

**No. 692,192.**

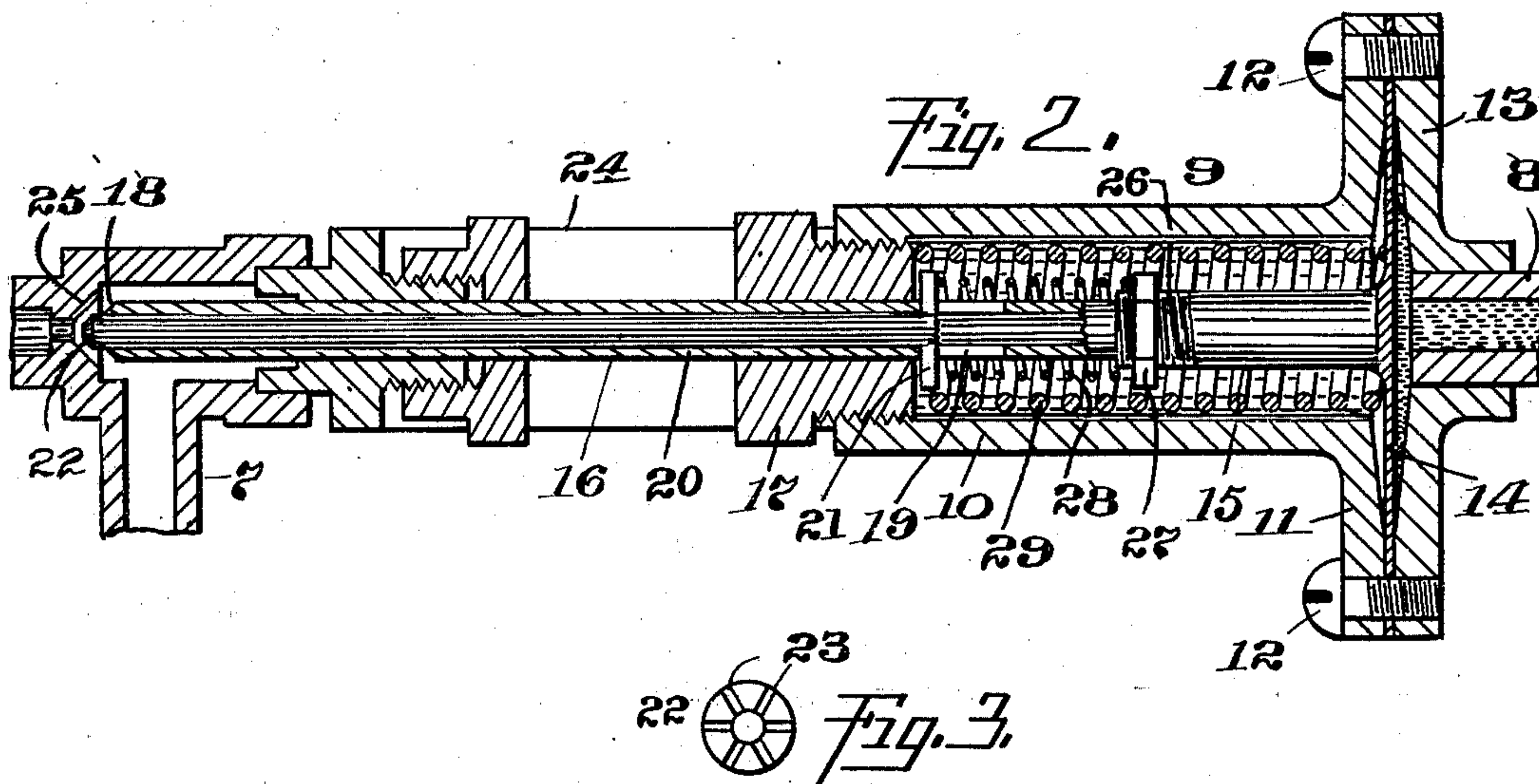
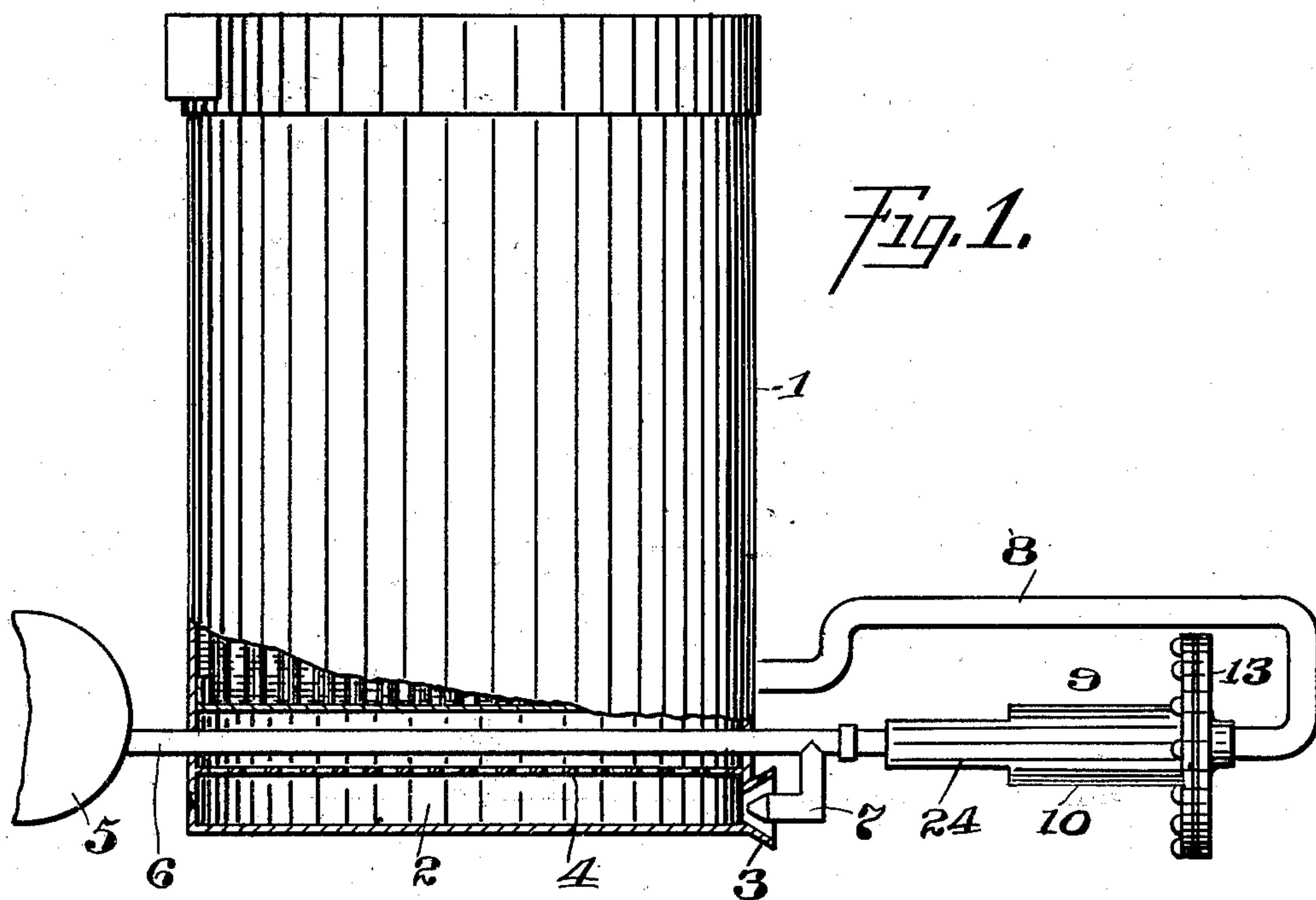
**Patented Jan. 28, 1902.**

**H. K. CLOVER.**

# FUEL CONTROLLER FOR STEAM BOILERS.

(Application filed Sept. 25, 1900.)

