W. D. HUFF.

AUTOMATICALLY CONTROLLED PUMPING STATION.

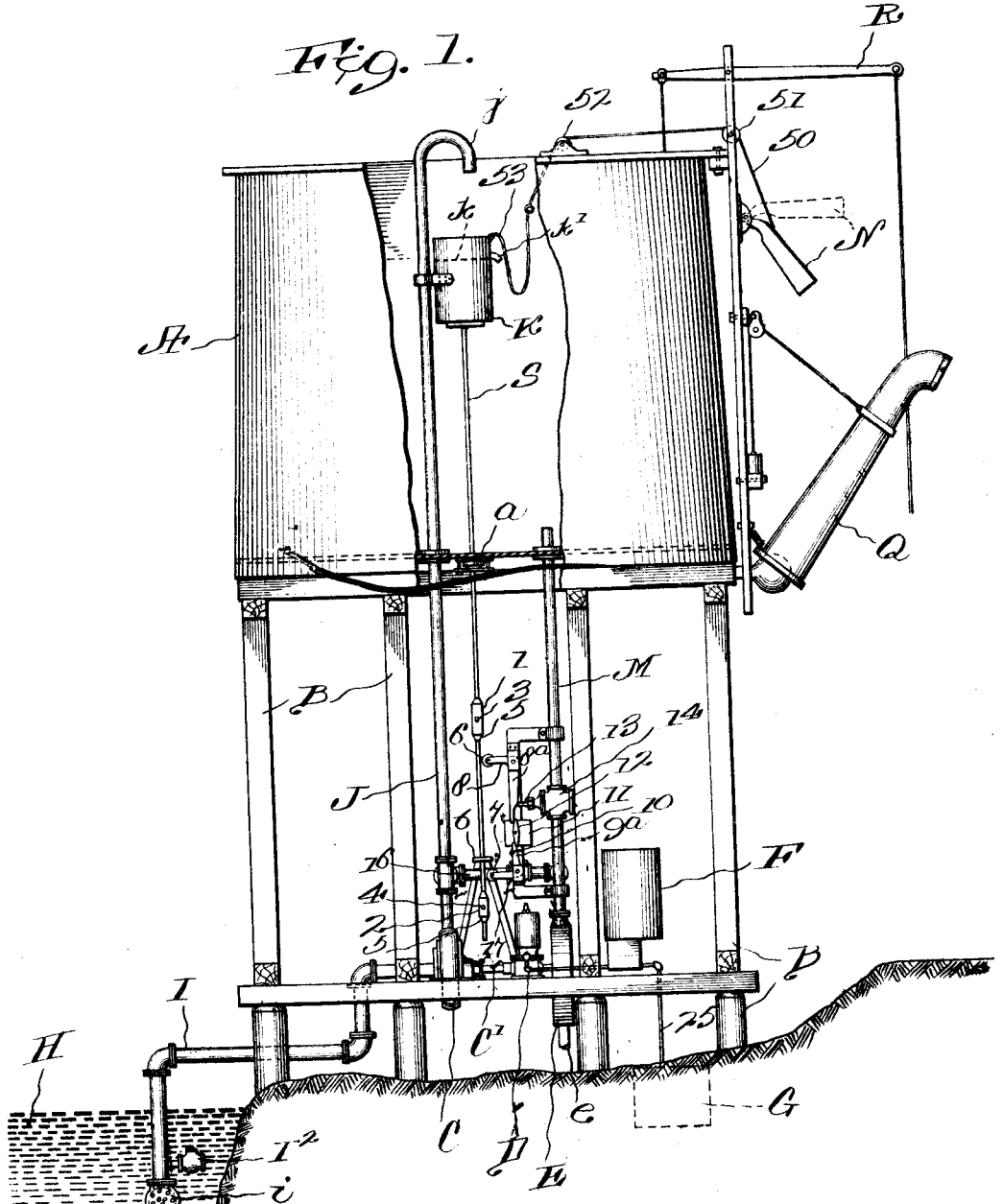
APPLICATION FILED NOV. 19, 1914.

1,172,994.

