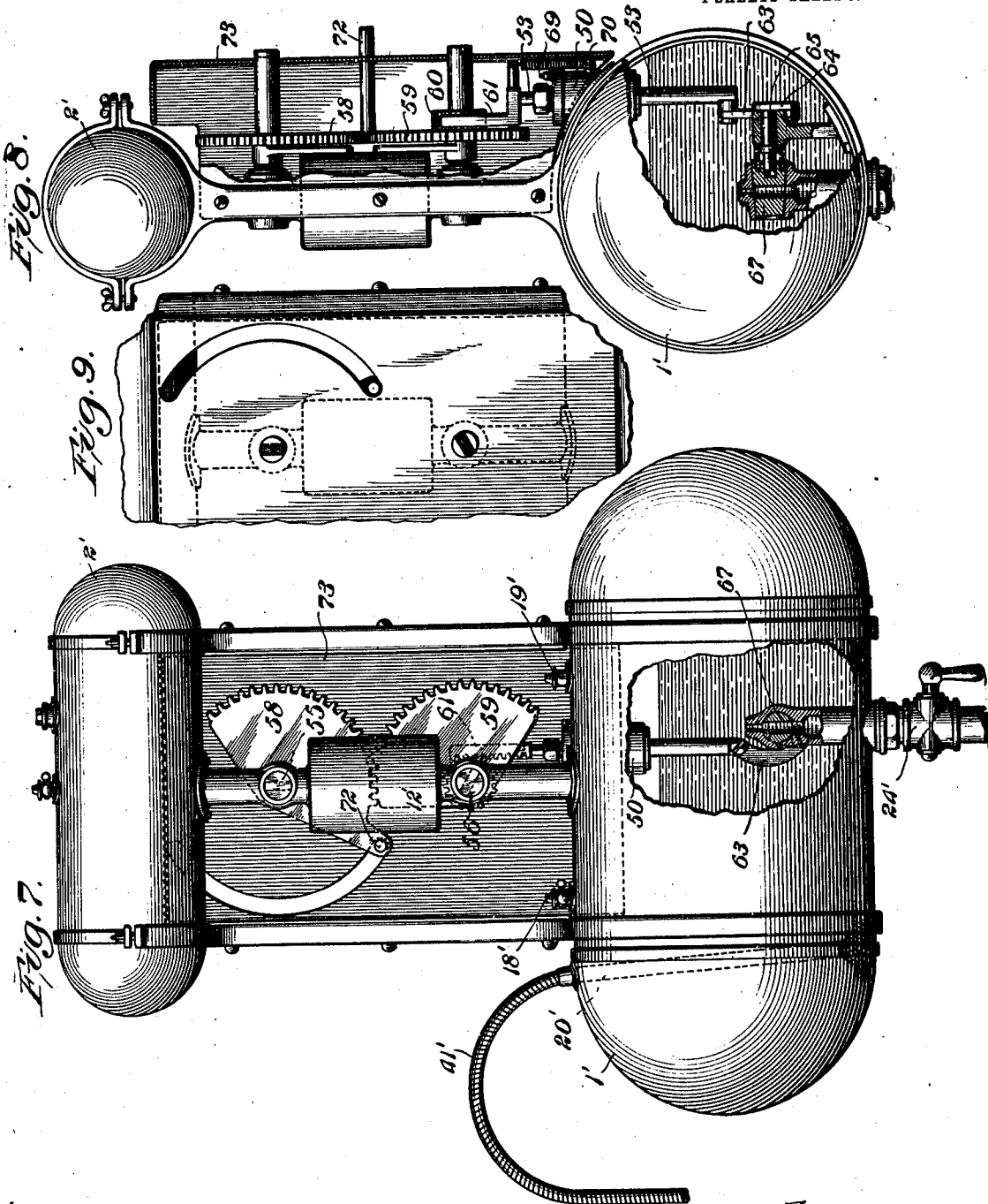
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4 SHEETS—SHEET 3.



