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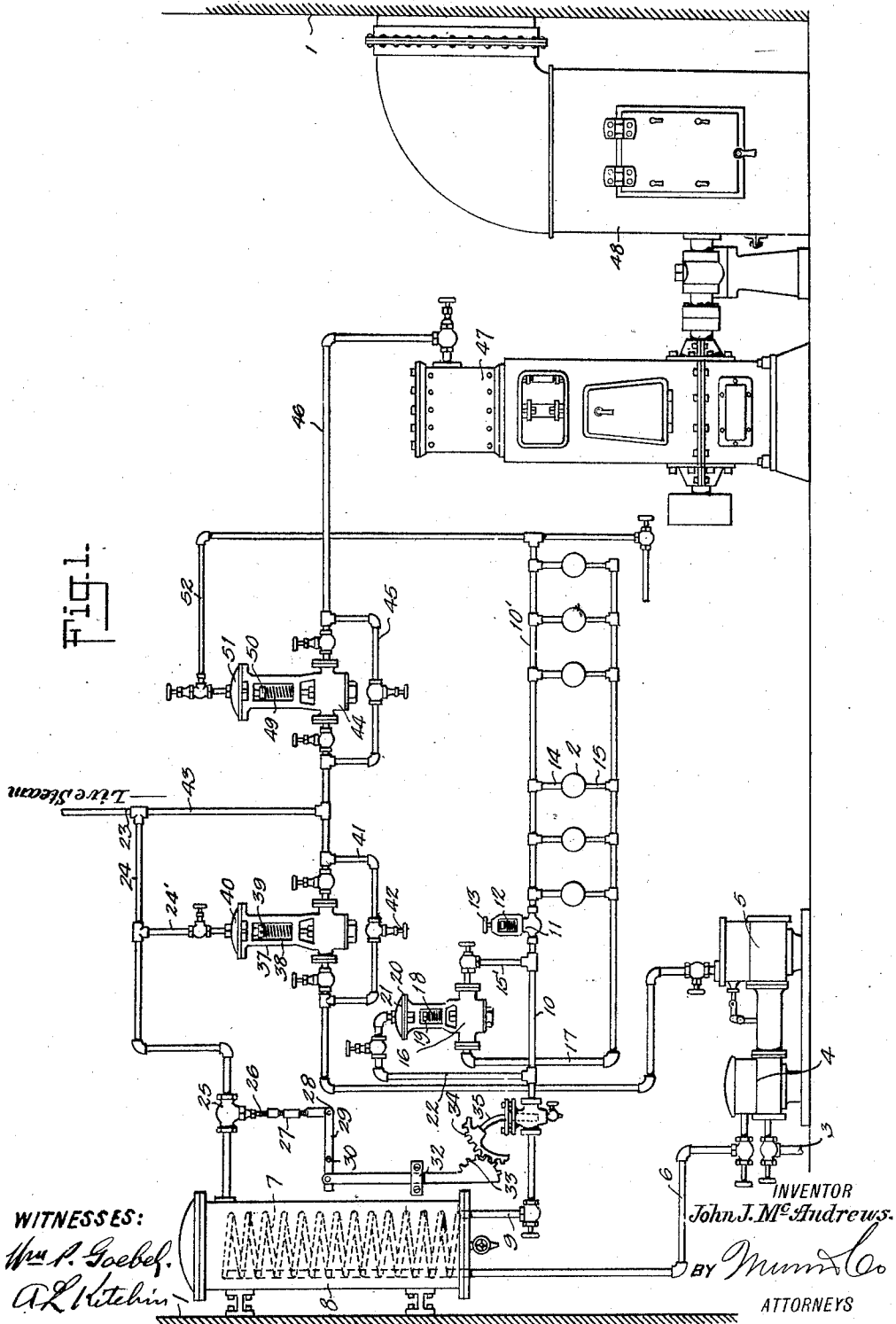
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J. J. McANDREWS

AUTOMATIC FIRE CONTROL AND FUEL ECONOMIZER SYSTEM

Filed Dec. 20, 1923

2 Sheets-Sheet 1



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Fig. 2.