Patented Feb. 22, 1916.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

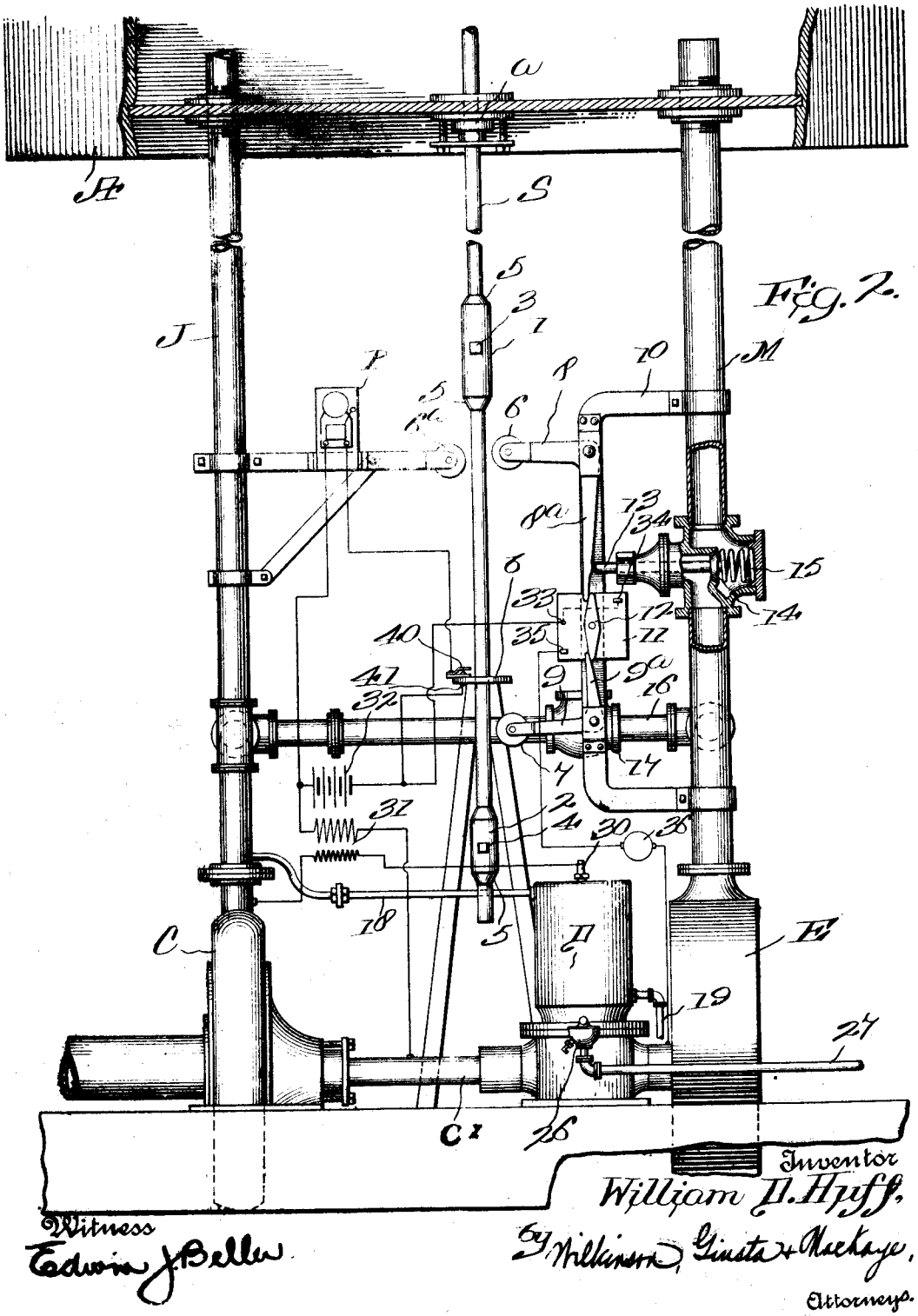


Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 3.

