No. 716,885. Patented Dec. 30, 1902.

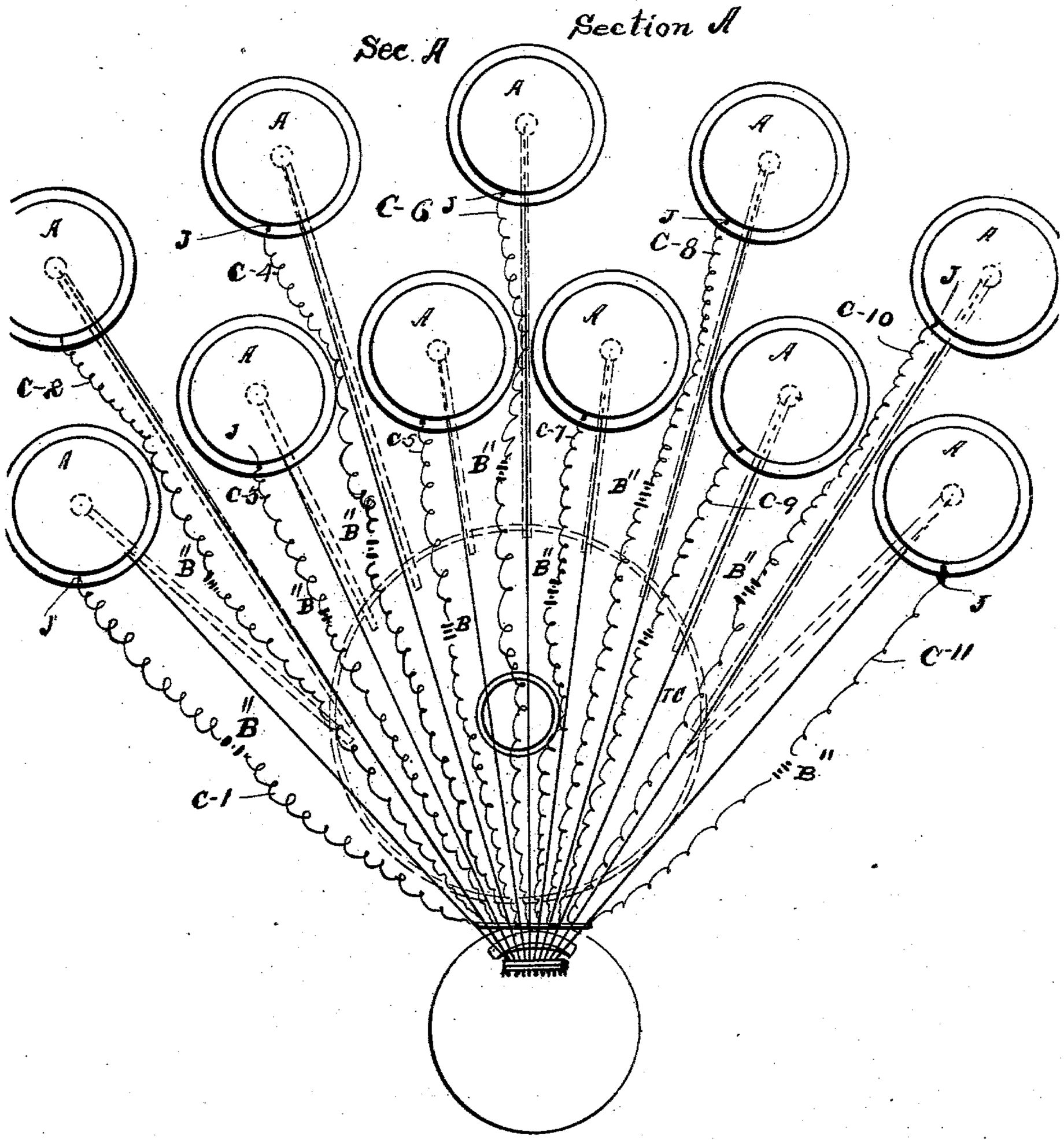
W. F. GAUL.

MEANS FOR EXTINGUISHING FIRES IN OIL TANKS.

(Application filed Oct. 14, 1901.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1



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(No Model.) 5 Sheets—Sheet 2.

