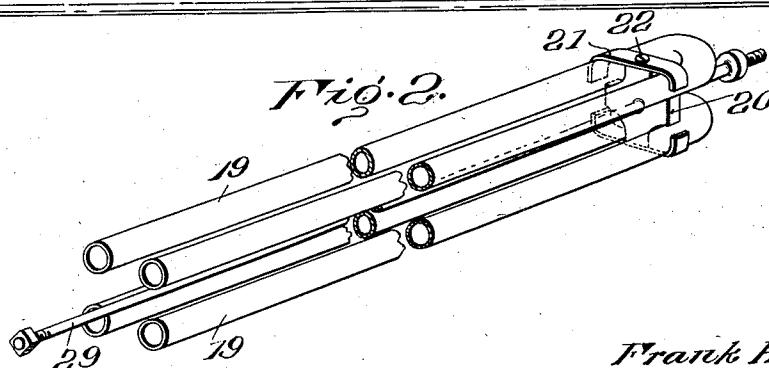
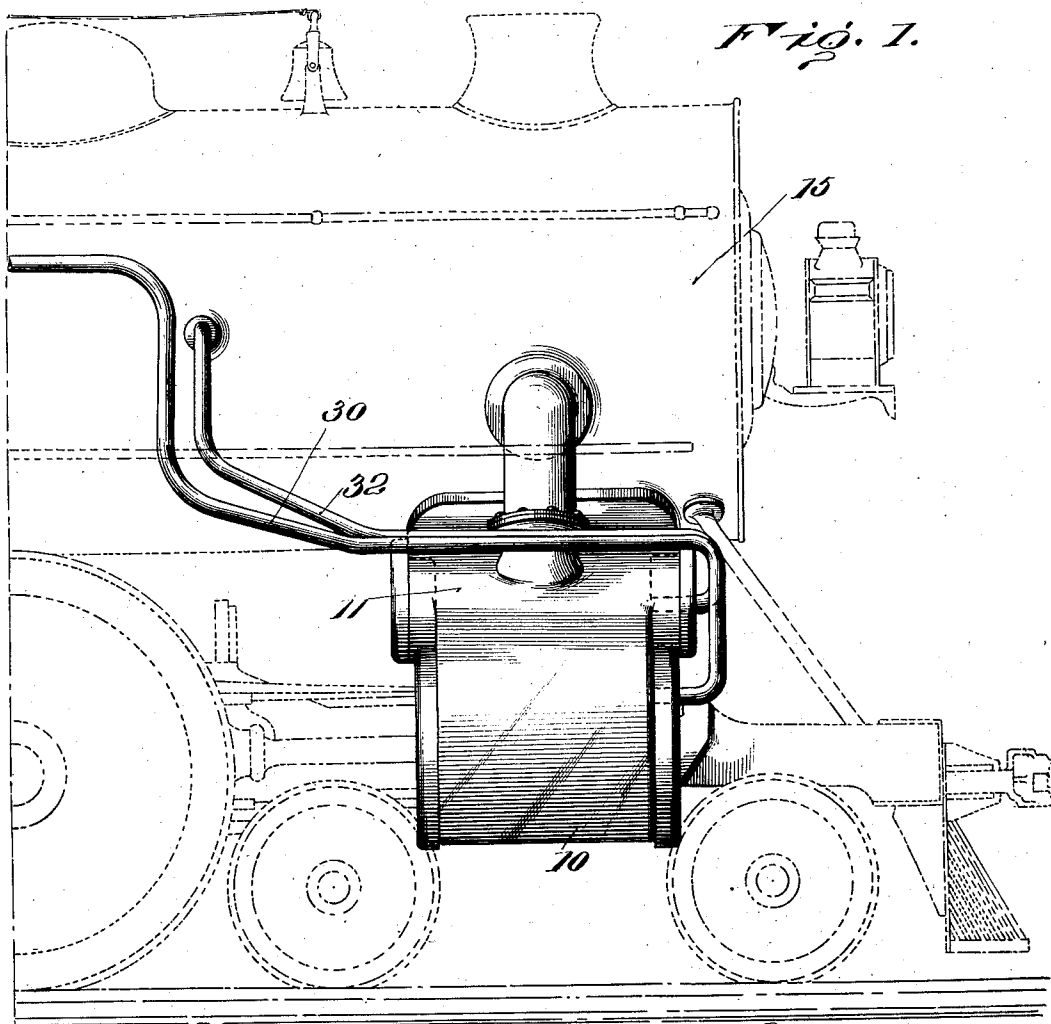


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 FEED WATER HEATER FOR LOCOMOTIVES.
 APPLICATION FILED NOV. 26, 1913.