Attest:
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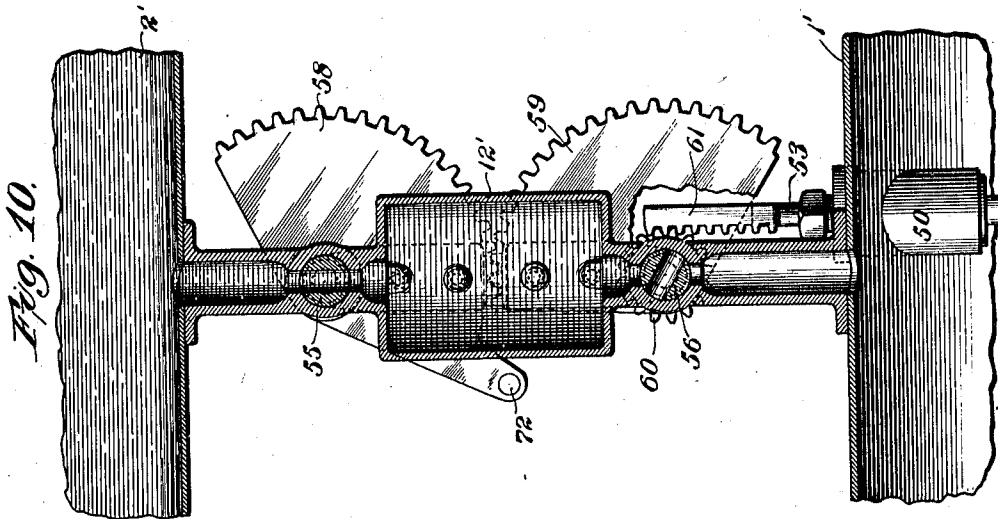
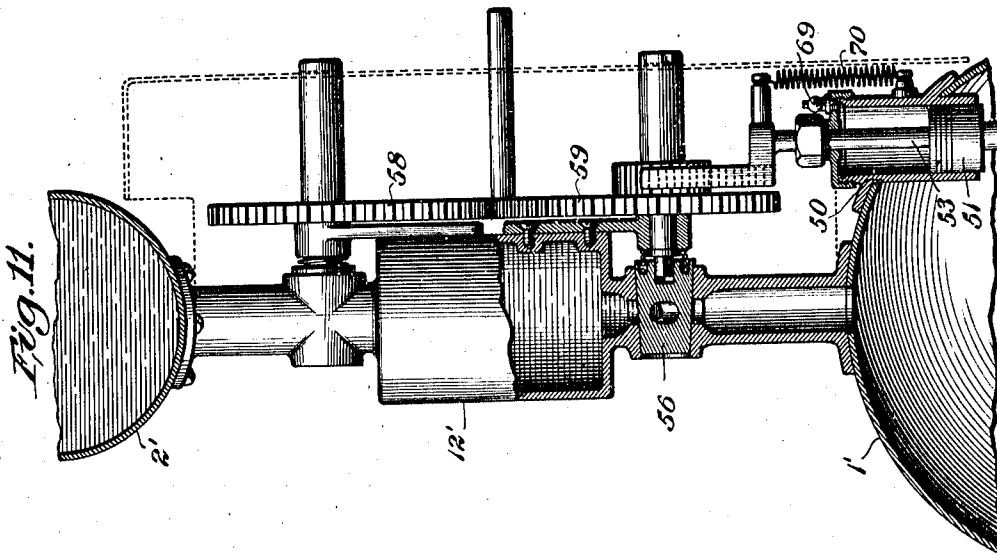
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR EXTINGUISHING FIRES.

1,003,853.

Specification of Letters Patent. Patented Sept. 19, 1911.

Application filed November 23, 1910. Serial No. 593,924.

To all whom it may concern:

Be it known that I, DANIEL W. ADAMS, a citizen of the United States, residing at Glendale Springs, in the county of Ashe and State of North Carolina, have invented new and useful Improvements in Apparatus for Extinguishing Fires, of which the following is a specification.

My invention relates to improvements in apparatus for extinguishing fire by projecting thereon streams of water and chemicals under great pressure, which is generated in a mixing tank by the evolution of gas due to the reaction of the chemicals. This principle has been applied heretofore, but in so far as I am aware, there has been no provision for automatically replenishing the water and the chemicals in the mixing tank or reservoir after each discharge in order that the extinguishing apparatus may be continued in operation for a great length of time.

The object of my invention is to overcome this defect in prior fire-extinguishers of this type, and to provide a machine which will be automatic in its operation after it has been started, so that the firemen may devote their energies to the work of fighting the fire, the apparatus generating one reservoir full after another in continuous succession of chemically charged water under great pressure and delivering it to the discharge hose. I have thus greatly enlarged the scope of portable chemical fire extinguishers and have eliminated the manual operations necessary where extinguishers having a single charge are employed, or where the introduction of successive charges requires the manipulation of charging devices. These and other advantages of my invention will be understood from the following description in connection with the accompanying drawings, in which—

Figure 1 is a perspective view of apparatus embodying my invention arranged to be carried by horses upon pack-saddles; Fig. 2 is a side elevation, partly in section, of the mixing tank and acid-supply tank; Fig. 3 is an end elevation of the same; Fig. 4 is a perspective view of a set of water-supply tanks and air-pressure tank; Fig. 5 is a sectional view of a part of the mixing tank; Fig. 6 is an end elevation of an air-pressure tank showing the connectors leading to the water-tanks; Fig. 7 is a side elevation, partly in section, of a mixing tank and acid-supply

tank, showing another embodiment of my invention; Fig. 8 is an end elevation of the apparatus shown in Fig. 7; and Fig. 9 is a rear view of a portion of the same; Figs. 10 and 11 are sectional views showing the valves and operating mechanism therefor of the apparatus shown in Fig. 7.