Fig. 2

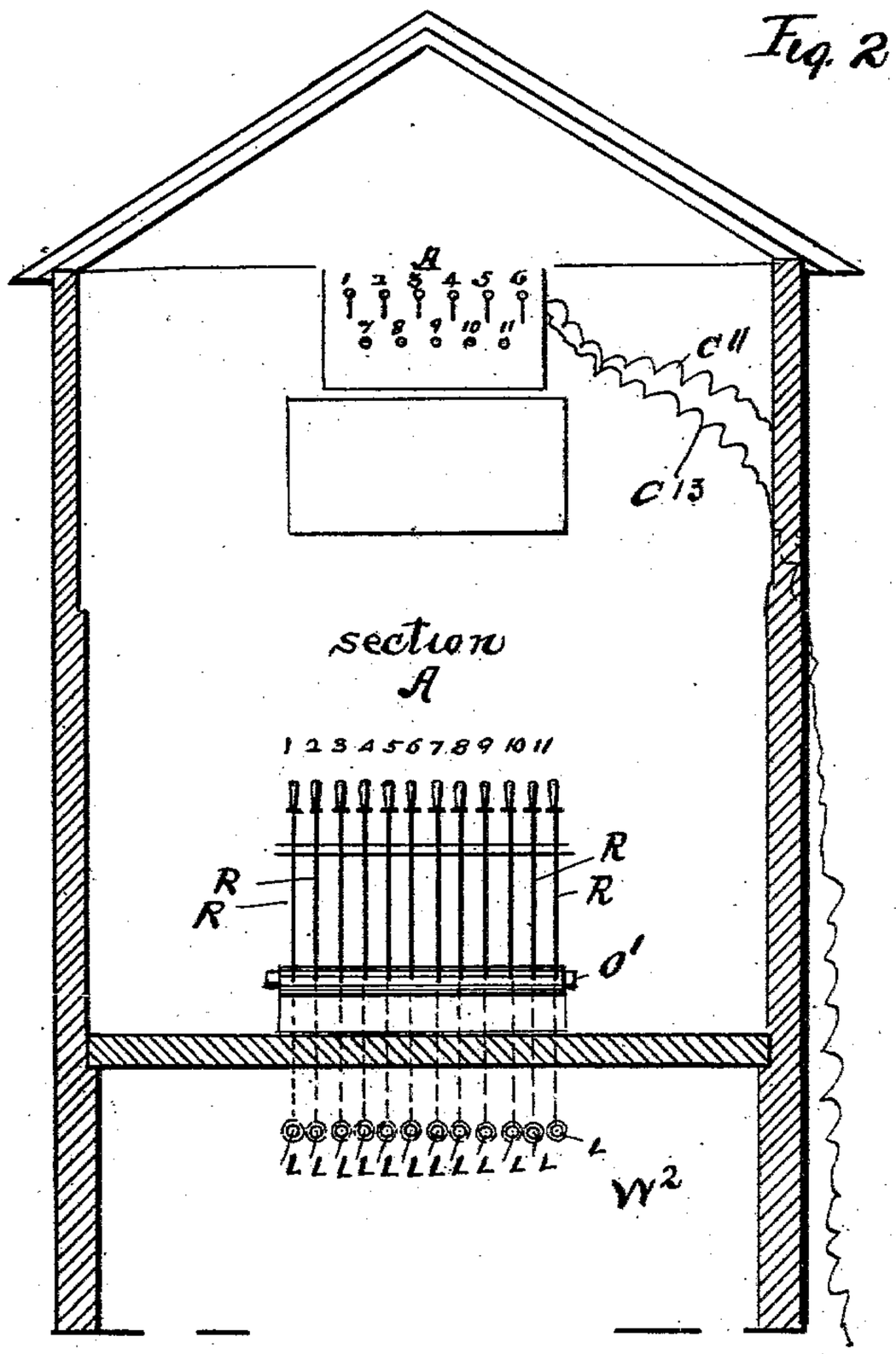
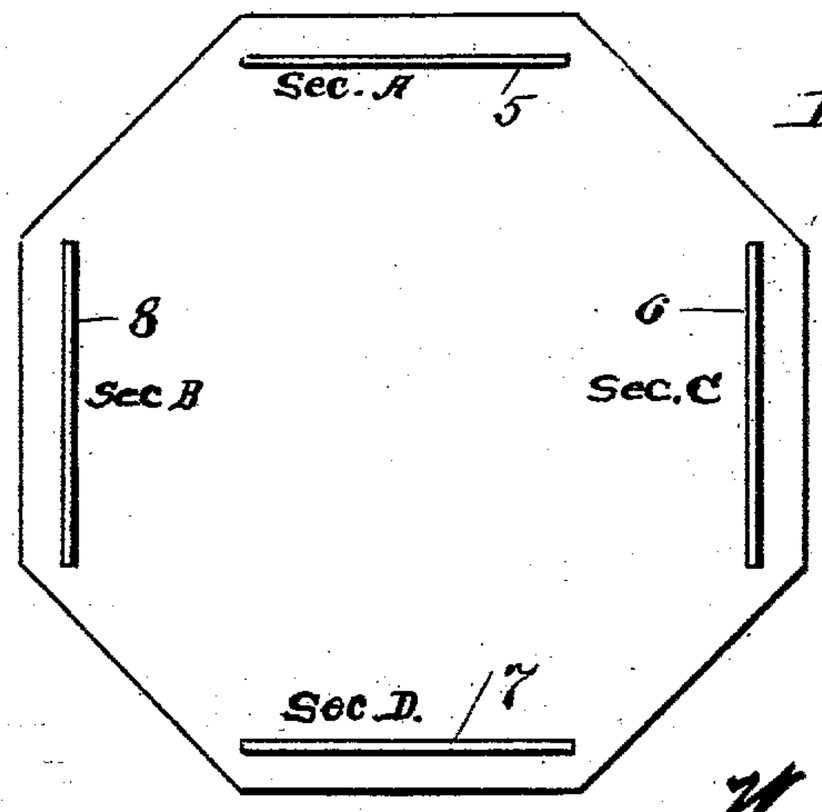


Fig. 3



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No. 716,885. Patented Dec. 30, 1902.