1,104,776.

Patented July 28, 1914.

3 SHEETS-SHEET 1.



Witnesses
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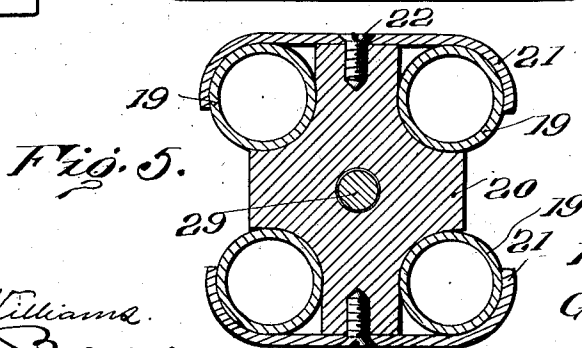
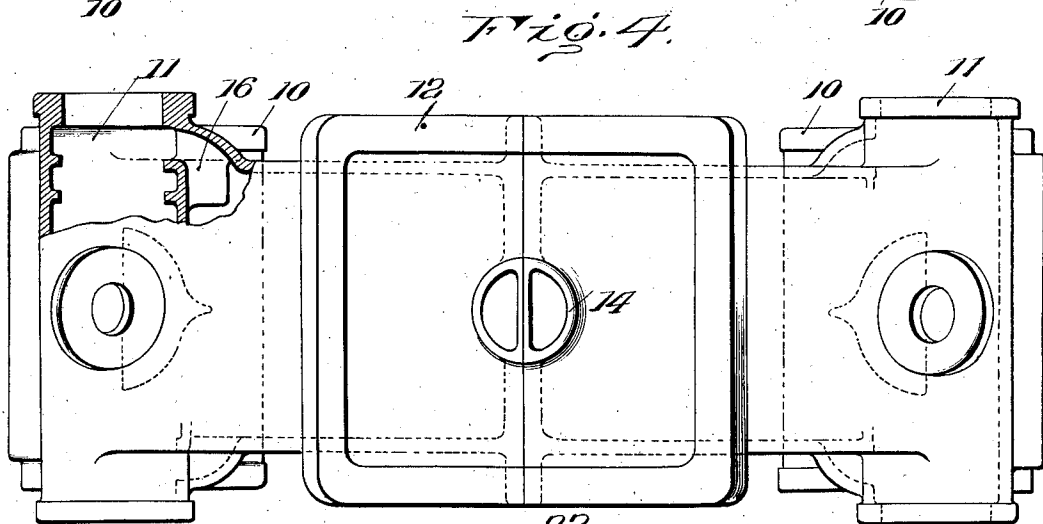
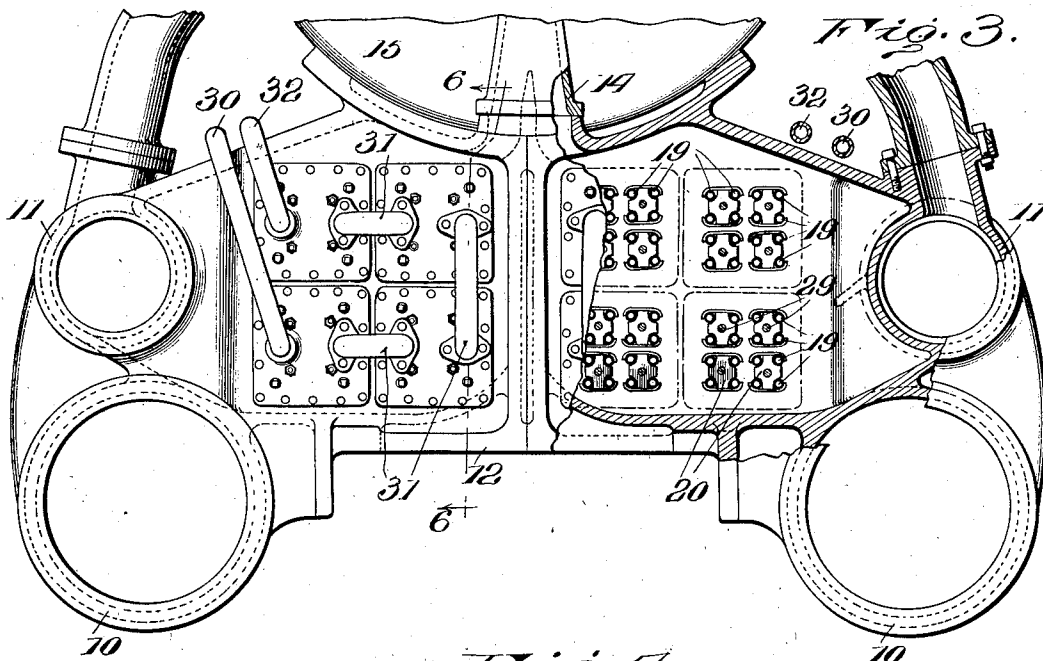
By *Brown Phelps* Attorneys