(No Model.)



WITNESSES:

WITNESSES.  
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# UNITED STATES PATENT OFFICE.

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## FUEL-CONTROLLER FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 692,192, dated January 28, 1902.

Application filed September 25, 1900. Serial No. 31,082. (No model.)

*To all whom it may concern:*

Be it known that I, HOWARD K. CLOVER, a citizen of the United States, residing at Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Fuel-Controllers for Steam-Boilers; 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.

This invention relates to improvements in steam-boilers and other heaters and burners of that class wherein liquid fuel is employed, and more particularly relates to a device for controlling the flow of the fuel.

The object of the present invention is to provide a controller of the character described which is so constructed as to automatically regulate the flow of the liquid fuel as it is fed to the combustion-chamber; and a further object of the invention is the provision of a controller which is adapted to be operated through the medium of the boiler-pressure, so that when the latter has attained a certain predetermined limit the flow of the fuel will be reduced, and in the event of increased pressure such flow will be completely cut off, thus effecting a perfect control of the pressure and eliminating liability of explosion due to overpressure.

With these and other objects in view, which will appear as the nature of the improvements is better understood, the invention consists, substantially, in the novel construction, combination, and arrangement of parts, as will be hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the appended claims.

In the drawings, Figure 1 is a side elevation of a steam-boiler provided with the herein-described fuel-controller, the boiler being partly in section to illustrate the combustion-chamber thereof. Fig. 2 is a longitudinal sectional view, on an enlarged scale, of the valve mechanism and the means for controlling the same. Fig. 3 is an end elevation, on an enlarged scale, of the valve-stem.

Referring to the drawings, the numeral 1 designates a steam-boiler which may be of any approved construction, but as shown is of the vertical tubular type, and said boiler

is provided at its lower end with a combustion-chamber 2, having a flared mouth 3, through which the fuel is fed, and said chamber is also provided with a horizontally-disposed diaphragm or grate 4.

The numeral 5 designates the liquid-fuel supply, which in the present case is preferably a gasoline-tank, and leading from said tank through the upper portion of the combustion-chamber 2 in order to vaporize the fuel is a pipe 6 for conducting the fuel to a feed-nozzle 7, which is arranged and discharges in the mouth 3.

Leading from the boiler 1 is a pipe 8, which communicates with the controller proper, 9, as clearly shown in Fig. 2, and said controller comprises a tubular casing 10, provided at one of its ends with an enlarged flange 11, to which is suitably secured, as by screws 12 or their equivalent, a head 13, to which is connected the pipe 8. It will be observed that the opposing faces of the flange 11 and the head 13 are concaved, and fitting between said flange and said head is a diaphragm 14, which is provided with a shank 15, extending into the casing 10. The shank 15 terminates in an elongated valve-sleeve 16, which passes through a screw-threaded plug 17, fitting in the end of the casing 10 opposite to the diaphragm 14, and the extremity of said sleeve 16 terminates in a conical valve 18. The sleeve 16 is provided with a vertically-disposed slot 19; and fitting in said sleeve is a valve-stem 20, which is provided at its inner end with a cross-head 21, fitting and working within the slot 19, and the outer end of said stem is provided with a conical valve 22, having a series of radially-arranged grooves 23. It will be observed that the valve-sleeve 16 is slidably mounted in a guide-frame 24, so that positive movement of said sleeve is insured, and it will also be observed that said guide-frame is connected to the fuel-pipe 6, which carries the depending nozzle 7. The pipe 6 has a flared valve-seat 25, arranged above the nozzle 7, and said seat is adapted to coact with the valves 18 and 21 in a manner to be presently stated.