When the apparatus is arranged to be mounted upon pack-saddles upon the backs of horses, in the manner illustrated in Fig. 1, a pair of mixing tanks 1 may be carried by the leading horse, and each connected with a centrally supported acid-supply tank 2, in the manner hereinafter described. I have shown the tanks 1 resting in brackets 4, attached to the saddle-arms 5, connected by a pivot-rod 6, provided with swivel 7. The acid-tank 2 may rest above the crossed extensions of the arms or may be supported upon metal cradles 10 clamped to the mixing tanks, as shown in Figs. 2 and 3.

Each mixing tank is connected to the acid-supply tank by means of a measuring-tube 12, which may be a brass pipe having upper and lower valve seats 13, 14, and is preferably platinum plated upon its interior. The double-ball valve which governs the flow of acid may consist of a pair of glass balls 13^a, 14^a connected by means of a platinum-plated rod. A cut-off valve 11 serves to shut off the acid supply when the apparatus is not in operation. The acid-supply tank may be a porcelain-lined or a lead-lined metal tank and is supplied with a filler inlet-screw 15 and an air-cock 16.

The mixing tank may be a lead-lined brass cylinder capable of withstanding large pressures, and is provided with an air-cock 18 and a safety pop-valve 19 set for 300 pounds pressure. A delivery pipe 20 for the hose connection extends nearly to the bottom of the tank and is provided with a screen or sieve over its inlet opening. The inlet connection leading to the water-supply tanks contains a check-valve 22 and is also provided with a cut-off valve 24 below the connection 25 leading to the mixing tank upon the opposite side of the saddle.

The water-supply tanks 30, are arranged upon either side of the pack-saddles in the manner shown in Figs. 1 and 4, each tank preferably holding about 15 gallons of dilute sodium solution. An air-tank 32, connected with each tank, maintains the solution under a pressure of from ten to twenty pounds. If the air in the tank 32 is compressed to

2,400 pounds, and is connected with the tanks through pressure-reducing valves so as to maintain a pressure upon the liquid of ten or twenty pounds, the tanks 32 will be able to empty each tank about fifteen times. The tanks may conveniently be provided with hand pumps 33, and pressure gages 34. As many pairs of water-supply tanks may be carried as are found necessary to extinguish the fires, but I have usually found ten tanks to be sufficient for use in fighting forest fires.

The discharge tubes 36 of each pair of tanks are connected by means of a Y-union with the main supply hose 38 leading to the mixing tanks. The several sections of the main supply hose are connected by lever-valve couplings 39 and a cut-off valve 40 is located in the rear of each union 37. By means of this arrangement any number of water-supply sets may be connected together.

The operation of my automatic apparatus for extinguishing fires will be understood from the foregoing description. Assuming that the acid-supply tank 2 has been filled with sulfuric acid and each of the tanks 30 with a dilute solution of sodium carbonate, and the air in tanks 32 having been compressed to the desired pressure, the apparatus may be set in operation in the following manner:—The air-cock 18 is opened and the valve 24 in the main supply hose is opened to permit the mixing tanks 1 to fill with the sodium solution. As soon as the solution begins to escape through the air-cock 18, the supply valve and the air-cock are closed and the acid cut-off valve 14 is opened, permitting the acid to enter the measuring tube 12. Upon again opening the supply valve 24, the solution in the mixing tank will be subjected to ten or twenty pounds pressure, depending upon the pressure maintained in the supply tanks, thereby lifting the ball-valve and forcing it up against the upper seat 13, thus permitting the measured quantity of acid to descend into the mixing tank. The reaction of the acid and sodium solution immediately evolve a large amount of carbonic acid and subject the solution to a pressure of about 300 pounds. As soon as the pressure in the tank reaches about ten pounds the check valve 22 closes off the supply hose, although the valve 24 remains open. The apparatus is now in condition to continue in operation automatically until all of the several supply tanks are emptied. Upon opening the cut-off valves 42, 43, in the hose 41 leading to the discharge nozzles 44, 45, the chemically charged solution in the mixing tanks will be discharged with great force. I have found it desirable to provide a spray nozzle 45 and a ball nozzle 44, and have been able to throw a stream from the latter to a height of fifty feet or over. As soon as the liquid is ex-

