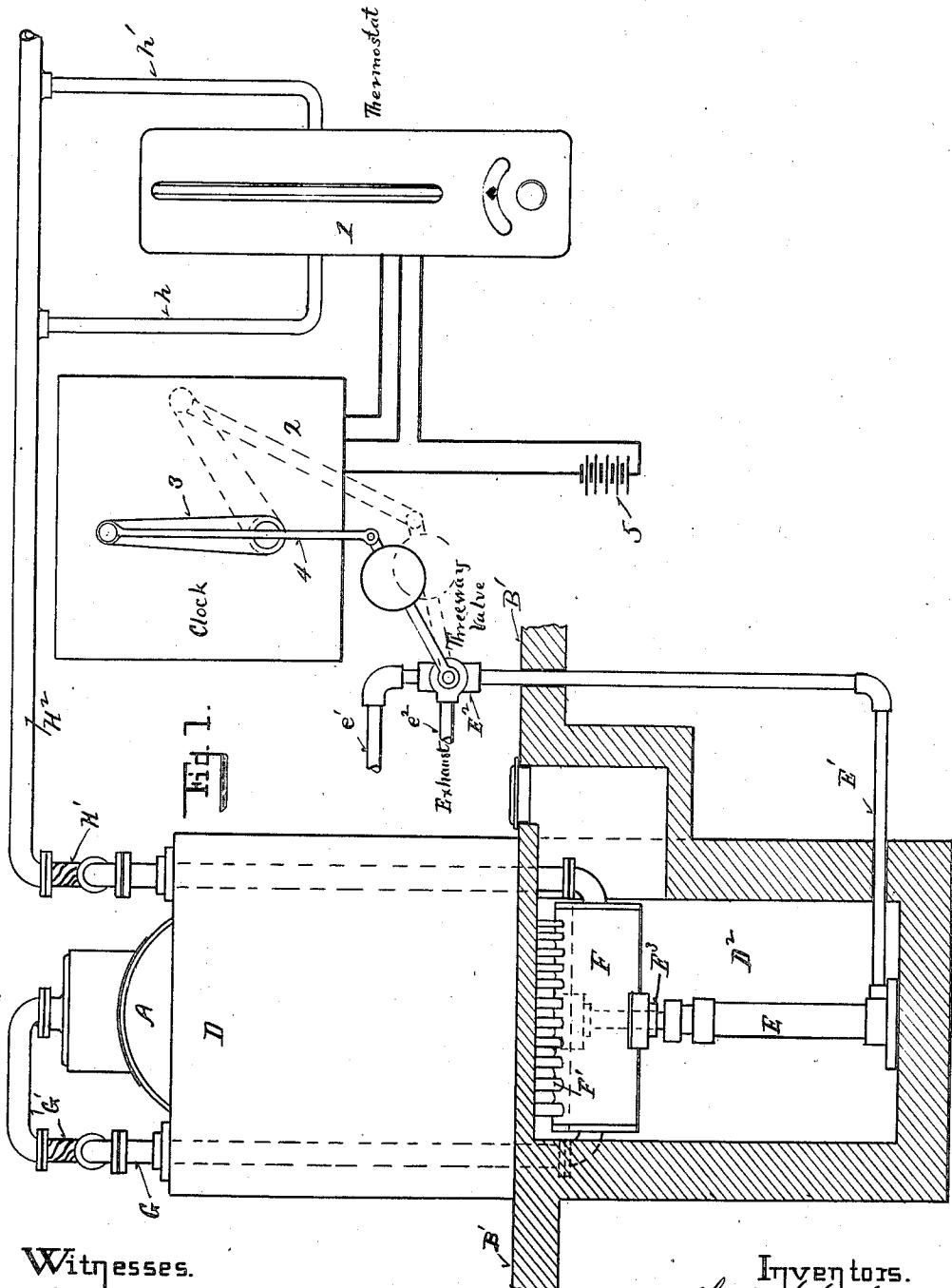


C. S. HOOPER & R. C. STEVENS.  
STEAM SUPERHEATER.  
APPLICATION FILED MAY 11, 1912.

1,074,792.

Patented Oct. 7, 1913.