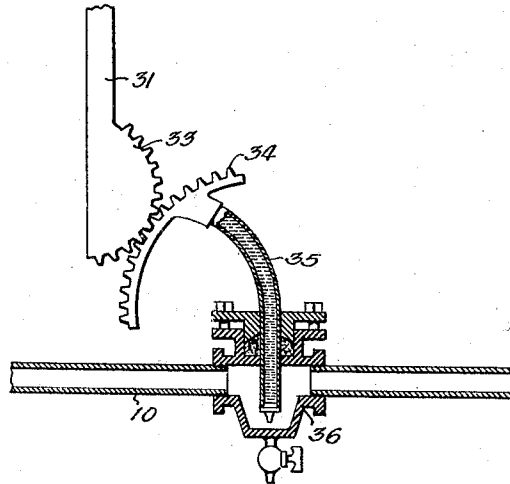
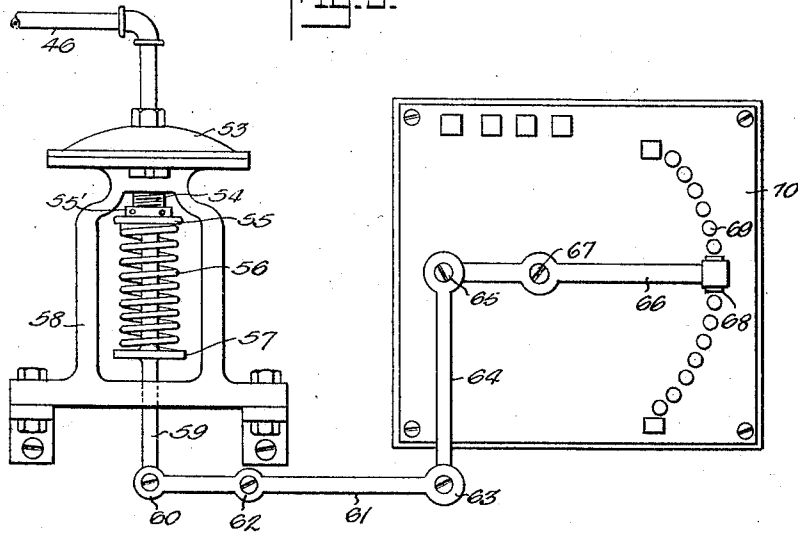


Fig. 3.



WITNESSES

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AUTOMATIC FIRE-CONTROL AND FUEL-ECONOMIZER SYSTEM.

Application filed December 20, 1923. Serial No. 681,879.

To all whom it may concern:

Be it known that I, JOHN J. McANDREWS, a citizen of the United States, and a resident of San Diego, in the county of San Diego and State of California, have invented a new and Improved Automatic Fire-Control and Fuel-Economizer System, of which the following is a full, clear, and exact description.

This invention relates to an improved system for automatically controlling liquid fuel to oil burning furnaces and has for an object to provide an improved structure wherein a fuel is not only economically used but it is supplied continually at the desired pressure when needed.

Another object of the invention is to provide a system for supplying liquid fuel to oil burning furnaces wherein the amount of air supplied will be automatically varied according to the quantity of oil used.

A still further object of the invention is to provide means for automatically igniting the burners in an oil burning furnace and to automatically ignite the pilots therefor when the burners are turned out.

An additional object is to provide in an oil burning system, means for supplying and maintaining the oil at the desired temperature.

In the accompanying drawings—

Figure 1 is a diagram showing the system embodying the invention as the same would be applied to an oil burning furnace, as for instance, the fire boxes beneath the boilers used on a steamboat.

Figure 2 is an enlarged fragmentary view partly in section showing an automatic regulator for regulating the temperature of the oil supplied to the burners.

Figure 3 is an elevation showing a modified form of means for controlling the speed of the fan or air compressor used in supplying air to the burners.

Referring to the accompanying drawings by numeral, 1 indicates the walls of the engine room of a steamship and 2 indicates the respective fire boxes for the boilers. It will be understood, of course, that the device might be used in other places besides on steamboats, without departing from the spirit of the invention, the intention being to present a structure which will automatically control the flow of liquid fuel to the burners in oil burning furnaces of any kind where steam is generated.

For the purpose of illustration and for understanding the invention, the device has been shown as associated with a steamship and will be described in this connection.

In oil burning vessels, tanks are provided for supplying the oil which may be located at any point but are usually in the bottom part of the ship and the oil is pumped from these tanks or other containers to a suitable heating apparatus and then forced through suitable burners into the fire box where the oil is mixed with air and burned to heat the water in the boilers. The method just described is old and well known and in the present invention a structure has been provided which will follow this general system but which so modifies the same as to produce an efficient and automatic structure whereby a minimum amount of fuel is used while maximum results are secured.

