

(No Model.)

2 Sheets—Sheet 1.

J. W. CASEY.  
FEED WATER HEATER.

No. 562,574.

Patented June 23, 1896.

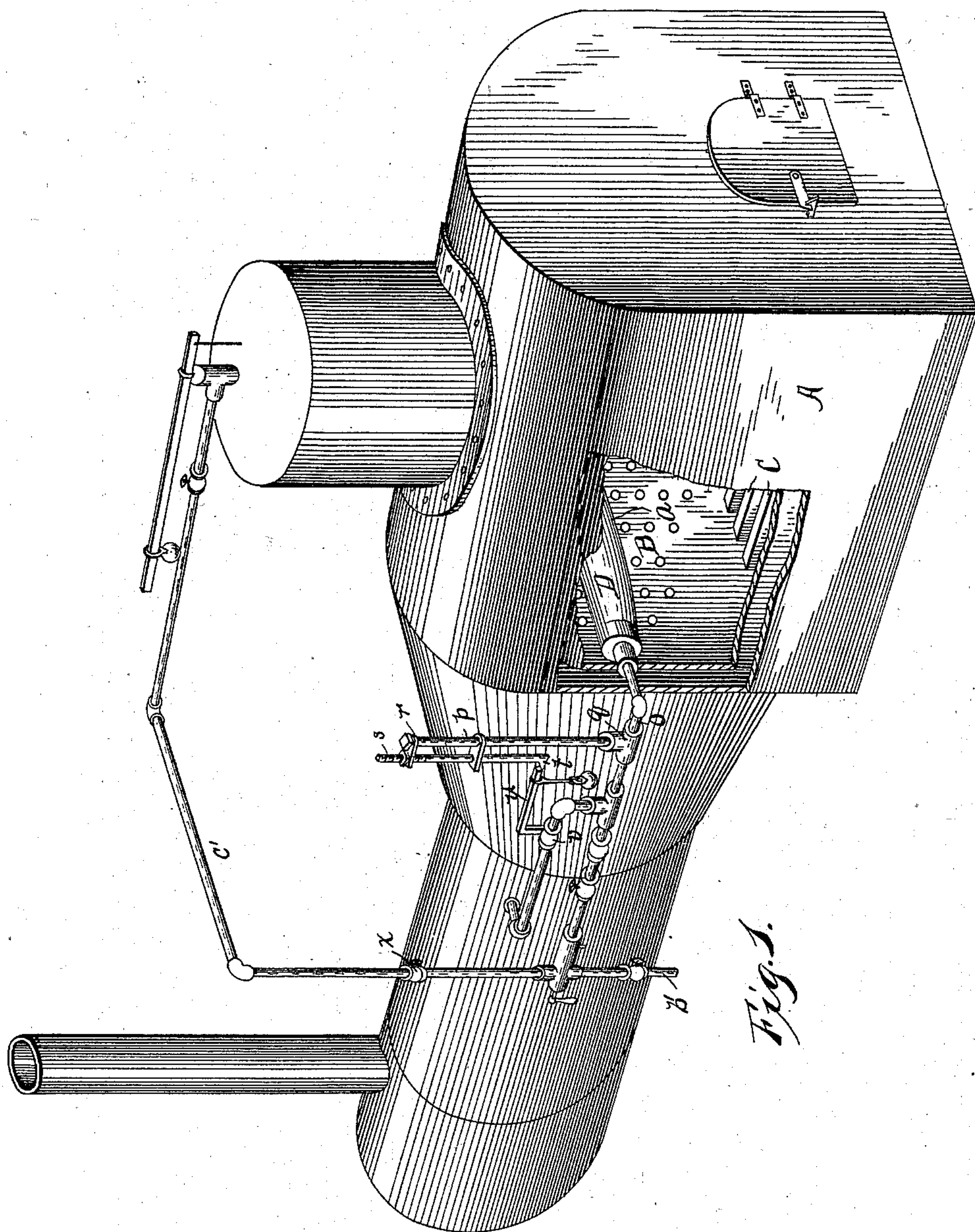


Fig. 1.