3 SHEETS-SHEET 1.



**Witnesses.**

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E. E. Myers

Proprietors.  
Charles S. Hooper  
Robert C. Stevens  
By J. C. Mullings  
Attops

C. S. HOOPER & R. C. STEVENS.

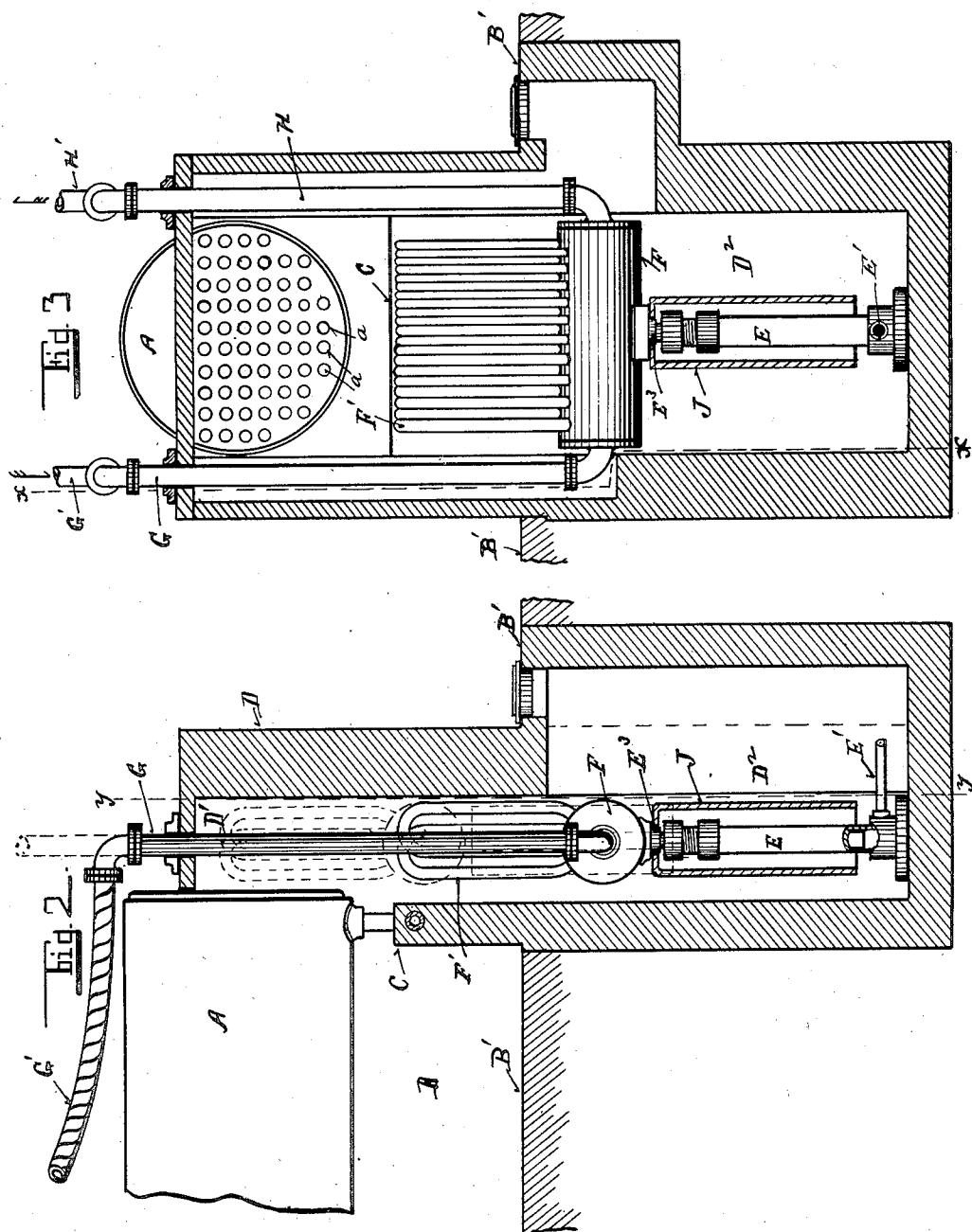
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3 SHEETS—SHEET 2.



Witnesses.

G. J. Mead

C. E. Myers

Inventor.

