

F. HODGKINSON.
FEED WATER HEATER.
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983,282.

Patented Feb. 7, 1911.

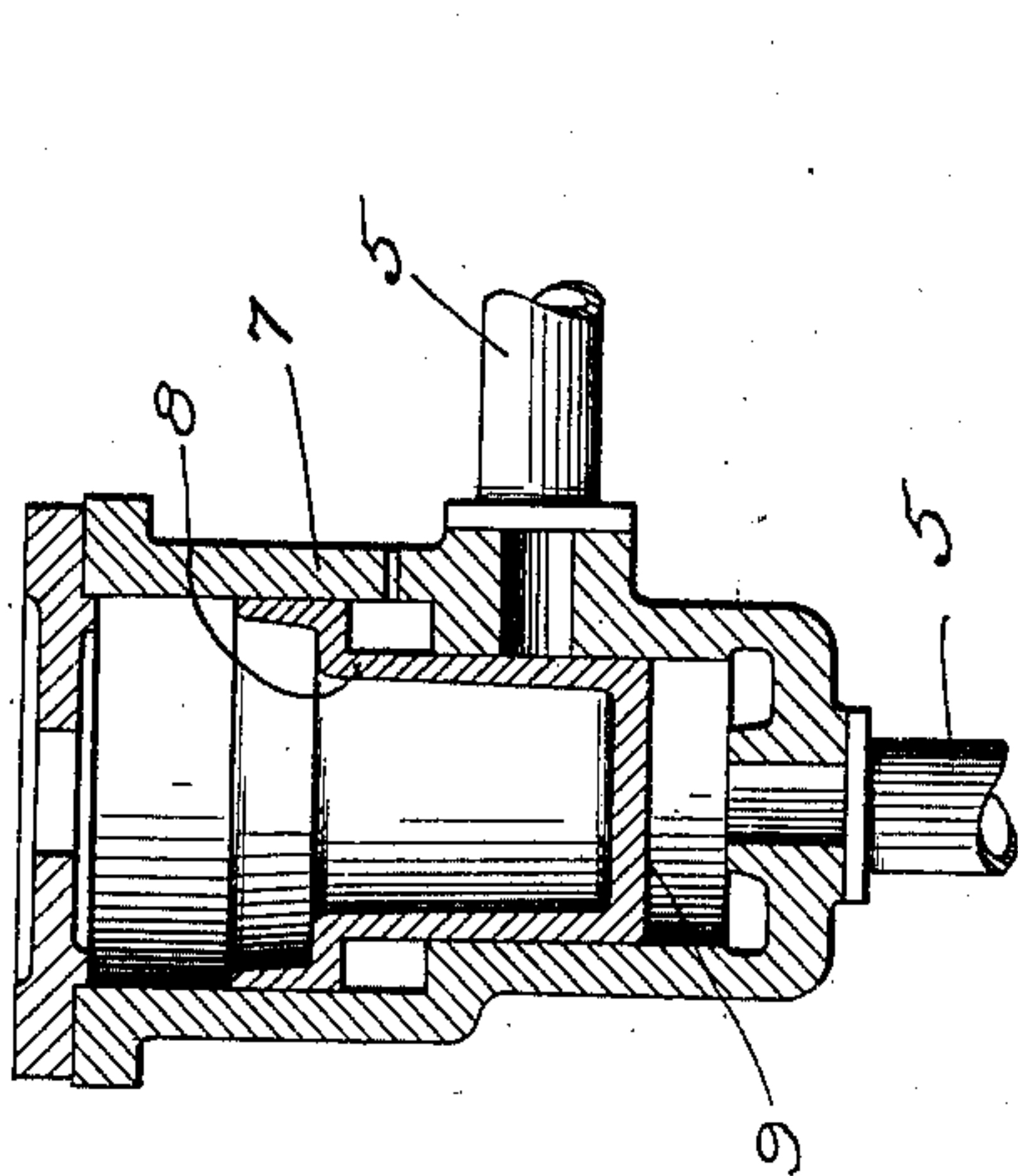


Fig. 2.