As indicated in Figure 1, the pipe 3 extends to the tank or other container for the oil which is drawn through said pipe by the pump 4 actuated by a suitable steam engine 5. The oil is pumped from the container through pipe 3 and forced through the pipe 6 to a heating coil 7 arranged in the heating tank 8 and from the coil 7 the heated oil passes through the pipe 9 to the supply pipe 10. Arranged in the supply pipe 10 is a valve 11 which is normally closed by a spring 12, the tension of which may be varied by the screw 13. When it is desired to supply for instance, fifty pounds pressure of oil to the respective burners 14, valve 11 is set to open at usually forty pounds. A pressure lower than forty pounds will not be sufficient to open the valve and, consequently, the burners 14 will be extinguished. Associated with the burners 14 are pilot lights 15 which are ignited from the burners 14 as oil is supplied thereto before the burners 14 are extinguished. In order to accomplish this, a pipe 15' is connected with the supply pipe 10 in front of valve 11 and directs oil to the valve 16 from which it passes to the pipe 17 and from thence to the respective pilot burners 15. The valve 16 is provided with a spring 18 which normally opens the same. A suitable screw 19 is provided for varying the tension of spring 18 so that the valve may open at different pressures. A diaphragm 20 is arranged in the chamber 21 provided in the upper part of the valve 16, said diaphragm being actuated by oil pressure through the pipe 22, which pipe is connected

to the supply pipe 10 and the oil in the chamber 21 is maintained at the same pressure as in the supply pipe 10. Preferably, the spring 18 is set to such a position as to be overcome by forty pounds pressure when the valve 11 is set to open at forty pounds whereby as valve 11 opens for supplying fuel to the burners 14, valve 16 is closing and, consequently, the pilots 15 will go out shortly after the burners 14 are ignited. When the pressure is reduced to a point below forty pounds, valve 11 will close as soon as the pressure reaches forty pounds and valve 16 will immediately open so that oil is immediately supplied at about forty pounds pressure to the pilots 15 at substantially the same time that the burners 14 are deprived of fuel whereby the pilot lights will be lighted automatically before the burners 14 are extinguished. If desired, the valve 16 could be set to open slightly before valve 11 closes whereupon both the burners and pilots will be burning for a short time together.

It will be understood that valve 11 may be set to open at any desired pressure and valve 16 will be correspondingly adjusted. When valve 11 is set to open at forty pounds pressure, the burners 14 could operate at for instance, forty-one pounds, fifty pounds or any pressure higher than fifty pounds which might be desired.

In order to heat the oil forced into the supply pipe 10, live steam is led from the boiler through the pipe 23 to pipe 24 which extends to the heating tank 8. A valve 25 is interposed in this pipe, said valve being preferably of a balance type and actuated by a reciprocating rod 26 connected to a suitable turn buckle 27, which in turn is pivotally connected at 28 to the lever 29. The lever 29 is pivotally mounted on a suitable support at 30 and is pivotally connected with a reciprocating rod 31 guided by suitable brackets 32, said rod having an arc-shaped rack 33 meshing with the segmental rack 34 connected to the thermostatic member 35. This thermostatic member as shown in Figure 2, is a hollow tube filled with mercury and extending into a fitting 36 whereby the oil passing through pipe 10 will heat the lower end of the thermostat 35 and will cause the same to straighten out more or less according to the heat and, consequently, causing the rod 31 to be reciprocated more or less. It is, of course, understood that some other form of thermostat might be used to move the rod 31 in proportion to the variation of heat.

The different oils used for fuel in oil burning furnaces require to be heated to a greater or less extent and, consequently, the heat maintained in tank 10 must vary to accomodate these different oils. For this reason, the turn buckle 27 is provided where-

by the valve 25 may be maintained opened to the desired extent and gradually opened and closed as the temperature might vary. With a given kind of oil, these various members are adjusted once and left in that position as long as that particular oil is used.

When it is decided to operate the burners 14 at a given pressure, as for instance, fifty pounds, the reducing valve 37 is set to supply steam to the engine 5 at the proper pressure to maintain fifty pounds pressure at the burners 14. The valve 37 is preferably of the balance type and is normally closed by a spring 38, which spring may be adjusted by the screw 39. A diaphragm is arranged in the chamber 40, said diaphragm acting on the screw 39 against the spring 38 for opening the valve. A by-pass 41 is provided so that steam may be supplied to the engine 5 through the manual operation of the valve 42 whenever desired. At the same time that steam is supplied to pipe 24, steam is also supplied to pipe 43 which is connected to the valve 44, said valve having a suitable by-pass 45. Steam passing through the valve 44 is conveyed through pipe 46 to the engine 47 which operates the fan 48 for supplying air to the various fire boxes 2. The particular form of pipes or conductors leading the air from the fan 48 to the fire box is unimportant as any suitable form of pipes or conduits may be used without departing from the spirit of the invention.