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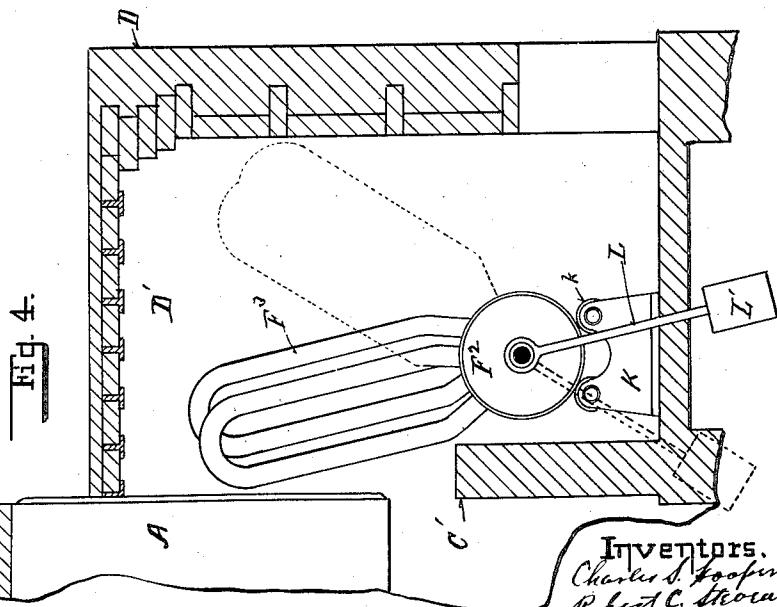
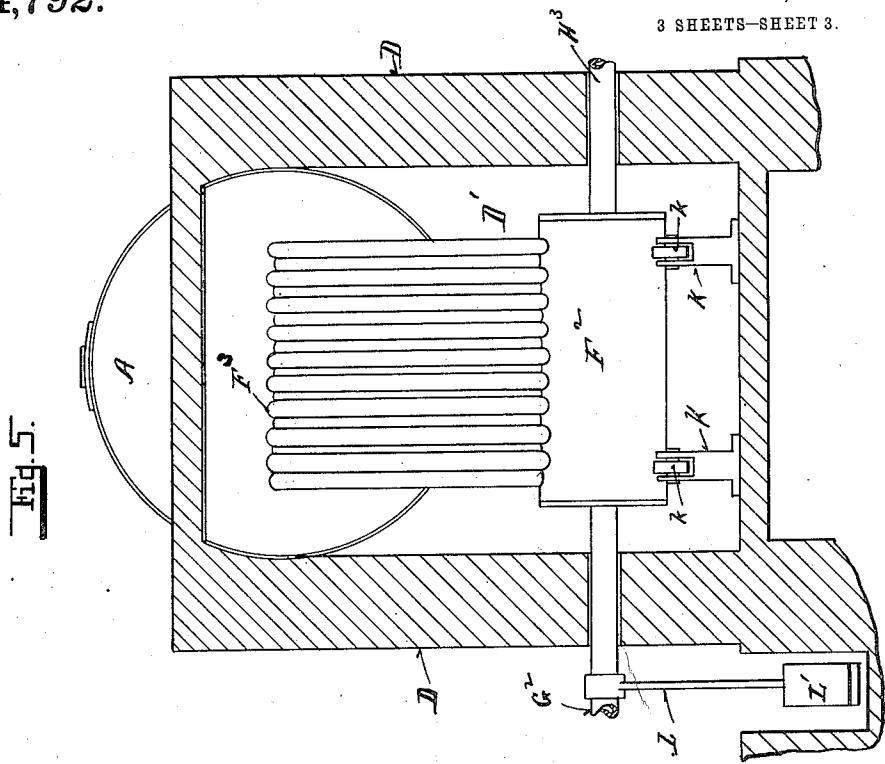
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3 SHEETS—SHEET 3.



Witnesses.

G. J. Mead

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# UNITED STATES PATENT OFFICE.

CHARLES S. HOOPER AND ROBERT C. STEVENS, OF ERIE, PENNSYLVANIA.

## STEAM-SUPERHEATER.

1,074,792.

Specification of Letters Patent.

Patented Oct. 7, 1913.

Application filed May 11, 1912. Serial No. 696,574.

To all whom it may concern:

Be it known that we, CHARLES S. HOOPER and ROBERT C. STEVENS, citizens of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Superheaters; and we 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, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming part of this specification.

Our invention relates to super-heaters and has for its object, the overcoming of certain defects in the construction and operation thereof hereinafter set forth and explained.

In super-heaters as ordinarily constructed, it is a well known fact that the steam delivered therefrom continually fluctuates from low to high, and vice versa, which fluctuations, supposing the application of heat to the super-heater to be constant in degree, is caused by an increase or decrease in the speed of travel of the steam through the super-heater, owing to changes of load upon the power generator; a heavy load consuming more steam than a light load.