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MEANS FOR EXTINGUISHING FIRES IN OIL TANKS.

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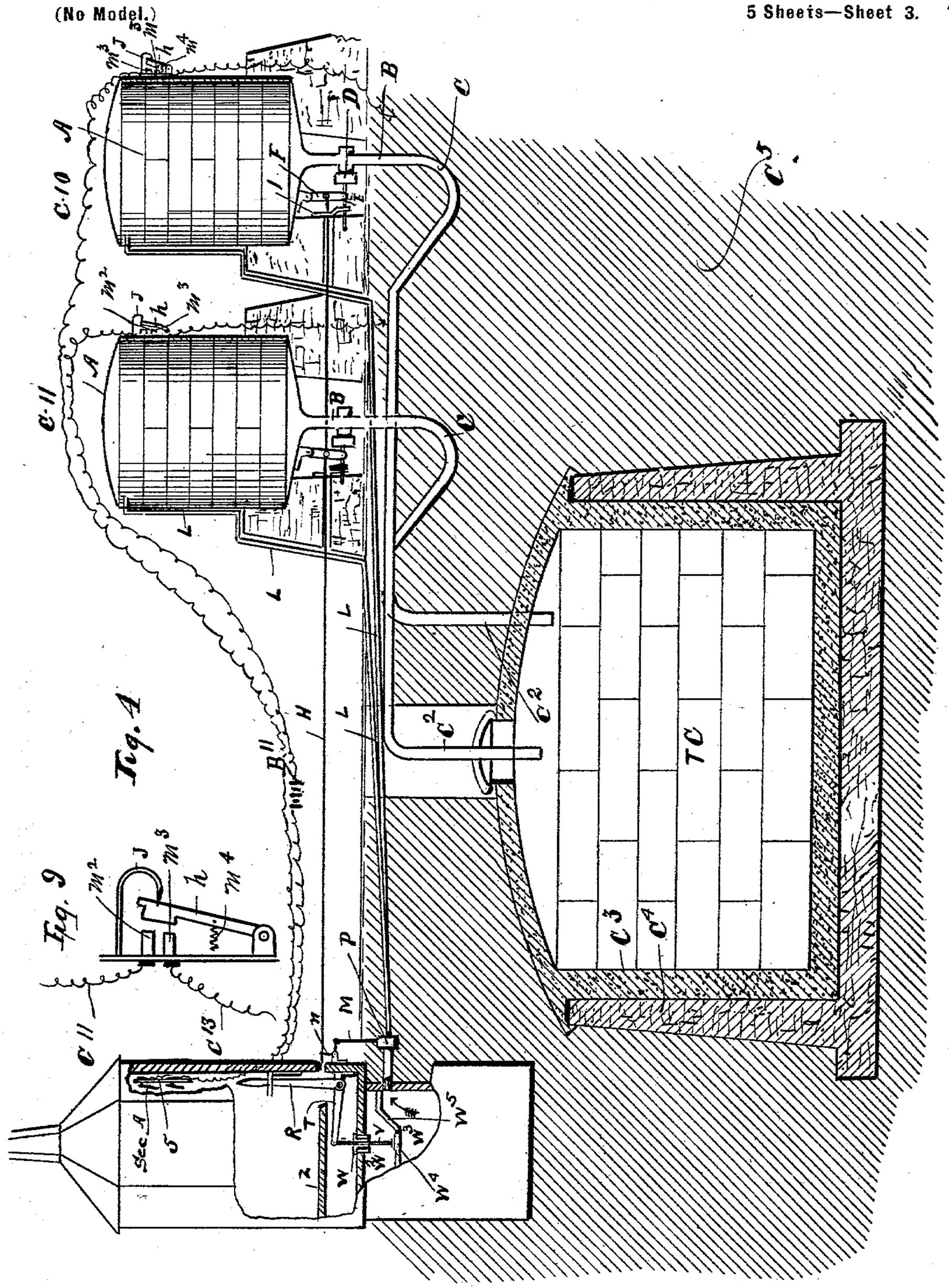
(No Model.) 5 Sheets—Sheet 3.



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No. 716,885. Patented Dec. 30, 1902.