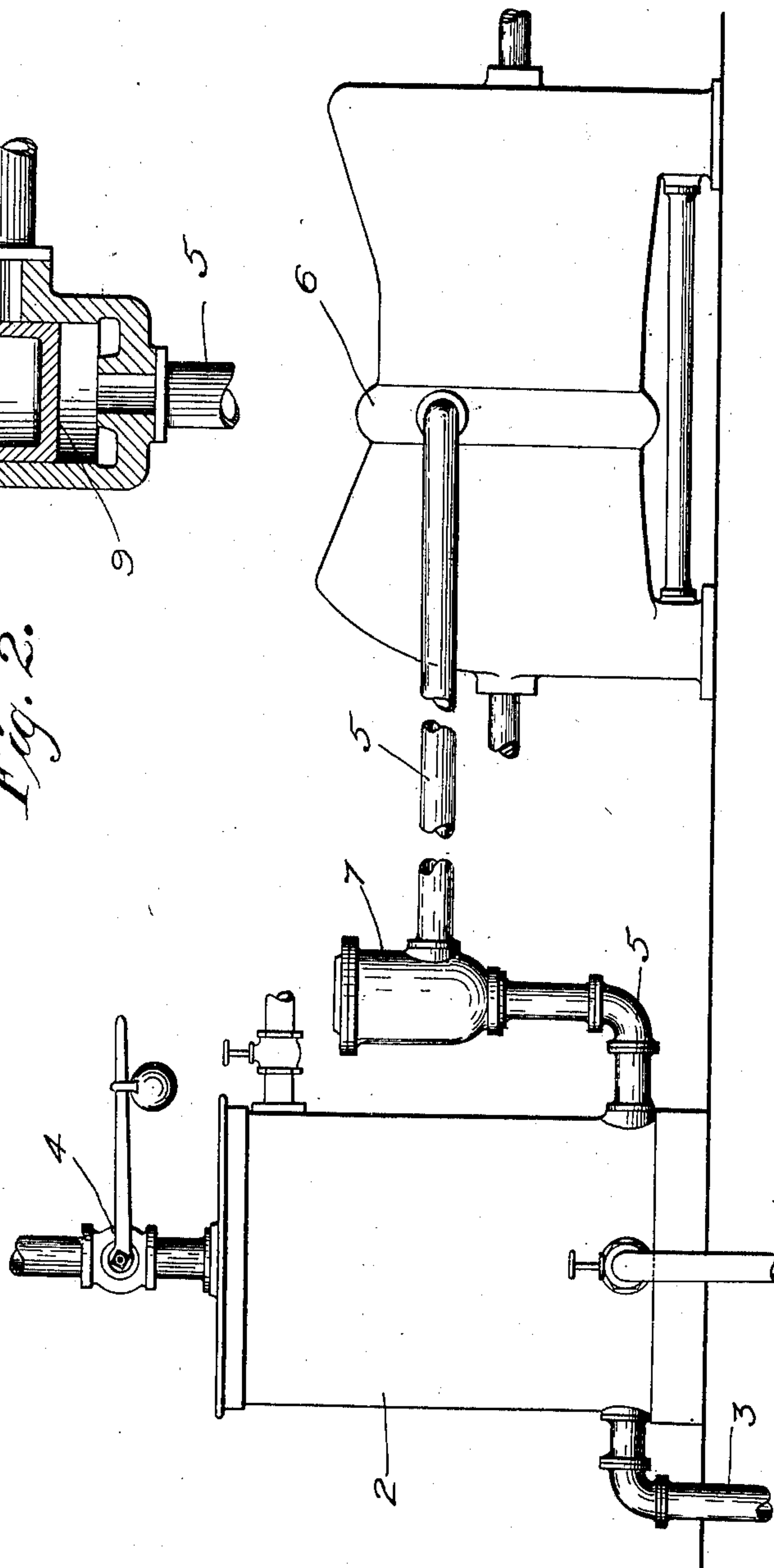


Fig. 1.

Witnesses;
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John D. Brown
His Attorney in fact

UNITED STATES PATENT OFFICE.

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FEED-WATER HEATER.

983,282.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FRANCIS HODGKINSON, a subject of the King of Great Britain and Ireland, and a resident of Edgewood Park, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Feed-Water Heaters, of which the following is a specification.

This invention relates to feed water heaters and has for an object to produce means for conserving all the available heat energy of the fluid delivered to the heater.

A further object is to produce means for abstracting variable amounts of heat energy from an approximately constant supply of fluid and for conserving the energy of the variable amounts of excess fluid.

A further object is to produce a feed water heater and automatic means for delivering to an engine, the excess of steam or heating fluid delivered to the heater.

These and other objects I attain in a device embodying the features herein described and illustrated.

In Figure 1 of the drawings accompanying this application and forming a part thereof, I have illustrated diagrammatically an embodiment of my invention. Fig. 2 is a sectional elevation of a valve forming a detail of my invention.