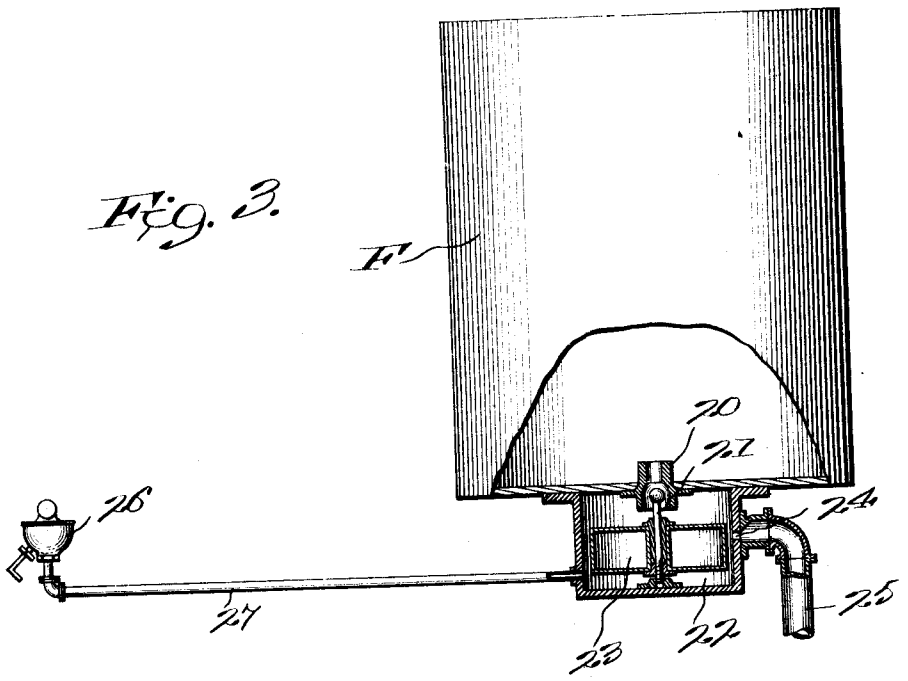
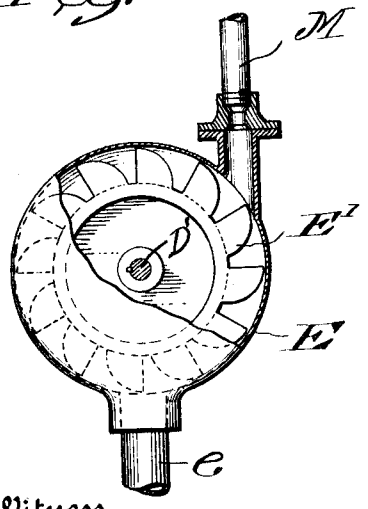
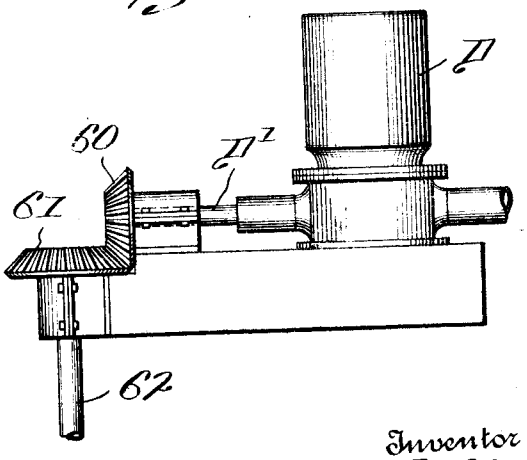


Fig. 4.



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Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM D. HUFF, OF LA FAYETTE, LOUISIANA.

AUTOMATICALLY-CONTROLLED PUMPING-STATION.

1,172,994. Specification of Letters Patent. Patented Feb. 22, 1916.

Application filed November 19, 1914. Serial No. 873,074.

To all whom it may concern:

Be it known that I, WILLIAM D. HUFF, a citizen of the United States, residing in the city of La Fayette, parish of Lafayette, and State of Louisiana, have invented certain new and useful Improvements in Automatically-Controlled Pumping-Stations; 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 appertains to make and use the same.

My invention relates to apparatus designed to automatically start and stop a gasolene or internal combustion engine, for the purpose of driving a pump or other means for lifting water, operated by such engine; and also to prime the water pipes before each operation and to drain the pipes and pump after each operation, whereby the danger from freezing is avoided, and the inconvenience and danger, due to water remaining in the operative parts when not required, is avoided; and the apparatus is further adapted to automatically take care of itself and operate in the absence of an attendant, and without any care or attention, for a period of several days at a time.

My invention particularly relates to pumping plants, such as are used by railroads to supply water to locomotives; and it also relates to pumping plants used by farmers and others, where water is elevated and stored, and it is desired to automatically replenish the supply so stored as it is used.