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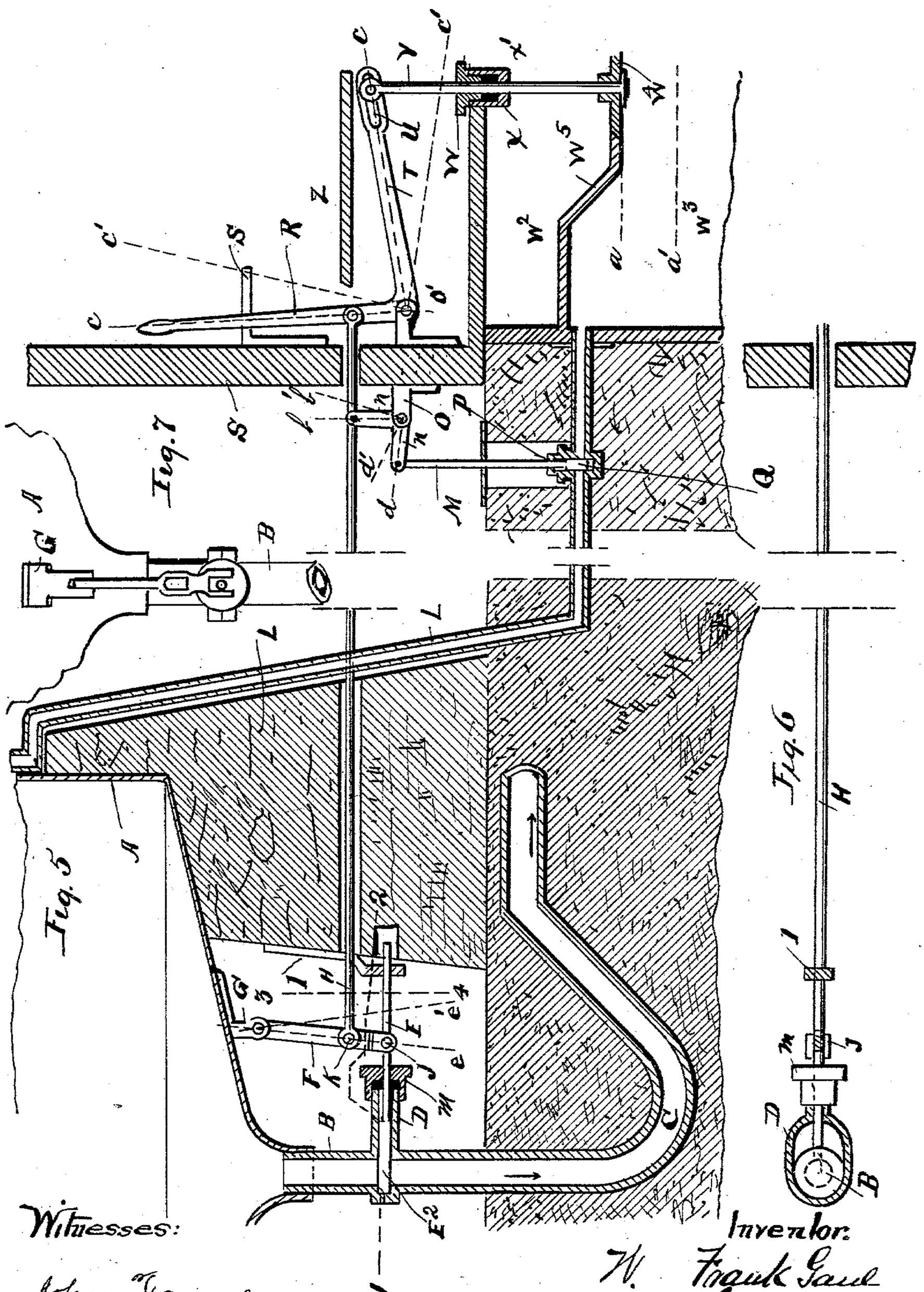
MEANS FOR EXTINGUISHING FIRES IN OIL TANKS.

(Application filed Oct. 14, 1901.)

(No Model.) 5 Sheets—Sheet 4.



No. 716,885. Patented Dec. 30, 1902.