The shank 15 is screw-threaded, as at 26, and mounted upon said threads is an adjusting-nut 27, and interposed between the adjusting-nut 27 and the cross-head 21 is a coil-



spring 28, which is designed to control the movements of the valve-stem 20. The spring 28 encircles the sleeve 16, and arranged within the casing 10 and encircling the shank 15 and the spring 28 is a coil-spring 29, which is of greater strength than the spring 28. The spring 29 bears against the diaphragm 14 and also against the screw-threaded plug 17, and through the medium of the latter the pressure of said spring is regulated. The spring 29 being thus positioned is designed to control the movements of the valve-sleeve 16.

The operation of the herein-described controller is as follows: When a predetermined pressure of steam in the boiler 1 has been attained, said pressure, through the pipe 8, will act upon the diaphragm 14, and being sufficient to overcome to some extent the tension of the spring 29 the diaphragm 14 is caused to move toward the nozzle 7. During such movement the valve-stem 20 and the valve-sleeve 16 retain their relative positions due to the pressure of the spring 28, and as the valve 22 is forced upon the seat 25 it will be seen that the flow of the fuel from the pipe 6 to the nozzle 7 is decreased. This flow, however, is not entirely cut off, as the grooves 23 will permit a small quantity of the fuel to continue flowing to the nozzle; but in the event that this decrease in the fuel fed to the combustion-chamber is not sufficient to prevent a further increase in the steam-pressure such further increase will act more strongly upon the diaphragm 14, and thereby cause the valve 18 to approach the seat 25. As this approach continues the pressure of the spring 28 is overcome, and when the valve 18 has come into close contact with the seat 25 it is obvious that the entire flow of the fuel to the nozzle 7 will be cut off, and hence the fire in the combustion-chamber becomes extinguished. With the extinguishment of the fire it is also obvious that further increase in the steam-pressure is prevented, and thus liability to explosion incident to such increase in pressure is entirely overcome.

While the form of the invention herein shown and described is what at the present time is believed to be a preferable embodiment thereof, it will of course be understood that the invention is susceptible of various changes in the form, proportion, and minor details of construction, and the right is therefore reserved to modify or vary the invention as falls within the spirit and scope thereof and as use and experience may require. It will also be understood that while the invention is herein shown as adapted for use as a fuel-feed controller for steam-boilers it may be effectively employed as a regulator for the fuel-supply of other heaters and burners.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In a fuel-controller for steam-boilers, the combination of a boiler, a source of liquid-fuel

supply, a fuel-supply pipe discharging into the combustion-chamber of the boiler, a valve-casing connected to said pipe, valves arranged in said casing and operating under different pressures for partially and wholly cutting off the flow of fuel, and a pressure-controlled operating member in communication with the boiler and operatively connected to said valves, substantially as described.

2. In a fuel-controller for steam-boilers, the combination of a boiler, a source of liquid-fuel supply, a fuel-supply pipe extending through the combustion-chamber of the boiler and discharging thereinto, a valve-casing connected to said pipe and having a diaphragm therein, valves arranged in said casing and adapted to be operated by the diaphragm to partially and wholly cut off the flow of fuel, and a pipe establishing communication between the boiler and diaphragm, substantially as described.

3. In a fuel-controller for steam-boilers, the combination of a boiler, a source of liquid-fuel supply, a supply and vaporizing pipe leading therefrom through the combustion-chamber of the boiler and provided with a nozzle discharging thereinto, valves controlling the flow of fuel through the nozzle, one of said valves being adapted to seat before the other to partially cut off the flow of fuel, a diaphragm in communication with and operated by the pressure in the boiler, and springs of different pressures, one acting upon the diaphragm and the other upon one of the valves, in opposition to the boiler-pressure, substantially as described.