Then again, the fluctuations in the temperature of the steam as delivered from the super-heater may be caused by faulty stoking. The evil results of this fluctuation, manifest themselves in the operation of the power generator, and also by causing continued alternate expansion and contraction in pipe fittings and generator parts which renders them short lived, and causes them to soon become leaky and wasteful. Another evil in the result of excessively high temperature of steam, is the dis-association of the oxygen and hydrogen which causes rapid oxidization of the super-heater tubes, and the destruction of lubricating agents and packings in the generator.

It is therefore the object of our invention to overcome these evils in the super-heating of steam, by constructing a super-heating apparatus in such a manner that the steam can be delivered therefrom at a uniform temperature; and we accomplish this object by automatically or manually advancing or receding the exposed surface of the super-heater into or from the path of the heat generated in the furnace of the boiler or super-heater thus increasing or diminishing

the intensity of heat to the exterior of the super-heating apparatus, while at the same time increasing or diminishing the area of the surface of the super-heating apparatus exposed to the action of the heat. These and other features of our invention will appear hereinafter in the specification and claims and are illustrated in the accompanying drawings in which,—

Figure 1, is a diagrammatic view showing an arrangement of mechanism for carrying out the objects of our invention. Fig. 2, is a side view of a super-heater embodying our invention partly in elevation and partly in section on the line  $x-x$  in Fig. 3. Fig. 3, is an end view of the same, on the line  $y-y$  in Fig. 2. Fig. 4, is a side view of the same, partly in elevation and partly in section, of a modified construction thereof. Fig. 5, is an end view of the same, partially in elevation and partially in section.

In these drawings A, indicates a steam boiler, B, indicates the fire-chamber thereunder, B', indicates the floor line, C, indicates the fire-wall, and D, indicates the wall at the back of the boiler, inclosing the chamber D', which receives and conducts the products of combustion from the furnace-chamber B, into the boiler tubes  $a$ ; these parts being of usual and ordinary construction.

In carrying out our invention, where the space at the rear of the boiler A, is limited, we excavate a pit  $D^2$ , under the chamber D', of sufficient dimensions, and in this pit we place preferably, a hydraulic jack E; the fluid supply pipe  $E'$ , of which leads to three-way valve  $E^2$ .

In Fig. 1 we have shown a form of automatic mechanism adapted to control the operation of the valve  $E^2$ , viz.—the adjustable electric thermostat 1, which is in communication with the super-heated steam in the steam discharge pipe  $H^2$ , by means of the branches  $h$ , and  $h'$ , a clock-mechanism 2, adapted to be electrically controlled by said thermostat, which clock, through the crank-arm 3, and link 4, is adapted to operate the arm  $e$ , of the valve  $E^2$ . Connected to one side of the valve  $E^2$ , is a fluid supply pipe  $e'$ , which is connected with a suitable supply of pressure fluid (not shown).  $e^2$ , indicates the exhaust from the valve  $E^2$ , and 5, indicates the electric generator in circuit with the thermostat 1, and clock-mechanism 2. The adjustable thermostat 1, and clock-

mechanism 2, are of ordinary construction, and the mechanism thereof is not shown as they form no part of this invention. Supported upon the ram E<sup>2</sup>, of this hydraulic jack E, we place the drum F, of a super-heater so that the tubes F' thereof extend upward nearly to the upper end of the fire-wall C. At one end of the drum F, a steam supply pipe G, is secured, which leads therefrom upward through the roof of the chamber D', and to the upper end of this supply pipe G, a flexible pipe G', of ordinary construction is secured, leading therefrom to the steam boiler A, in the usual manner. To the opposite end of the drum F, a discharge pipe H, is secured and leads upwardly therefrom through the roof of the chamber D', where a flexible tube is secured thereto and leads therefrom to any desired point. In order to protect the jack E, from cinders and soot, which may fall down into the pit D<sup>2</sup>, we secure a cylinder J, to the upper end of the ram E<sup>2</sup>, of the jack E, the upper end of said cylinder being closed and the lower end open, so that said cylinder extends down and completely covers the jack E, when the super-heater is in its lowermost position, as is shown by full lines in the drawings, and when the super-heater is raised to its highest position as shown by broken lines in Fig. 1, said cylinder J, entirely embraces and protects the plunger of the ram E<sup>2</sup>, from soot and dirt.