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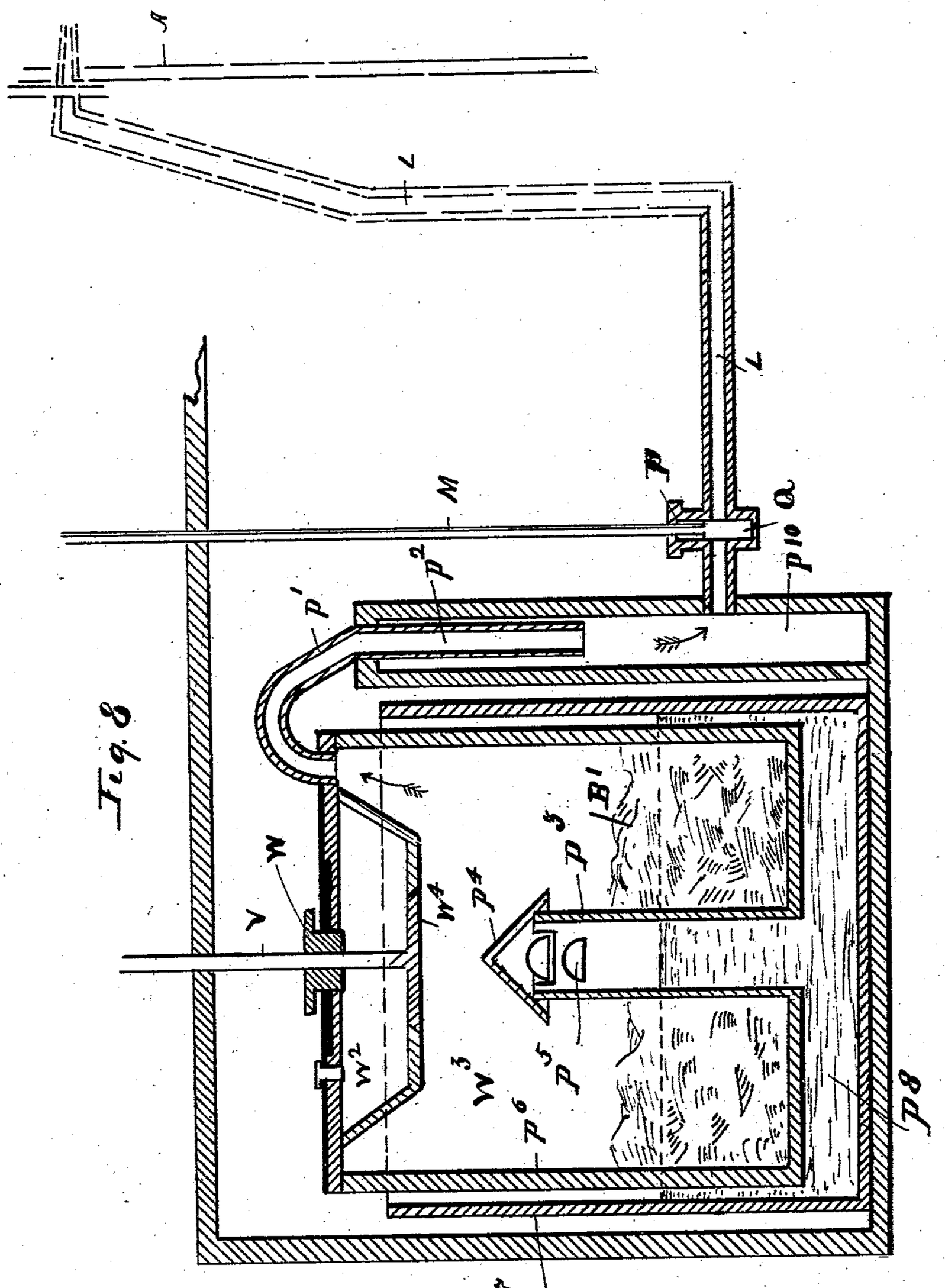
(No Model.) 5 Sheets—Sheet 5.



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UNITED STATES PATENT OFFICE.

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MEANS FOR EXTINGUISHING FIRES IN OIL-TANKS.

SPECIFICATION forming part of Letters Patent No. 716,885, dated December 30, 1902.

Application filed October 14, 1901. Serial No. 78,538. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM FRANK GAUL, a citizen of the United States of America, and a resident of Greenbank, State of New Jersey, have invented certain new and useful Improvements in Means for Extinguishing Fires in Oil-Tanks, of which the following is a specification.

My invention has reference to means for extinguishing fires in oil-tanks when arranged in groups or series or otherwise.

It consists of features fully set forth in the following specification and the accompanying drawings, forming part thereof.

The object of my invention is to provide positive and reliable apparatus to extinguish fires originating from any cause in oil-tanks at oil-refineries or in storage-yards wheresoever located. These tanks are usually arranged in series or groups, as the quantity of oil is generally so large that it is not practicable to store it all in one tank.

It consists, therefore, in combination, with a series of oil-retaining tanks, of a central station wherein is located a series of annunciators electrically connected, each with its respective tank, a common receiving-tank into which the oil of any of the series of tanks is dischargeable through suitable connections, and a series of hand-controlled means for simultaneously opening the oil-valves, the gas-valves, and the valve permitting the sulfuric acid to pass into a vessel containing bicarbonate of soda, from which latter two ingredients is produced the carbonic-acid gas which I use to extinguish any accidental ignition of any or of all the tanks.

In the drawings like parts are referred to by marks or figures of a corresponding kind in the different views.