4. In a fuel-feed controller for boilers, the combination of a boiler, a liquid-fuel supply, a discharge-nozzle connected thereto and discharging into the combustion-chamber of the boiler, a valve-stem, a valve-sleeve encircling said stem, said stem and sleeve being provided with valves coacting with the discharge-nozzle for regulating the flow of fuel therethrough, one of said valves being adapted to seat before the other and partially cut off the flow of fuel, and means for controlling the movements of said stem and sleeve through the pressure in the boiler, substantially as described.

5. In a fuel-controller for steam-boilers, the combination of a boiler, a liquid-fuel supply, a discharge-nozzle connected thereto and discharging into the combustion-chamber of the boiler, a valve-stem, a valve-sleeve encircling said stem, said stem and sleeve being provided with valves coacting with the discharge-nozzle for regulating the flow of the fuel through said nozzle, one of said valves being adapted to seat before the other and partially cut off the flow of fuel, and a controller proper for regulating the movements of said stem and sleeve, said controller proper comprising a casing, in communication with the boiler, and a diaphragm arranged therein and suitably connected to said stem and sleeve, said



diaphragm being operated through the pressure in the casing from the boiler, substantially as described.

6. In a fuel-feed controller for boilers, the combination of a boiler, a liquid-fuel supply, a discharge-nozzle connected thereto, a valve-stem, a valve-sleeve encircling said stem, said stem and sleeve being provided with valves coacting with the discharge-nozzle for regulating the flow of the fuel therethrough, one of said valves being adapted to seat before the other and partially cut off the flow of fuel, and a controller proper for regulating the movements of said stem and sleeve, said controller proper comprising a casing in communication with the boiler, a diaphragm arranged therein and suitably connected to said stem and sleeve, said diaphragm being controlled by the pressure in the casing from the boiler, and means arranged in said casing and exerting pressure upon said diaphragm in opposition to said boiler-pressure, substantially as described.

7. In a fuel-controller for steam-boilers, the combination of a boiler, a liquid-fuel supply, a discharge-nozzle connected thereto, a valve-stem, a valve-sleeve encircling said stem, said stem and sleeve being provided with valves coacting with the discharge-nozzle for regulating the flow of the fuel therethrough, one of said valves being adapted to seat before the other and partially cut off the flow of fuel, and a controller proper for regulating the movements of said stem and sleeve, said controller proper comprising a casing, a diaphragm arranged therein and suitably connected to said stem and sleeve, said diaphragm-casing being connected with the boiler and the diaphragm controlled by the pressure therein, and a spring arranged in said casing and exerting pressure upon said diaphragm in opposition to said boiler-pressure, substantially as described.

8. In a fuel-feed controller for boilers, a

fuel-feed supply having a port, a sleeve provided with a valve for cutting off the flow of fuel through said port, a valve-stem encircled by said sleeve and provided with a valve projecting beyond the sleeve to seat first and formed with grooves through which a reduced supply of fuel may pass through the port when said valve is seated, and means controlled through the pressure in the boiler for operating said valve sleeve and stem.

9. In a fuel-feed controller, the combination of fuel-supplying means having a feed-port provided with a valve-seat, a reducing-valve adapted to close against said seat to partially cut off the flow of fuel, a second valve adapted to close against the same seat to completely cut off the flow of fuel, the valves being movably connected to allow the reducing-valve to seat first, and means for operating the valves, substantially as described.

10. In a fuel-feed controller, the combination of fuel-supplying means having a feed-port provided with a valve-seat, a valve-stem having a valve adapted to close against said seat and partially cut off the flow of fuel and provided with a cross-head, a valve-sleeve slidably mounted upon the stem and having a valve adapted to close against the same seat and completely cut off the flow of fuel, and provided with a slot for receiving said cross-head, a diaphragm having a shank connected directly with said valve-sleeve, a spring acting on the diaphragm to resist the movement thereof, an adjusting-nut on said shank, and a coil-spring between said adjusting-nut and cross-head, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HOWARD K. CLOVER.

Witnesses:

RUDOLPH REX,  
F. E. COULTER.