My invention will be understood by reference to the accompanying drawings, in which:—

Figure 1 shows an elevation of the complete apparatus, parts being broken away; Fig. 2 shows in elevation the lower part of the apparatus shown in Fig. 1, the parts being shown on a larger scale, and parts being broken away; an electric bell and circuit being shown in place of the semaphore of Fig. 1; Fig. 3 shows the oil supply tank and the arrangement of feeding the oil to the engine; the parts being shown on a larger scale than in the other figures, and parts being broken away; Fig. 4 shows the water motor for use in starting the engine, the bucket wheel of which serves also as a fly wheel for the engine; and Fig. 5 shows a modification in which the engine shaft drives a vertical pump shaft instead of the horizontal pump shaft of Figs. 1 and 2.

A represents the tank or reservoir which is to be replenished with water whenever the surface thereof falls below a predetermined level. This tank is mounted on a suitable framework, or other support B.

C represents the pump, preferably a rotary pump, having its axis horizontal, but the axis may be vertical if desired, and any suitable form of pump may be used. The pump shaft C′ is either rigidly attached to or geared to the main shaft of the driving engine D, which is preferably an internal combustion engine of the reciprocating type; but any suitable internal combustion engine may be used for driving the pump C.

The engine is started by a suitable water motor E, and the bucket wheel E′ of this motor is mounted on the engine shaft D′, as shown in Fig. 4, and serves as a fly wheel for the engine. Oil is supplied to the engine from the tank F, and any waste oil leaking from the apparatus is carried to the drain tank G, as will be hereinafter described. Water is pumped from any suitable source of water supply, such as H, through the pipe I supplied with a strainer I′, and a check valve I^2, which latter opens outward for reasons which will be hereinafter explained. Water is delivered by the pump C through the pipe J to the float K, which float automatically controls the operating mechanism, as will be hereinafter described.

The engine is started by a flow of water through the pipe M which, falling on the buckets of the wheel E′ of the water motor, turns the main shaft of the engine and starts the engine up in the usual way. After the engine has started up, the supply water to the water motor will be cut off, as will be hereinafter described. The position of the float may be indicated either by means of a semaphore N, shown in Fig. 1, or an electric bell P, shown in Fig. 2, or any other suitable signal, either visual, or audible, or both may be used. In Fig. 1 I have shown the usual pipe Q for supplying water to a locomotive from the tank A, and a lever R for operating same, but other means for delivering water from the tank may be adopted if desired.

Having thus, in a general way, described briefly the principal parts of the apparatus I will now describe more particularly the details of construction.

The whole apparatus is primarily driven by the engine D, and the engine and other

parts are automatically controlled by the float K, which float is divided into two chambers by the partition *k*, shown in Fig. 1, and has a drain nozzle *k'* which will drain the upper chamber of the float when the pump C is not acting; but will not drain the liquid out of the upper chamber of the float as fast as it is supplied by the pump C when the latter is in operation. Attached to the bottom of the float K is the operating rod S, which passes through a stuffing box *a*, in the bottom of the tank A, and also through a guide *b* carried by the framework B. This rod S has two tappets 1 and 2, in the form of sleeves, adjustably mounted thereon, which are held in the desired position by means of the set screws 3 and 4, respectively. The two ends of these tappets 1 and 2 are preferably in the form of frustums of cones 5, and these tappets engage the rollers 6 and 7 carried by the bell crank levers 8 and 9 which are pivoted to the bracket 10 carrying the switch block 11 and the switch lever 12. The tappet 1 is somewhat more elongated than the tappet 2, for reasons that will be hereinafter described.

The inner arms 8^a and 9^a of the bell crank levers 8 and 9 engage the two ends of the switch lever 12, and the arm 8^a presses against the stem 13 of the check valve 14 which controls the flow of water to the water motor through the pipe M. This check valve 14 is normally held on its seat by the spring 15, except when pressed back by the arm 8^a of the bell crank lever 8, as will be hereinafter described. The pipes J and M are connected by a by-pass 16, controlled by a check valve, in the valve chamber 17, which, when the valve 14 is open, permits water to flow across this by-pass 16 to the pipe J and down said pipe into the pump C, priming the same and, incidentally, filling the pipe I so that the pump will be primed and ready to start when the water motor begins to start the engine; but this check valve in the chamber 17 will prevent the return from the pipe J through said by-pass 16, after the valve 14 is closed, and while the pump C is running. The engine is water cooled by a pipe 18 connected to the delivery pipe J, and the hot water is drawn off by the pipe 19.