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3 SHEETS—SHEET 2.



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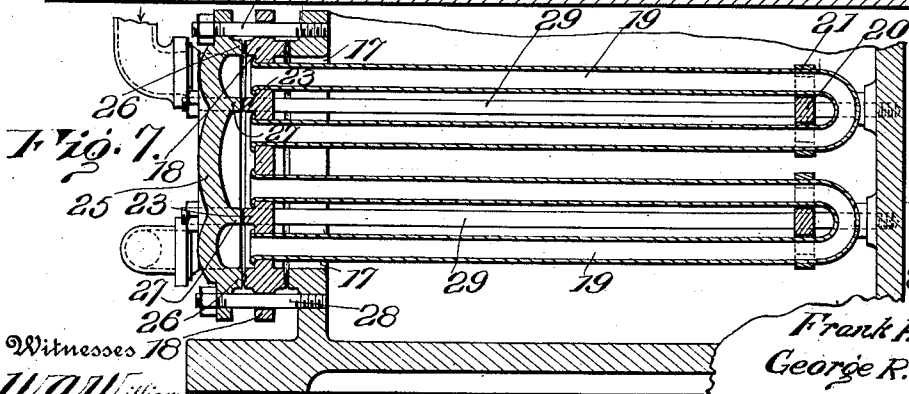
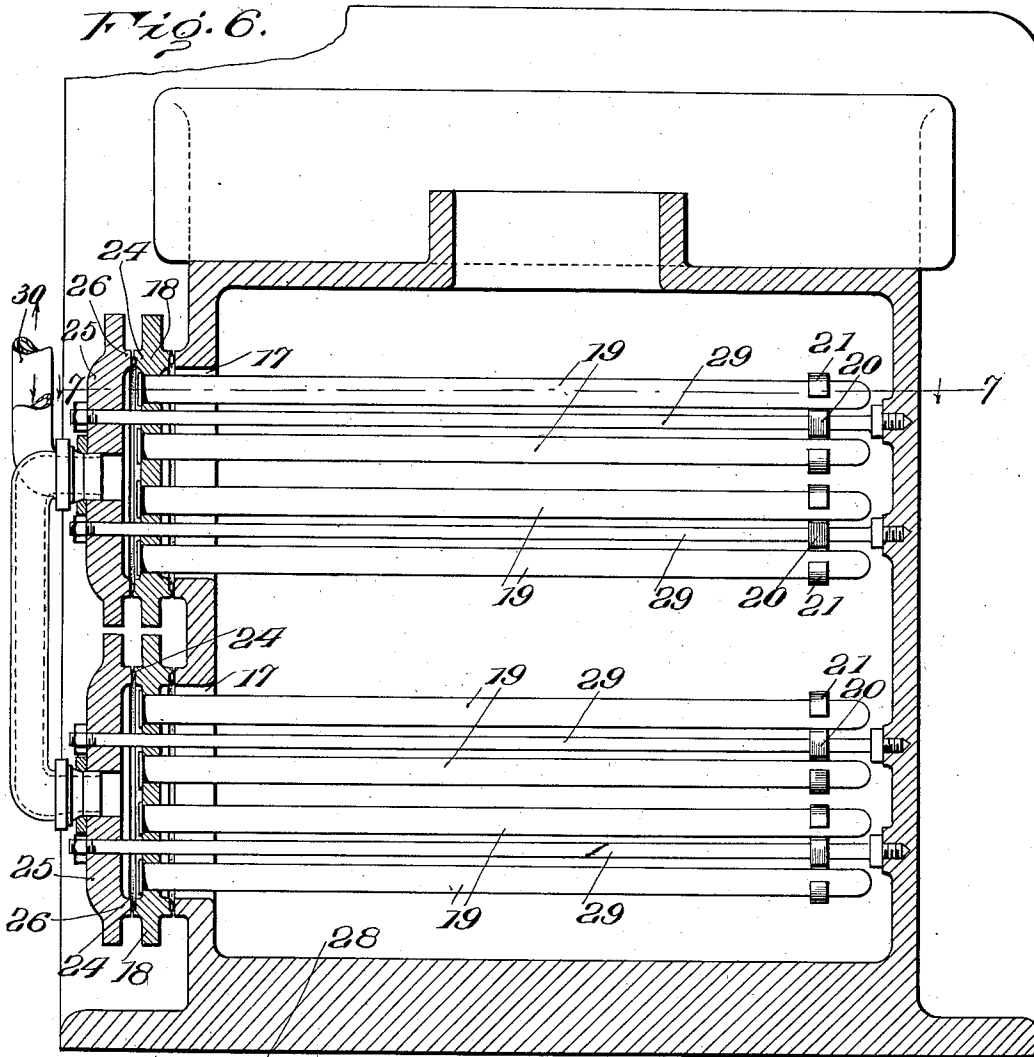
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3 SHEETS—SHEET 3.