In Figs. 4 and 5, we show another means of carrying out the objects of our invention, which may be employed where there is more room at the rear ends of the boilers. In these figures F<sup>2</sup>, indicates the drum of a super-heater and F<sup>3</sup>, the tubes thereof. G<sup>2</sup>, indicates the steam pipe leading from the boiler to the super-heater, and H<sup>3</sup>, indicates the pipe leading from the super-heater. The super-heater drum F<sup>2</sup>, is supported upon supports K, placed upon the bottom of the chamber D', which have journaled in the upper ends thereof rollers k, upon which the drum F<sup>2</sup>, of the super-heater may revolve. On one of the pipes G<sup>2</sup>, or H<sup>3</sup>, or on both, may be placed an arm L, on which there is a counter weight L', of sufficient gravity to counter balance the super-heater tubes F<sup>3</sup>.

It will be noticed that in the construction shown in Figs. 4 and 5, while it is not necessary to dig a pit in the bottom of the chamber D', that it is necessary to make said chamber wide enough to permit the oscillation therein of the tubes F<sup>3</sup>.

While we have described and illustrated our invention as associated with a tubular boiler, those skilled in the art will readily understand that it could with equal facility be operated in connection with a water tube boiler or other form of boiler; also that it could be advantageously utilized as an independently fired super-heater, and that the

objects of our invention may be completely carried out whether the movement of the super-heater into and out of exposure to the action of the heat be linear or rotative, and whether controlled manually or automatically.

In operation when the steam passing through the super-heating apparatus possesses the required number of degrees of heat without exposing the tubes F', thereof to the action of heat, the crank-arm 3, of the clock 2, will be in an upright position as shown by full lines in Fig. 1. But when the thermostat is adjusted for the higher number of degrees of heat the crank-arm 3, will be moved downward, which will operate the lever of the valve E<sup>2</sup>, as shown in broken lines in Fig. 1, to admit pressure fluid from the pipe e', into the pipe E', and jack E, which will cause the jack to lift the super-heater drum F, upwardly until the tubes F', are exposed to a sufficient degree of heat to raise the steam therein to the required number of degrees of super-heat, and as the super-heated steam in the pipe H<sup>2</sup>, raises or lowers above or below the number of degrees that the thermostat 1, is adjusted to maintain, the valve E<sup>2</sup>, will automatically be operated to raise or lower the super-heater F.

While we have shown and described an automatic mechanism for controlling the operation of the valve E<sup>2</sup>, it will be understood that the same may be manually controlled.

While we have shown electrically controlled clock mechanism for controlling the operation of the valve E<sup>2</sup>, it will be obvious to those skilled in the art, that electro-magnetic mechanism controlled by a suitable thermostat, may with equal facility be substituted for the clock mechanism.

Having thus shown and described our invention so as to enable others to construct and use same, we do not desire to be limited to the exact construction and arrangement of mechanism herein shown and described for carrying out the same, but what we claim as new and desire to secure by Letters Patent, is:—

1. The combination in a super-heater of walls forming a heating chamber, a super-heating apparatus in said chamber, mechanism adapted to be operated to move said apparatus into and out of the path of the heating gases in said chamber, and thermo-automatic mechanism adapted to control the operation of said first mentioned mechanism, substantially as and for the purpose set forth.

2. The combination in a super-heater, of walls forming a heating chamber, a super-heating apparatus in said chamber, a fluid pressure jack adapted to be operated to move said super-heating apparatus into and out of the path of the heating gases in said

chamber, a fluid supply pipe, valve mechanism in said pipe adapted to control the admission and escape of fluid from said pressure jack, automatic mechanism adapted to 5 operate said valve, and thermo-electric mechanism adapted to control the operation of said automatic mechanism, substantially as and for the purpose set forth.

3. The combination in a super-heater, of 10 walls forming a heating chamber, a super-heating apparatus in said chamber, a fluid pressure jack adapted to cause said apparatus to move into or out of the path of the heating-gases in said chamber, a fluid supply pipe adapted to supply fluid to said jack, 15 a valve adapted to control the admission and

escape of fluid through said pipe, electrically controlled mechanism adapted to control the operation of said valve, and electric mechanism adapted to be controlled by the 20 thermal condition of the super-heated steam for controlling the operation of said electrically controlled mechanism, substantially as and for the purpose set forth.

In testimony whereof we affix our signatures, in presence of two witnesses.

CHARLES S. HOOPER.  
ROBERT C. STEVENS.

Witnesses:

H. M. STURGEON,  
E. E. MYERS.