Figure 1 is a plan of a series of tanks with central station and large receiving-tank indicated. Fig. 2 is a vertical section of central station and side elevation of the series of levers for controlling the different valves, respectively, for the egress of oil from tanks, egress of gas from generator, and sulfuric acid from its retainer. Fig. 3 is a ground plan of a central station as the indicator-boards for the annunciator would be arranged when more than one series of oil-tanks would be employed. Fig. 4 is partly an elevation of a central station and part vertical section, a vertical section through large discharge-tank with oil-conductors from individual tanks to large tank shown. Fig. 5 is a vertical section through one of the small oil-tanks with its foundation-support shown, also a vertical section through the wall of the central station and side elevation of the lever connections between the annunciator-station and the different parts that this lever operates. Fig. 6 is a section on line 1 and 2 of Fig. 5. Fig. 7 is a section on line 3 and 4 of the same figure looking toward the tank. Fig. 8 is the way in practice that I prefer to construct my gas-generator. The outlet to the tank, it will be seen in this view, is very much contracted. Fig. 9 is a detail of the fuse or cut-out.

A, Fig. 5, is one of the oil-tanks. There are a series of these tanks, as shown in Fig. 1. They are all of like construction and capacity, and a description of one will therefore suffice for a description of all. While I show these tanks in series, as in Fig. 1, yet I in practice, where the requirements of the plant would warrant, would so plot the ground plan for the location of these that I would have four sections, all similar to Fig. 1. Therefore Fig. 1 and the group of tanks therein indicated would only represent one section.

In Fig. 3 numerals 5, 7, 6, and 8 represent horizontal sections on indicator-boards in a central station, where I use four sections of tanks. For the purpose of this specification we will assume that the tanks indicated in Fig. 1 are section A. We will therefore make the annunciator shown in Fig. 2 have the the same number of indicators that Fig. 1 has oil-tanks, and the different wires C' C^2 C^3 C^4 C^5 C^6 C^7 C^8 C^9 C^{10} C^{11} each represent an electrical circuit between each tank and its respective annunciator. The numerals on the line-wire represent the number of the tank, and C the circuit. A battery B^{11} is shown in each circuit, and the earth is used as a return-conductor. It will now be apparent that for each tank I have an annunciator and an electrical connection between each tank and the central station, where the annunciators are arranged convenient for observation on the part of the attendant.

On consulting Fig. 2 it will be seen I show a series of levers in elevation. There is one of these levers for each tank, and therefore one for each indicator. The function of these levers will be explained more at length hereinafter. Where there were several stations of tanks there would be a set of levers for each section, just as there would be a set of indicators for each section.

Returning now to the detailed description, R is the hand-engageable arm of one of the levers aforesaid. These levers are of the bell-crank class. T is the other arm thereof.

U is a slotted opening in the arm T and carries a pin C, fixed to the head of the rod V. Thus the pin C can slide freely in the slot U, permitting thereby the rod V to have a vertical rectilinear motion independent of the curvalinear motion of the point with which the pin C contacts.

W and X form the guide and means for retaining the packing X′ in proper oil-tight condition.

W^2 is a chamber for storing sulfuric acid, and W^3 is a chamber containing the bicarbonate of soda. Sulfuric acid being a liquid, it is very evident that when I swing the lever R T from C to C′ the valve W^4, being fixed to the rod V, will be opened and the liquid acid will pass into the chamber W^3. The contacting of the sulfuric acid with the bicarbonate of soda generates carbonic-acid gas, which is the gas I employ, as I have hereinbefore stated. It will be seen in Figs. 4 and 5 I show the bicarbonate-of-soda chamber as one of fixed and unyielding dimensions; but in Fig. 8 I show a water-seal gasometer construction. The latter in practice would be my choice, although the former will perform the function of its design. The latter is my choice, because it enables me to keep a steady pressure on the stored gas after generation and to thus accumulate a larger quantity of gas in store for distribution.

n n represent a small bell-crank lever pivoted to the rod H at one end and carrying the rod M at the other. It is supported by a carrier O to the frame of the station S.

Q is a valve carried by the rod M and held in a box P. This valve controls the outlet of the gas from the gas-chamber W^3. It is now apparent that the gas-conductor L when the lever R T is moved from *c* to *c′* will be free to permit the gas to pass by the valve Q and thereafter on its way to the tank A to its work of flame-extinguishing. The said valve Q is opened by the bell-crank *n n* being moved—oscillated—from *d* to *d′* and *b* to *b′*, as shown in Fig. 5. This Fig. 5, it will be noticed, is very much contracted—that is, the tank A and the central station S, in which the operator is located, are brought immediately together. Space limitations compel this, as it was necessary to make the drawings of fair proportions in order to clearly illustrate the different correlated parts in this view. It will now be seen from the description of the operation of the valve Q for the egress of the gas and the valve W^4 for the outlet of the sulfuric acid for the generation of the gas that these two valves are operated simultaneously. That is true also of the oil-outlet valve now to be described. I do not show the large oil-receiving tank in Fig. 5, as space limitations forbid; but this is shown in Fig. 4 clearly.