In large power plants and installations it is customary to deliver the exhaust of all or a number of the auxiliaries (that is, feed pumps, oil pumps, etc.,) to a feed water heater. The amount of steam so delivered is generally so proportioned that the heater will deliver, at a determined temperature, all the water necessary for the boilers while the prime mover is operating under full load. The prime mover in such an installation delivers its exhaust to a condenser and the variations in the amount of steam supplied to it or exhausted from it do not vary directly in the same proportion or effect the amount of steam delivered to the feed water heater by the auxiliaries. The load on the auxiliaries and consequently the amount of steam delivered by them does not vary materially with the variations of load on the prime mover and consequently the amount of steam delivered to the feed water heater is approximately constant at all times and for all demands on the boilers. During light loads on the prime mover the amount of water passing through the feed water

heater is decreased and consequently the amount of steam delivered to it is in excess of that necessary for heating the water up to the determined temperature and the excess steam is discharged from the heater into the atmosphere resulting in a great heat loss.

In the illustrated embodiment of my invention, I have shown a low pressure turbine which is adapted to receive the excess of steam discharged from the heater and I provide a pressure responsive valve which prevents the steam pressure in the heater from falling below a predetermined amount and controls the supply of steam to the low pressure engine or turbine in accordance with the variations in the heater's demand for steam.

Referring to the drawings: A feed water heater 2 of ordinary construction communicates with a supply of exhaust or low pressure steam through suitable piping 3. A safety valve 4 is provided on the heater 2 which is adapted to discharge steam from the heater into the atmosphere. The heater communicates through suitable piping 5 with a low pressure turbine 6 and is adapted to deliver the operating steam to the turbine. A valve 7 is interposed in the piping 5 between the heater and the turbine and is adapted to open when the pressure in the heater 2 exceeds a determined amount and to deliver steam from the heater to the turbine. The valve 7 may consist of a weighted valve disk 8 which is capable of being lifted by the pressure exerted on its lower face 9 by the steam in the heater. The turbine 6 exhausts into a condenser and will operate efficiently on steam at or a little above atmospheric pressure. The turbine may be directly connected to a generator or to any other apparatus.

The excess steam may be delivered to a low pressure stage of a high pressure turbine instead of the low pressure turbine 6. With such an arrangement the piping 5 would deliver steam to a portion of a high pressure turbine in which the pressure is normally lower than the determined pressure in the receiver 2 and the valve 7 would operate in the manner described.

Under some conditions it might be preferable to employ a speed governor on the low pressure turbine. With such an arrangement it is essential to provide the

safety valve 4 on the feed water heater so that the pressure in the heater can never exceed a safe determined pressure.

The operation of the apparatus is as follows: The piping 3 communicates with the exhaust of the auxiliaries of a large installation or power plant and consequently delivers an approximately constant flow of steam to the feed water heater 2. When the prime mover is operating under full load the amount of water passing through the heater to the boilers is sufficient to utilize all the available heat energy delivered to the heater by the steam and consequently it is all condensed in the heater. As the load on the prime mover decreases the amount of feed water necessary for the boilers is decreased and consequently the steam pressure in the heater 2 increases. After it has increased a predetermined amount it is sufficient to open the valve 7 and deliver the excess steam from the heater to the turbine.

It will be apparent that the safety valve 4 is loaded so that it operates at a pressure above that required to open the valve 7. It will be also understood that the turbine may be replaced by a reciprocating or a rotary engine and that the feed water heater may be replaced by any heater employing elastic fluid, under pressure as a heating agent.

In accordance with the provisions of the

patent statutes I have described the principle of operation of my invention together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means.

What I claim is:

1. In combination with a feed water heater, means for delivering heating fluid thereto, an engine and means responsive to pressure within said heater for delivering fluid from said heater to said engine.

2. The combination with a feed water heater and its supply pipe, of a turbine adapted to receive and utilize steam from said heater and means for controlling the fluid pressure in said heater and for delivering fluid therefrom to said turbine.

3. The combination with a feed water heater and its steam supply pipe, of a turbine adapted to receive and utilize steam from said heater and means responsive to the pressure within said heater for delivering fluid therefrom to said turbine.

In testimony whereof, I have hereunto subscribed my name this 24th day of September 1909.

FRANCIS HODGKINSON.

Witnesses:

C. W. MCGHEE,
C. W. BALLAY.