hausted and the pressure in the mixing tank falls below ten pounds, the weight of the ball valve plus the weight of the acid in tank 2, causes the ball valve to descend and seat against its lower seat 14, allowing the measuring tube 12 to fill; check valve 22 also opens under the ten pound pressure in the supply hose and refills the mixing tank, again lifting the ball valve and permitting the measured quantity of acid to enter the sodium solution. The operation is thus repeated automatically and continues until all of the supply tanks are empty. If, however, the fire is extinguished before all of the tanks have been discharged, the operation can be stopped by closing the cut-off valves 42, 43. Before disconnecting the several main hose supply sections, the cut-off valves of the acid-supply, mixing tank, and water-supply tanks are closed.

In Figs. 7 to 11, inclusive, I have illustrated another embodiment of my invention, in which the mechanism for operating the valves connected with the mixing and acid tanks differs somewhat from that described in connection with Fig. 2, the corresponding parts being designated by the same reference numerals primed. In this arrangement, the valves are positively operated by means of mechanism mechanically connected to a piston, the valves being actuated synchronously and being maintained in a definite fixed relation. A cylinder 50 extending within the mixing tank is provided with a piston 51, having a piston-rod 53, extending in opposite directions and connected to the valve-gear. The valves 55, 56, which govern the filling and the discharge, respectively, of the acid-measuring tube or receptacle 12', are connected by segmental gears 58, 59, mounted upon the valve stems. The stem of valve 56 also carries a pinion 60 which meshes with a rack 61 secured to the upper end of the piston-rod 53. The lower end of the piston is connected by means of link 63 and lever-arm 64 with the stem 65 of the valve 67. The valve stems may have squared inner ends fitting into sockets, the valves being held upon their seats under spring pressure as shown. The operation of the valve-operating mechanism will be readily understood. To start the operation, the air-cock 18' is opened, and the parts being in the position indicated in Fig. 7, upon opening the main cut-off valve 24', the sodium solution from the supply tanks flows into the mixing tank, the air-cock being turned off when it is full. Inasmuch as the valve 55 is also open, the acid from the tank 2' fills the measuring tube or chamber 12'. The liquid in the mixing tank being under a pressure of ten or more pounds, lifts the piston 51, which rotates the valves 55 and 67 into closed position and simultaneously opens the valve 56, through the gear and

link connections, thereby permitting the acid to descend into the mixing or generating tank and cutting off the main conduit leading to the supply tanks. The air above the piston escapes through the air-relief-cock 69. As soon as the acid enters the sodium solution, the generation of carbonic acid places the liquid in the mixing or generation tank under a pressure of about 300 pounds, as previously explained in connection with Fig. 1, and the charged liquid may be delivered through the hose 41' to the nozzles under forced pressure. When the liquid has discharged from the generating tank, and the pressure has dropped below ten pounds, the piston will drop, assisted by the retractile spring 70, into the lower position, thereby actuating the valves and automatically returning them to the position shown in Fig. 7, causing a repetition of the filling and generating steps above described. This process will be repeated again and again, until the liquid in all of the supply tanks has been exhausted, thus leaving the firemen free to direct the streams issuing from the hose-nozzles. I have pointed out that the valves 55 and 67 are opened simultaneously, and that valve 56 is closed when the other two valves are open. Valve 56 is placed at such an angle that it will not assume the open position until after the valve 55 is closed, thus absolutely cutting off the acid supply before the acid is permitted to enter the mixing tank, thereby avoiding any dangerous conditions. In order, however, that the pressure shall be maintained upon the piston until some of the acid has been permitted to enter the mixing tank, the valve 56 is arranged to open slightly before the valve 67 has entirely closed. The safety valve 19' is set for 300 pounds to avoid any danger due to a pressure exceeding the elastic limit of the tank. In case it should be desired at any time to manually operate the valve-mechanism, I have provided a hand-lever-arm 72 on the gear 58 which swings in a slot in the housing 73.

While I have described in detail the particular apparatus illustrated in the drawings for the purpose of showing one embodiment of my invention, it is evident that many changes may be made therein without departing from the spirit of my invention or the scope of my claims. I have described an apparatus adapted to be carried upon horses and especially applicable to use in extinguishing forest fires, or fires occurring in rural districts; it is evident, however, that it may be mounted upon trucks or other conveyances for use in the fire service of cities.