F, Fig. 5, is an oscillating bar supported to the tank A by the intermediate holder therefor, G. The rod H, previously referred to, is held to this bar by the pin K.

E is a rod carrying the valve E^2. D is the said valve-retainer, and *m* is a packing-retainer cap for the valve-rod E, making same oil-tight.

B is the oil-outlet pipe, which carries the valve above described. C is a curved section of the said pipe. The purpose of the curved section is to prevent flame from passing into the large tank from any smaller one that may have taken fire.

The rod E is supported in proper alinement with the valve by the fixed support therefor, I.

As I have already referred in this specification to the identity in structure of all the tanks and their connections, it follows that the detailed description of all the coöperating elements for the performance of the functions set out would be the same for all the tanks in a series or section, and therefore a description of this one, as shown in Figs. 5, 6, and 7, is a description of all; but while I show this hand-lever-actuating mechanism as the preferred means to actuate the different valves I desire it understood I do not limit myself to this specific means for accomplishing this purpose. I could with equal success use compressed air or electric magnets to do all I accomplish by the arrangement specifically described.

In Fig. 4 I show a view of the parts set out in Fig. 5, but on a reduced scale, and by reason of this reduced scale I am enabled to show the large common tank in approximately its relative correct position. The body of this tank is shown at T C. C^3 represents a heavy concrete wall lined with cement, so as to be positively oil-tight. C^4 represents masonry of a thickness to resist the greatest strains to which it would be subject. This tank is placed in the solid earth (indicated by C^5.) The outlet-pipes for oil B B and the gas-conducting pipes L L L having been fully described, further reference to them here is not thought necessary. C^2 C^2, as will be seen, represent a depending portion of the pipes B, and it leads directly into the tank T C. In Fig. 4 there are only two oil-storing tanks shown. This showing is considered sufficient, as it would not be practical to show a larger quantity in section. However, in practice it will be understood that each common tank T C has as many as eleven supplemental tanks in position to discharge their oil contents into it. It is evident that the number of these tanks,

as well as their size, will be determined by the volume of business that the plant will be handling.

Fig. 9 is an enlarged view showing the manner in which my electrical circuit is closed after a tank has taken fire. *h* in this figure is a switch normally held in the position shown in Fig. 9 by a metallic support or retainer J. This retainer is made of some metal that will melt at a low temperature. M^2 and M^3 are two terminals of the conductors C^{11} and C^{13}. When a tank has become ignited the temperature is speedily raised to a degree sufficient to melt the switch-support J, whereupon the spring m^4 will pull the armature *h* to the terminals m^2 and m^3 and close the circuit C^{11} and C^{13}. The indicator corresponding to the tank ignited will be moved at the central station and the bell or gong sounded. The tanks shown in Fig. 4 have the switches, as shown in Fig. 9, but on too small a scale to be readable.

Fig. 8 shows my preferred construction of gas generator and reservoir. The said chamber in this construction is substantially the same as that shown in the other views, likewise the valves Q and W^4. The bicarbonate of soda is indicated at B'. As the valve W^4 is opened and the sulfuric acid permitted to drop on the soda the carbonic acid will pass through the ports P to contact with the water, and if the gas generated is in sufficient volume it will raise the chamber W^3. The water P^8 will prevent any escape of the gas. P^3 is a tubular integral part of the gas retainer or generator. P^6 and P^4 represent a roof therefor to prevent the acid from falling on the water. P^7 is a water-retaining chamber into which the gas-generator is placed. P' is a gas-outlet pipe having a depending portion P^2, leading to the gas-chamber P^{10}. From the chamber P^{10} the pipes L L L lead each to their respective tank.

The operation of my device is as follows: The common cause of fires in oil-tanks such as are here contemplated and which my invention is designed to extinguish is lightning. We will now assume that lightning has struck any one of the tanks shown in Fig. 1. The tank so struck will of course be immediately ignited. The heat will almost immediately melt the retainer J, and the armature *h* will immediately thereafter be drawn to the terminals m^2 and m^4, closing the circuit formed by the conductors c^{11} and c^{13}. The annunciator will indicate at the central station which tank is ignited, and the operator will pull the lever corresponding to the indicator. The pulling of this lever will open the gas-valve Q, oil-outlet valve E^2, and sulfuric-acid outlet-valve W^4. Now while the oil is discharging through the pipe C into the main tank T C the fire will gradually be extinguished by the carbonic gas being forced into the tank A through the pipe L. Thus do I not only save nearly all the oil of any tank that may become ignited by having same discharged from the burning tank, but I also prevent the spread of the flame by charging the air with carbonic-acid gas. Should other tanks be threatened or should more than one become involved, I would repeat the operation to each one so endangered.