Oil is supplied to the engine from the tank F through the valve seat 20, past the valve 21 and through the chamber 22. The valve 21 is carried by the float 23, which is adapted to close the valve port when the chamber 22 is filled with oil above a predetermined height, but should the valve stick for any reason, I provide an outlet 24 connected to the oil drain pipe 25, which is connected to the oil waste tank G. The height of the opening of the orifice 24 is below the level of the carbureter 26, which is connected to the chamber 22 by means of the pipe 27 so that if there is any excess of flow of oil from the tank F to the chamber 22, the excess will be taken care of by the drain pipe 25 and will not run into the engine.

Any suitable form of engine and carbureter may be used if desired, and any suitable form of spark plug 30 may be used with the engine, which receives the current from any suitable source of electricity, such, for instance, as the induction coil 31 operated by the battery 32. One terminal of this battery is connected to the binding post 33 and the switch box 11, which is electrically connected to the contact piece 34, which is ordinarily insulated from the contact piece 35, but electrically connected therewith when the lever 12 is thrown to the operative position. This contact piece 35 is connected to the timer 36, for timing the spark, which is effected in the usual well known way, but is shown diagrammatically only in Fig. 2.

When it is desired to have an audible signal, I provide an electric bell P whose circuit is closed through the battery by means of the spring 40, which is normally held clear of, but is pressed down on the contact button 41 and completes the electric circuit when the tappet 1 approaches the guide *b*. Where a visual signal is required, I may use a semaphore N, operated by the cord or chain 50 which passes over the pulleys 51 and 52 and is connected, as at 53, to the float K. When the float is in the raised position, the semaphore will obviously fall to the position indicated in full lines in Fig. 1, and when the float is lowered the semaphore will be raised to the position indicated by dotted lines in Fig. 1, which will occur when the level of the water in the tank is lower than is desired.

The operation of the device is as follows: Assuming the pump to be at work filling the tank when the water reaches the desired height in the tank A, the lower tappet 2 will be lifted, engaging the roller 7 and rocking the bell crank lever 9, throwing the lower end of the switch lever 12 outward and swinging the arm 8^a of the bell crank lever 8 clear of the stem 13 of the check valve 14; and this will also cut off the current from the igniter, and the engine will stop, while at the same time the check valve 14 will close the pipe M and the entire apparatus will be thrown out of operation. Water may now be used from the tank A until the level falls so low that the float K will cause the tappet 1 to descend, engaging the roller 6 of the bell crank 8, throwing the arm 8^a of the bell crank lever outward, pressing the stem 13 of the valve 14 against the action of the spring 15, and opening the check valve 14. At the same time the check valve in the chamber 17 will open, permitting water to simultaneously flow across the by-pass 16 into the pipe J and down into pump C, and also per-