Having thus given a full disclosure of my invention, I claim:—

1. An automatic fire extinguishing apparatus comprising a liquid-supply reservoir,

an acid-supply vessel, a mixing tank, a conduit connecting said reservoir and said tank, a measuring chamber intermediate said vessel and said tank, and means actuated by fluid-pressure within said tank operating to automatically govern the flow of liquid from said vessel and from said reservoir into said tank. 70

2. An automatic fire extinguishing apparatus comprising a liquid-supply reservoir, an acid-supply vessel, a mixing tank, a conduit connecting said reservoir and said tank, a measuring vessel intermediate said vessel and said tank, valves governing the flow of liquid from said reservoir and a measured quantity of acid from said acid-supply vessel into said tank, and means actuated by fluid pressure within the mixing tank to automatically control the operation of said valves. 75 80 85

3. Automatic fire extinguishing apparatus comprising a liquid-supply reservoir, an acid-supply vessel, a mixing tank, a conduit connecting said reservoir and said tank, a tube provided with a measuring chamber directly connecting said vessel and said tank, coöperating valves in said tube for governing the flow of liquid therethrough and automatically controlled by fluid pressure within said tank, a cut-off valve controlling said conduit, and a discharge-hose having a cut-off valve connected with said tank. 90 95

4. Apparatus for extinguishing fires comprising a plurality of liquid-supply reservoirs, independent external means for maintaining liquid therein under pressure, an acid-supply vessel, a mixing tank, a common supply conduit connected to each of said reservoirs and to said tank, a measuring tube directly connecting said vessel with said tank, and means for automatically governing the successive discharge of liquid from said reservoirs into said mixing tank and acid from said vessel successively into said measuring tube and from said tube into said mixing tank. 100 105 110

5. Apparatus for extinguishing fires comprising a plurality of liquid-supply reservoirs, means for maintaining liquid therein under pressure, an acid-supply vessel, a mixing tank, a common supply conduit connected to each of said reservoirs and to said tank and provided with a pressure-operated valve, a measuring tube connecting said vessel with said tank having interconnected valves, and means actuated by fluid pressure within said tank for actuating said valves to govern the flow of liquid from said reservoirs and acid from said vessel into the tank. 115 120

6. Apparatus for extinguishing fires comprising a plurality of liquid-supply reservoirs, a source of air pressure connected with said reservoirs, a chemical-supply vessel, a mixing tank, a main supply conduit connecting said reservoirs with said tank, a 125 130

tube connecting said vessel with said tank, and fluid pressure-controlled means operable by pressure within said tank to govern the flow of liquid from said reservoirs and from said chemical-supply vessel into said tank.

7. Apparatus for extinguishing fires comprising a plurality of liquid supply reservoirs, air-pressure tanks connected with said reservoirs, an acid-supply vessel, a mixing tank, a common supply conduit connected to each of said reservoirs and to said tank, a measuring tube connecting said vessel with said tank, and having valves at opposite ends thereof, a valve between said conduit and said tank, each of said valves being automatically controlled by fluid pressure within said tank and a discharge hose connected with said tank.

8. Apparatus for extinguishing fires comprising a plurality of liquid-supply reservoirs adapted to contain an alkaline solution, a vessel adapted to contain a supply of acid, a mixing tank, a conduit connecting said reservoirs and said tank, a tube connecting said vessel and said tank, and mechanism for filling the tank with the alkaline solution and successively with a measured quantity of the acid and for automatically repeating the same at intervals after each evacuation of the mixing tank.

9. An apparatus of the type set forth

comprising a chemical supply vessel, a mixing tank, a measuring tube connecting said vessel and tank, cooperating valves within said tube, and interconnected means for causing one valve to close when the other valve opens.

10. An apparatus of the type set forth comprising a chemical supply vessel, a mixing tank, a measuring tube connecting said vessel and tank, cooperating valves within said tube, interconnected means for causing one valve to close when the other valve opens, and means actuated by fluid pressure within said tank for operating said valves.

11. An automatic fire-extinguishing apparatus, comprising a liquid-supply reservoir, a chemical supply vessel, a mixing tank, a valved conduit connecting said reservoir and said tank, a measuring chamber intermediate said vessel and said tank, interconnected inlet and outlet valves at opposite sides of said chamber, and means actuated by fluid pressure in said tank to operate said valves.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

DANIEL W. ADAMS.

Witnesses:

P. F. CHAPPELL,
HENRY E. GREENLEAF.