While I speak only of carbonic-acid gas as a material to use in the extinguishing of the flame, I desire it understood I do not limit myself to the employment of this agency for this purpose. The employment of any element, simple or compound, that will accomplish the work of flame-extinguishing comes within the compass of my desire, and as I do not limit myself to the chemical element that I employ for the purpose above set out, neither do I limit myself to the exact specific structure mechanically set out, but could make numerous modifications without departing from the spirit of my invention.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination in a device for extinguishing fires in an oil-tank, of a series of oil-tanks, a tank common to the said series, a series of indicators one for each tank, a connection between each tank and its indicator normally inoperative, but rendered operative by heat action automatically, a bicarbonate-of-soda chamber, it being also a gas-generating chamber, a valve interposed between the two said chambers, a gas-conductor interposed between the said gas-generating chamber and each of said series of oil-tanks, and hand-controlled means for simultaneously operating the valve for the bicarbonate-of-soda chamber, gas-outlet valve and oil-outlet valve, as and for the purpose set forth.

2. The combination in a device for extinguishing fires in oil-tanks, of a series of tanks, a series of indicators, one for each tank, a connection between each tank and its indicator normally inoperative but rendered operative by heat action, a series of oil-outlet conductors, a series of hand-controlled levers, a gas-generating chamber, it being also a bicarbonate-of-soda receptacle, a sulfuric-acid chamber, a valve interposed between the two said chambers, a gas-conductor interposed between the said gas-generating chamber and oil-tank, and means for simultaneously operating the outlet-valve for the bicarbonate-of-soda chamber, the gas-outlet valve and the oil-outlet valve, as and for the purpose set forth.

3. The combination in a device for extinguishing fires in oil-tanks, of a series of tanks, a series of indicators one for each tank, a connection between each tank and its indicator normally inoperative, but rendered operative by heat, a series of oil-outlet conductors, one for each tank, a valve in each of the said conductors, a bicarbonate-of-soda receptacle, it being also a gas-generating chamber, a sulfuric-acid chamber, a valve interposed between the said two chambers, a gas-conductor interposed between said gas-generating cham-

ber and each of said oil-tanks and hand-controlled means for simultaneously operating the outlet-valve for the bicarbonate-of-soda chamber, the gas-outlet valve and the oil-outlet valve, as and for the purpose set forth.

4. The combination in a means for extinguishing fires in oil-tanks, of a central oil-tank of relative large dimensions, a series of smaller oil-tanks whose combined capacity approximately equals the larger tank, a series of oil-conductors one between each of the smaller and the large tank, a central or common station, a series of means in the said station for operating said valves whereby the discharge of the oil from the smaller to the large tank is controlled, a bicarbonate-of-soda chamber it being also a gas-generating chamber, a sulfuric-acid chamber, a gas-conductor interposed between the said gas-generating chamber and oil-tanks and hand-controlled means for simultaneously operating the valve for the acid-chamber, the gas-outlet valve and the oil-outlet valve.

5. The combination in a means for extinguishing fires in oil-tanks, of a large common tank, a series of smaller tanks, a carbonic-acid-gas retainer, a gas-generating chamber, it being also a bicarbonate-of-soda chamber, a sulfuric-acid chamber, a valve interposed between the two latter chambers, a gas-conductor interposed between the gas-generating chamber and the oil-tanks and hand-controlled means for simultaneously operating the outlet-valve for the sulfuric acid, the gas-outlet valve and the oil-outlet valve, as and for the purpose set out.

6. The combination in a means for extinguishing fires in oil-tanks, of a series of tanks, a tank common to the said series, oil-conductors leading from each of the said series to the said common tank, a central station, means interposed between the said central station and each of the said tanks for controlling the discharge of the oil from all or any of said tanks to the said common tank, a gas-generating chamber, it being also a bicarbonate-of-soda-retaining chamber, a sulfuric-acid chamber, and means for simultaneously operating valves leading from the gas-chamber, the sulfuric-acid chamber and from any one of the oil-tanks as and for the purpose set out.

7. The combination in a means for extinguishing fires in oil-tanks, of a series of tanks, a common tank therefor, oil-conductors leading from each of the said tanks to the common tank, means interposed between each of said tanks and the common tank for conducting the oil therebetween, means for extinguishing a fire in any or all of the said tanks controlled from a central station, consisting of a gas generating chamber, a supplemental chamber thereto, a valve communicating between the two said chambers, an outlet-valve for said gas-generating chamber and an outlet-valve for each and all of the said oil-tanks.

8. The combination in a device for extinguishing fires in oil-tanks, of a central station, a series of tanks, a tank common to all of the said series, a series of oil-conductors one of which leads from the common tank to each of said tanks, a valve in each of said oil-conductors, a retainer for carbonic-acid gas, a generator for the said gas, a gas-conductor interposed between each of said tanks and said retainer, a valve in each of said conductors and means for simultaneously actuating all of the said valves, as and for the purpose set out.

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