It will be noted that the engine 47 and fan 48 will operate at varying speeds according to the amount of steam permitted to pass valve 44. This valve is normally closed by the spring 49, the tension of which may be varied by the screw 50, which screw is acted on by a diaphragm in chamber 51. The diaphragm in chamber 51 is pressed or moved downwardly as shown in Figure 1 by oil from the pipe 52, which pipe is connected to the end of the supply pipe 10'. It will, therefore, be seen that as the pressure in pipes 10 and 10' increases, the pressure in the chamber 51 will increase and valve 44 will be opened wider and wider and, consequently, more and more air will be supplied. When the pressure decreases in pipe 10', the pressure in chamber 51 decreases and, consequently, the action of fan 48 will be reduced so that the pressure of air will decrease. In this way, the variation in the pressure of oil to the burners 14 will vary the amount of air supplied so that there will always be maintained a proper proportion of oil and air regardless of the pressure at which the burners are operating. When the reducing valves 37 and 44 are set and also when the other parts have been properly adjusted or set, the system will take care of itself automatically. When the burners 14 are turned out for any reason, the pilots 15 will immediately be lighted so that when the

burners 14 are turned on they will be automatically lighted and the pilots 15 turned out. In this way, there is no unnecessary burning of either the pilots or the burners 14 and, consequently, a minimum amount of fuel used with maximum results.

Under some circumstances, instead of using a steam engine, as for instance, engine 47 for driving the fan 48, an electric motor may be used, which motor is caused to move slow or fast as desired by the mechanism shown in Figure 3. From this figure it will be noted that the pipe 46 supplies oil to the chamber 53 and, consequently, moves the rod 59 in proportion to the pressure on the diaphragm mounted in the chamber 53. The threaded member 54 is hollow and permits the rod 59 to freely reciprocate therein, said threaded member being screwed into bracket 58. An abutment 55 is screwed onto the threaded member 54 and is locked in any desired manner by suitable set screws 55', said abutment acting to receive one end of the spring 56 while the opposite end rests on the enlargement or abutment 57 formed integral with or rigidly secured to the rod 9. Preferably, the spring 56 is rigidly secured in any desired manner to the abutment 55 and to the abutment 57 so as to resist movement of the rod 59 and to return the parts to their former position when the pressure has been released. The rod 59 is pivotally connected at 60 with the lever 61, which in turn is pivotally mounted at 62 on a suitable stationary support and pivotally connected at 63 to the link 64. The link 64 is pivotally connected at 65 to the arm 66 pivotally mounted at 67 on a stationary support, said arm having a contact member 68 which passes over the switch terminals 69 of the starting box 70. It will thus be seen that if a small pressure is exerted in the chamber 53, rod 59 and associated parts will be moved only a short distance and, consequently, the contact 68 will move over the contact 69 for a very short distance. If the pressure is increased, arm 66 will be swung over more and more according to the pressure and, consequently, more and more current will be turned onto the motor for driving the fan 48 at a higher speed. The spring 66 acts to return the parts to their former positions when the pressure is removed so as to cause the parts to recede as the pressure in pipe 46 decreases whereby the current supplied to the motor will be in direct proportion to the pressure of steam in pipe 46. The fan 48 is in the

last analysis controlled by the action of valve 37, which in fact controls the entire system. This valve is controlled by boiler pressure and in turn controls the fuel oil pump 4. It will be noted that the boiler pressure passes through pipe 24 and 24' into the chamber 40 where it operates the diaphragm for opening the valve as far as the spring will permit whereby there is maintained a constant steam pressure on the engine 5 for maintaining a constant pressure in the oil system.

What I claim is:—

1. In an automatic fire control system for oil burning furnaces, a plurality of burners, a plurality of pilot lights, means for supplying oil to the burners under any desired pressure, said means including a supply pipe, means for directing oil through said supply pipe to said pilot lights, a valve arranged in said last mentioned means adapted to be normally opened and closed at a given pressure, a valve arranged in said supply pipe at a point between the burners and where said means directs the oil to the pilot lights, said last mentioned valve opening at a given pressure, which pressure is substantially the same as that at which the first mentioned valve operates whereby when the burners are supplied with oil the pilot lights will be deprived of oil and when the burners are deprived of oil the pilot lights will be supplied with oil in order that the burners may be ignited from the pilot lights and the pilot lights ignited from the burners.

2. In an automatic system for fire control for a liquid fuel burning boiler furnace, a plurality of burners operating above a certain pressure, a pilot light for each of said burners operating at a pressure below the pressure at which the burners operate, means for supplying fuel to said burners and pilot lights including a steam operated pump, a pipe line connecting said pump with the boiler of said furnace, an automatic control valve in said pipe line adapted to close at substantially the pressure to be maintained in said boiler for depriving said pump of steam when the boiler pressure has reached a certain point whereby said burners will be deprived of fuel, and means presenting a by-pass for said valve for admitting sufficient steam from said boiler to said pump to cause the pump to function sufficiently to supply fuel to said pilot lights.

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