Fig. 6.



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UNITED STATES PATENT OFFICE.

FRANK H. CLARK, OF NEW YORK, N. Y., AND GEORGE R. SMITH, OF PORTSMOUTH, VIRGINIA.

FEED-WATER HEATER FOR LOCOMOTIVES.

1,104,776.

Specification of Letters Patent.

Patented July 28, 1914.

Application filed November 26, 1913. Serial No. 803,354.

To all whom it may concern:

Be it known that we, FRANK H. CLARK and GEORGE R. SMITH, citizens of the United States, residing at New York, in the county of New York and State of New York, and Portsmouth, Norfolk county, Virginia, have invented certain new and useful Improvements in Feed-Water Heaters for Locomotives, of which the following is a specification.

Our invention relates to certain new and useful improvements in feed water heaters for locomotives.

It is now the common locomotive practice to use superheated steam in the cylinders and as a consequence the exhaust steam leaving the cylinders has a temperature of over 300° F. which in the present locomotive practice is wasted.

The object of our invention is to utilize this heat of the exhaust to heat the feed water before it enters the boiler, without increasing the back pressure on the cylinders and without interfering with the draft.

A further object of our invention is to so place the feed water heater that the exhaust steam will be delivered to it at its highest possible temperature, and at the same time having it so located as to utilize what has heretofore been waste space on a locomotive.

A further object of our invention is to so construct the heater that it is easily accessible for the purpose of cleaning or repairing the same, and also to construct it in a number of units which are separately removable and which are interchangeable.

With the foregoing and other objects in view our invention consists in certain constructions, combinations and arrangements of parts the preferred form of which will be first described in connection with the accompanying drawings and then the invention particularly pointed out in the appended claims.

Referring to the accompanying drawings wherein the same reference numeral is used to designate the same part wherever it occurs: Figure 1 is a side elevation of the forward portion of a standard type of locomotive showing the same as equipped with the preferred form of our invention; Fig. 2 is a detail perspective view of one set of the heating tubes; Fig. 3 is a front elevation partly in section of the saddle showing the feed

water heater in place therein, Fig. 4 is a top plan view of the saddle with one of the cylinders partly broken away; Fig. 5 is a cross section of a set of heating tubes as shown in Fig. 2 and illustrating our preferred manner of holding them in proper relative position at their rear ends; Fig. 6 is a section taken on line 6—6 of Fig. 3 and looking in the direction of the arrow, and Fig. 7 is a section taken on line 7—7 of Fig. 6.

10 designates the cylinders of a standard type of locomotive, 11 the steam chests, 12 the saddle, 13 the steam inlet pipes to the steam chests, 14 the exhaust nozzle in the smoke box 15, and 16 the exhaust passages into the saddle. All these parts except the saddle and the exhaust passages are shown to be of standard design.