mitting water to flow down the pipe M to the water motor E, and will cause the water motor to turn the engine shaft. At the same time the circuit will be closed by the lever 12 between the contact pieces 34 and 35, and the igniter will be in operation. The engine will now start up, and the pump C, being primed and put in operation, will pump water up through the pipe J and flowing through the bent end *j* of said pipe, the water will fall into the upper chamber of the float and will soon fill this up, gradually depressing the float still farther down and causing the tappet 1 to pass entirely below and clear of the roller 6, at which time the spring 15 will restore the valve 14 to the closed position and the water motor will be thrown out of operation. The pumping will continue until the float rises high enough again to cause the lower tappet 2 to engage the roller 7 and throw the switch lever 12 to the position for cutting off the current. As the tappet 1 rises with the float, it will press up the roller 6, keeping the lower end 8^a clear of the stem 13 of the valve 14, and also clear of the switch lever 12. The operation of this roller 6 may be facilitated by having an oppositely-disposed guide roller 6^a, which latter has no function in the operation of the apparatus except to center the tappet 1 and hold it up against the roller 6. The water will continue to flow into the water motor only while the elongated tappet 1 is bearing on the roller 6, or long enough only to get the engine started. When the float falls down to an abnormally low position, the tappet 1 will press on the contact spring 40, will close the bell circuit and ring the bell P, or will lift the semaphore N from the lower to the raised position, thus giving either a visual or an audible signal that the supply water is low in the tank. It will be noted that the extra weight of water thrown on the float K by filling the upper chamber of said float will continue to hold the float down, so long as the water is flowing into said chamber from the orifice *j* faster than it flows out through the drain *k'*; but when the pump C stops, the water in the upper chamber of the float will drain off through said drain *k'*, and the normal buoyancy will be restored to the float. The maximum height of liquid in the tank A may be automatically controlled by adjusting the position of the tappet 2 on the rod S, and the minimum level of the liquid in said tank may be automatically controlled by adjusting the position of the tappet 1 on the rod S. In order to permit the pipe I to be filled with water, as in the priming of the pump, and yet to permit this water to drain off when the pump is not in operation, I provide, besides the ordinary flap valve *i* above the strainer I' in the pipe I, a small check valve I^2 opening outward, which will allow any water that accumulates in said pipe to flow out into the main body of the water in the reservoir; while any water remaining in the water motor runs off, of course, through the drain pipe *e*. Thus it will be seen that when the water falls below a predetermined level in the tank A the float will descend low enough to cause the tappet 1 to open the check valve 14, and will complete the electrical connections, and will also open the by-pass 16; thus simultaneously starting up the water motor and the engine, and priming and starting up the pump. As soon as the pump begins working, it will fill up the chamber in the float, partly sinking the same and throwing the tappet 1 out of engagement, and permitting the check valve 14 to return to the closed position; thus cutting off the supply of water to the water motor, but without in any way affecting the electrical connections, or the running of the engine or the pump. In this way only a small amount of water is used from the tank for starting the engine, and the feed to the water motor is cut off soon after the engine starts. Should the level of the water get lower than is desired, the signaling apparatus will be automatically thrown into operation and the proper signal will be made. After the tank is filled up again, the lower tappet 2, engaging the roller 7, will cut off the current and stop the engine, and the water in the pump and in the pipe I will be allowed to drain out through the check valve I^2.

In Figs. 1 and 2 I have shown a pump mounted on a horizontal shaft connected directly with the main shaft of the engine; but in Fig. 5 I have shown an engine shaft provided with a gear wheel 60, meshing with a gear wheel 61 on the pump shaft 62, in which case the pump shaft is vertical, and this construction may be preferable under certain conditions; but I do not mean to limit myself to any particular form or arrangement of parts, or to any particular form of engine, or gearing for same, or other parts of the apparatus except as particularly set out in the claims.

While I have shown the apparatus all located at the same station, it will be obvious that the pumping plant, and especially the oil supply and oil drainage tanks, may be located at any reasonable or convenient distance from the water tank. In railway service it is specially desirable not to have any large quantity of oil or other inflammable material close to the tracks, or to buildings near the tracks, and therefore it is specially desirable to feed the oil from a distance, and to prevent any leakage of oil at the plant which is all provided for in the apparatus herein described.

It will be obvious that various modifications might be made in the herein described apparatus and in the construction, combina-

tion and arrangement of parts which could be used without departing from the spirit of my invention.

Having thus described my invention what I claim and desire to secure by Letters Patent of the United States is:—

1. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an internal combustion engine for driving said pump, a water motor connected to the engine shaft for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor, a valve controlling the flow of water through said pipe, a float mounted in said over-head tank, and means controlled by said float for operating said valve, with a by-pass for water connecting said pipe and said pump, substantially as described.

2. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an internal combustion engine for driving said pump, a rotary water motor, having its bucket wheel permanently connected to the engine shaft and serving as a fly wheel for same, for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor, a valve controlling the flow of water through said pipe, a float mounted in said over-head tank, and means controlled by said float for operating said valve, substantially as described.

3. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an internal combustion engine for driving said pump, a rotary water motor, having its bucket wheel connected to the engine shaft and serving as a fly wheel for same, for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor, a valve controlling the flow of water through said pipe, a float mounted in said over-head tank, and means controlled by said float for operating said valve, with a by-pass for water connecting said pipe and said pump, substantially as described.

4. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an internal combustion engine for driving said pump, a source of electricity, and an electric igniter for said engine, with an electric circuit connecting same to said source of electricity, a water motor connected to the engine shaft for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor, a valve controlling the flow of water through said pipe, a float mounted in said over-head tank, and means controlled by said float for operating said valve, with a by-pass for water connecting said pipe and said pump, with means also controlled by the fall and rise of said float for completing or breaking the electric circuit through said igniter, for starting or stopping said engine, substantially as described.

5. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an internal combustion engine for driving said pump, a source of electricity, and an electric igniter for said engine, with an electric circuit connecting same to said source of electricity, a rotary water motor, having its bucket wheel permanently connected to the engine shaft and serving as a fly wheel for same, for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor, a valve controlling the flow of water through said pipe, a float mounted in said over-head tank, and means controlled by said float for operating said valve, with means also controlled by the fall and rise of said float for completing or breaking the electric circuit through said igniter, for starting or stopping said engine, substantially as described.

6. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an internal combustion engine for driving said pump, a source of electricity, and an electric igniter for said engine, with an electric circuit connecting same to said source of electricity, a rotary water motor, having its bucket wheel connected to the engine shaft and serving as a fly wheel for same, for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor, a valve controlling the flow of water through said pipe, a float mounted in said over-head tank, and means controlled by said float for operating said valve, with a by-pass for water connecting said pipe and said pump, with means also controlled by the fall and rise of said float for completing or breaking the electric circuit through said igniter, for starting or stopping said engine, substantially as described.

7. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an internal combustion engine for driving said pump, a water motor connected to the engine shaft for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor, a valve controlling the flow of water through said pipe, a float mounted in said over-head tank, means for priming said pump controlled by said float, and means controlled by said float for operating said valve, substantially as described.

8. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an internal combustion engine for driving said pump, a water motor connected to the engine shaft for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor, a valve controlling the flow of water through said pipe, a float mounted in said over-head tank, means for priming said pump controlled by said float, a suction pipe connected to said pump, a check valve in said suction pipe opening outward to permit the escape of water trapped in said suction pipe, and means controlled by said float for operating said valve, substantially as described.

9. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an internal combustion engine for driving said pump, a water motor connected to the engine shaft for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor, a valve controlling the flow of water through said pipe, a float mounted in said over-head tank, and means controlled by said float for operating said valve, with a by-pass for water for priming said pump connecting said pipe and said pump, and adapted to be opened or closed by means of said float simultaneously with the opening and closing of said valve, with means for draining said pump whenever it is stopped, substantially as described.

10. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an internal combustion engine for driving said pump, a water motor connected to the engine shaft for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor, a valve controlling the flow of water through said pipe, a float mounted in said over-head tank, and means controlled by said float for operating said valve, with a by-pass for water for priming said pump connecting said pipe and said pump, and adapted to be opened or closed by means of said float simultaneously with the opening and closing of said valve, with means for draining said pump whenever it is stopped, said means comprising a suction pipe connected to said pump, and a check valve in said suction pipe opening outward to permit the escape of water trapped in said suction pipe, substantially as described.

11. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an internal combustion engine for driving said pump, a water motor for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor for driving same, a valve controlling the flow of water through said pipe, a float mounted in said over-head tank, a rod moving with said float, a tappet on said rod for stopping the engine, and a second and elongated tappet on said rod for starting and stopping the water motor, with means controlled by said tappets for opening and closing said valve and starting and stopping said engine, substantially as described.

12. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an internal combustion engine for driving said pump, a water motor for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor for driving same, a valve controlling the flow of water through said pipe, a float mounted in said over-head tank, a rod moving with said float, a chamber provided in the upper part of said float adapted to receive water from the pump to increase the weight of said float during the pumping operation, with a drain for said chamber to release the water therefrom when the pump stops, a tappet on said rod for stopping the engine, and a second and elongated tappet on said rod for starting and stopping the water motor, with means controlled by said tappets for opening and closing said valve and starting and stopping said engine, substantially as described.

13. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an internal combustion engine for driving said pump, a water motor for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor for driving same, a valve controlling the flow of water through said pipe, a float mounted in said over-head tank, a rod moving with said float, a tappet on said rod for stopping the engine, and a second and elongated tappet on said rod for starting and stopping the water motor, with a switch lever and bell crank levers engaging therewith, said bell crank levers engaging said tappets for opening and closing said valve and starting and stopping said engine, substantially as described.

14. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an internal combustion engine for driving said pump, a water motor for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor for driving same, a valve controlling the flow of water through said pipe, a float mounted in said over-head tank, a rod moving with said float, a chamber provided in the upper part of said float adapted to re-

ceive water from the pump to increase the weight of said float during the pumping operation, with a drain for said chamber to release the water therefrom when the pump stops, a tappet on said rod for stopping the engine, and a second and elongated tappet on said rod for starting and stopping the water motor, with a switch lever and bell crank levers engaging therewith, said bell crank levers engaging said tappets for opening and closing said valve and starting and stopping said engine, substantially as described.

15. An apparatus of the character described comprising an over-head water tank, a pump for delivering water thereto, an engine for driving said pump, a water motor for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor for driving same, a valve controlling the flow of water through said pipe, a float mounted in said overhead tank, means automatically controlled by the starting up of the pump for temporarily increasing the weight of said float, a rod moving with said float, a tappet on said rod for stopping the engine, and a second and elongated tappet on said rod for starting and stopping the water motor, with means controlled by said tappets for opening and closing said valve and starting and stopping said engine, substantially as described.

16. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an engine for driving said pump, a water motor for starting said engine, a pipe opening into said tank and adapted to supply water to said water motor for driving same, a valve controlling the flow of water through said pipe, a float mounted in said overhead tank, means automatically controlled by the starting up of the pump for temporarily increasing the weight of said float, a rod moving with said float, means for stopping the engine, an elongated tappet on said rod, a bell crank lever having an arm engaging said tappet when the water in the tank reaches a predetermined level, and means controlled by said bell crank lever for opening said valve and starting said engine, substantially as described.

17. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an engine for driving said pump, a water motor for starting said engine, means for supplying water from said tank to said water motor for driving same, and means for controlling said water supplied to said motor comprising a float mounted in said overhead tank, a rod moving with said float, a chamber provided in the upper part of said float adapted to receive water from the pump to increase the weight of said float during the pumping operation, with a drain for said chamber to release the water therefrom when the pump stops, an elongated tappet on said rod, means controlled by said tappet for turning on the water to said water motor, with means controlled by said float for stopping said engine when desired, substantially as described.

18. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an engine for driving said pump, a water motor for starting said engine, means for supplying water from said tank to said water motor for driving same, and means for controlling said water supplied to said motor comprising a float mounted in said over-head tank, a rod moving with said float, a chamber provided in the upper part of said float adapted to receive water from the pump to increase the weight of said float during the pumping operation, with a drain for said chamber to release the water therefrom when the pump stops, an elongated tappet on said rod, and a lever arm engaging said tappet, and means controlled by said lever arm for turning on the water to said water motor while said engagement continues, substantially as described.

19. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an engine for driving said pump, a water motor for starting said engine, means for supplying water from said tank to said water motor for driving same, and means for controlling said water supplied to said motor comprising a float mounted in said over-head tank, a rod moving with said float, a chamber provided in the upper part of said float adapted to receive water from the pump to increase the weight of said float during the pumping operation, with a drain for said chamber to release the water therefrom when the pump stops, an elongated tappet on said rod, and a lever arm engaging said tappet, and means controlled by said lever arm for turning on the water to said water motor while said engagement continues, with means controlled by said float for stopping said engine when desired, substantially as described.

20. An apparatus of the character described, comprising an over-head water tank, a pump for delivering water thereto, an engine for driving said pump, a water motor for starting said engine, means for supplying water from said tank to said water motor for driving same, and means for controlling said water supplied to said motor comprising a float mounted in said over-head tank, a rod moving with said float, a chamber provided in the upper part of said float adapted to receive water from

the pump to increase the weight of said float during the pumping operation, with a drain for said chamber to release the water therefrom when the pump stops, an elongated tappet on said rod, and a lever arm engaging said tappet, and means controlled by said lever arm for turning on the water to said water motor while said engagement continues, with a second tappet on said rod, and a second lever arm operated thereby, with means controlled by said second lever arm for stopping said motor, substantially as described.

W. D. HUFF.

Witnesses:
A. R. MIELLY,
M. CAREY.