Instead of providing the saddle with a passage way to convey the exhaust steam from the exhaust outlet 16 to the nozzle 14, we form the saddle into a hollow box into which the steam is delivered by the exhaust passages 16, and from which it is discharged through the nozzle 14. The hollow box in the saddle forms the casing of the feed water heater and into the casing thus formed we introduce any suitable means for carrying the feed water therethrough, whereby it can be heated by the exhaust steam in the casing. It is to be noted that by thus utilizing the saddle as the casing of the heater, we utilize what has heretofore been waste space on a locomotive, and at the same time so place the heater that it does not interfere with the draft from the fire box, as would be the case were it placed in the smoke-box. Furthermore because of the size of the casing available for the heater we are enabled to place sufficient heating surface therein to obtain the maximum efficiency for the heater without increasing the back pressure on the cylinders and at the same time we utilize the maximum temperature of the exhaust steam as it is delivered from the cylinders.

Preferably and as shown we build the heater in a series of units which can be readily and independently removed from the saddle, for the purposes of cleaning, repairing, etc., and also form each unit identical with the others, so that they are interchangeable.

In the particular form of our invention shown, the front face of the saddle is formed

into two similar sections, each formed with four substantially rectangular openings 17 therethrough.

18 designate what we term the header plates of the heater, one being provided for each opening 17 and adapted when secured in position to close the openings. Secured in each header plate 18 are the open ends of a pair of U tubes 19. The tubes are preferably of a length to extend for nearly the full depth of the saddle. In order to hold the rear ends of each pair of tubes properly spaced we have illustrated a plate 20 cruciform in shape as inserted between the tubes and have provided a pair of straps 21 extending over the tubes and secured to the plate by screws 22.

The front face of each header plate 18 is provided with a pair of parallel ribs 23 which extend between the ends of one pair of tubes and the other rib extending between the other pair. Each of the header plates is provided with the rib 24 extending around the same adjacent its edges, and 25 is a cover plate having the rib 26 adapted to register with the rib 24 and a pair of ribs 27 registering with the pair of parallel ribs 23, whereby when the cover plate is secured in position on the header plate three chambers will be formed between them with which the U tubes connect whereby the feed water is caused to circulate through the tubes as will be obvious. The cover plates and header plates are secured to the face of the saddle by the bolts 28 and also pass along bolts 29 through the cover plate, the header plate, the cruciform block 20 and secured into the rear inner face of the saddle casing, so that all parts are rigid.

The feed water pipe 30 is connected to one side of one of the heater units as shown in Fig. 3, and is led from one unit to the other by the U pipes 31 connecting them together. The feed water after being heated is fed to the boiler through the pipe 32. It will be obvious that the way in which the units are connected together by the U pipes may be varied as desired, and that for instance all the units may be connected together so as to make a single heater to heat the water from a single feed water pipe instead of forming two heaters one for the feed water pipe on each side as shown.

We realize that considerable variation is possible in the details of construction herein

shown and described, without departing from the spirit of our invention, and we do not intend to limit ourselves thereto, except as pointed out in the following claims, in which it is our intention to claim all the novelty inherent in the structure shown and described as broadly as the state of the art will permit.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

1. The combination with a locomotive having its saddle formed into a chamber into which the cylinders directly exhaust and from which the exhaust nozzle leads, and a feed water heater located in said chamber between said exhaust ports and nozzle.

2. The combination with a locomotive having its saddle formed into a chamber into which the cylinders directly exhaust and from which the exhaust nozzle leads, and a feed water heater formed of a plurality of independently removable and interchangeable units located in the said chamber.

3. The combination with a locomotive having its saddle formed into a chamber into which the cylinders directly exhaust and from which the exhaust nozzle leads, the cross section of the steam space of the chamber being greater than the cross section of either the exhaust passages of the cylinder or the nozzle.

4. The combination with a locomotive having its saddle formed into a chamber with which the exhaust ports and nozzle connect, and a feed water heater in said chamber composed of a plurality of serially connected units the last unit of the series being adjacent an exhaust port.

5. The combination with a locomotive having its saddle formed into a chamber with which the exhaust ports and nozzle connect, and a feed water heater in said chamber composed of two sets of serially connected units, the first unit of each set being adjacent an exhaust port.

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

FRANK H. CLARK.
GEORGE R. SMITH.

Witnesses:

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FRANCIS M. PHELPS.