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E. C. Duff  
Chas. M. Werle

Inventor:  
John W. Casey  
per E. C. Duff  
Attorney

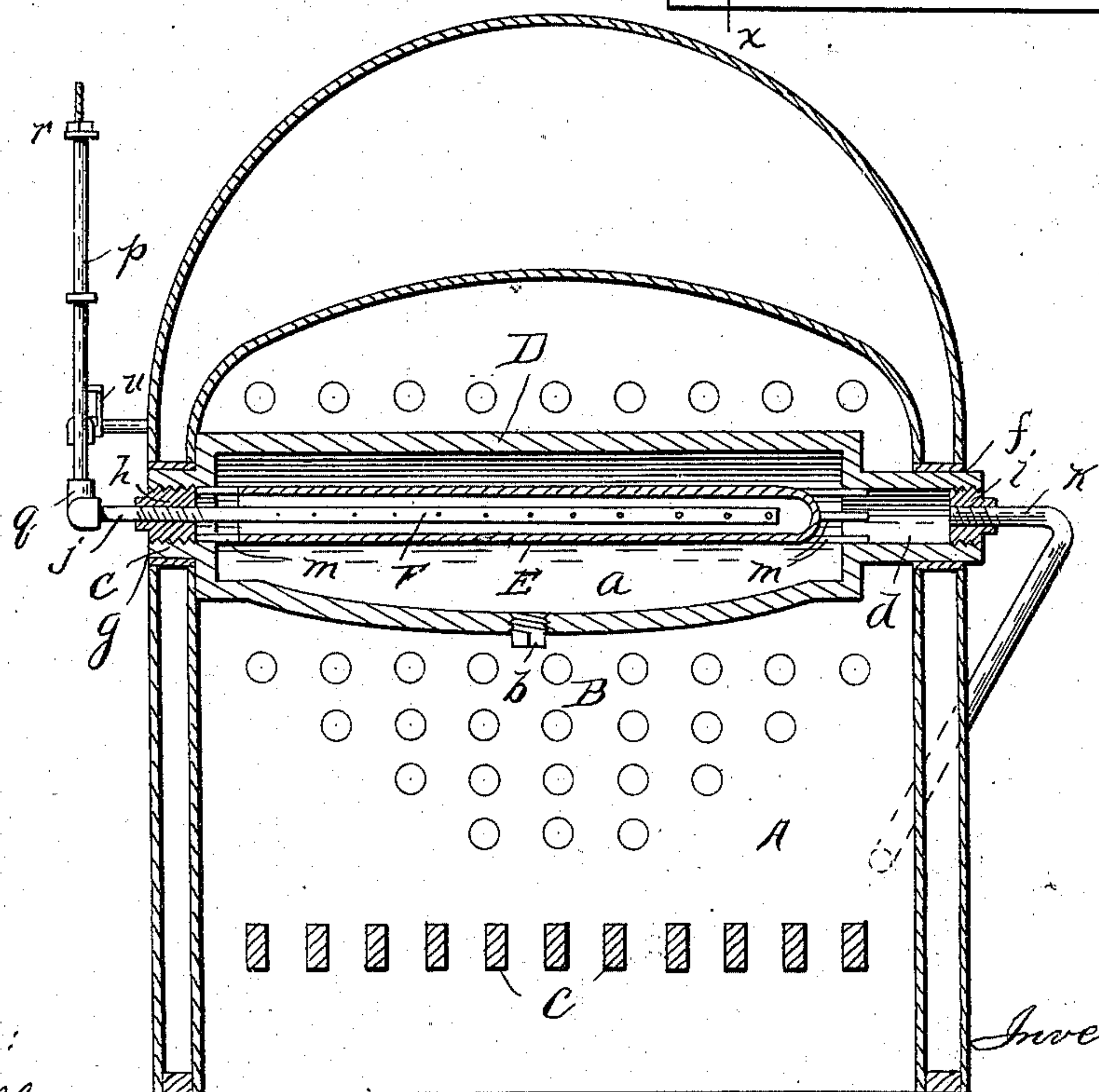
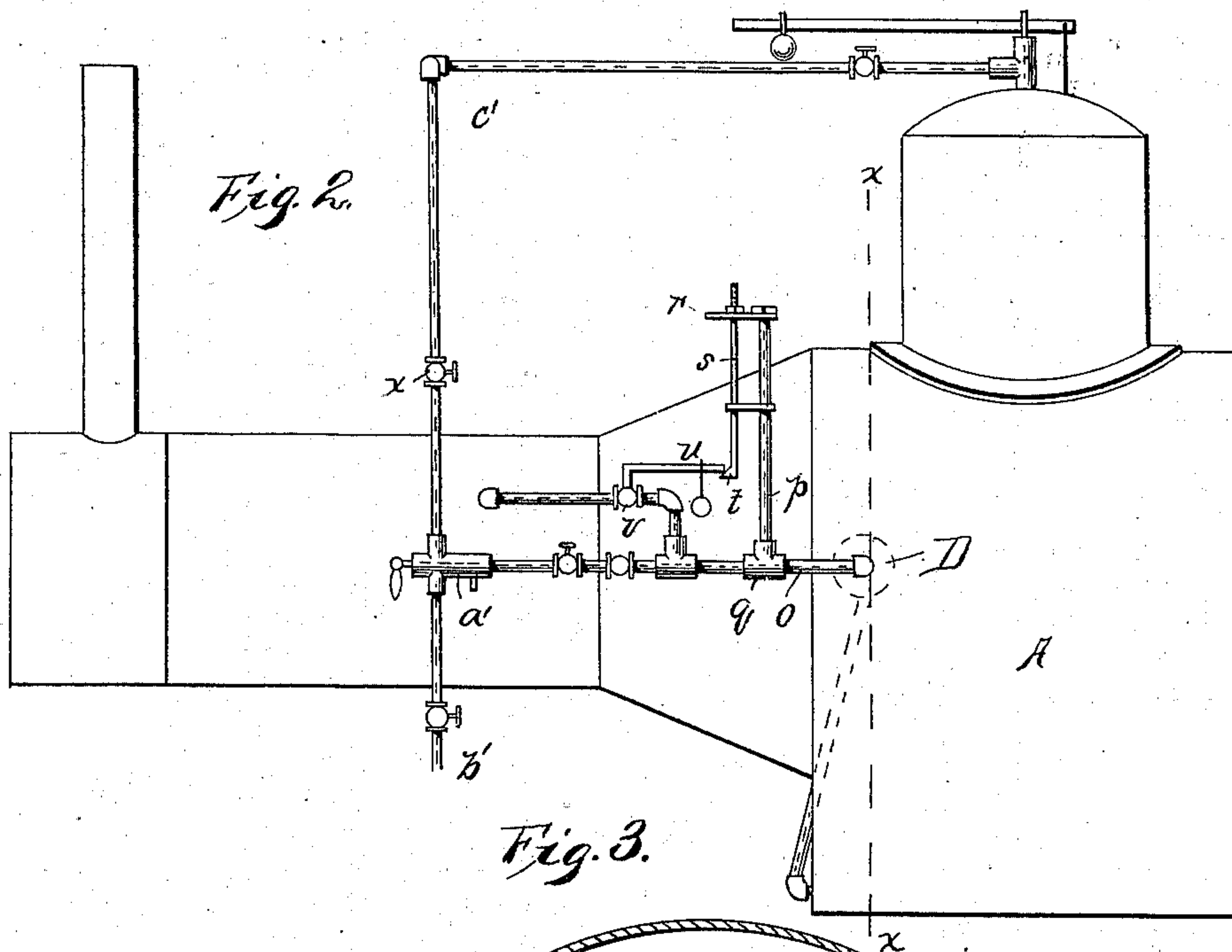
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J. W. CASEY.  
FEED WATER HEATER.

No. 562,574.

Patented June 23, 1896.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

JOHN W. CASEY, OF SISTERSVILLE, WEST VIRGINIA.

## FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 562,574, dated June 23, 1896.

Application filed November 23, 1895. Serial No. 569,937. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN W. CASEY, of Sistersville, in the county of Tyler and State of West Virginia, have invented certain new and  
5 useful Improvements in Feed-Water Heaters; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and  
10 use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention has relation to feed-water  
15 heaters for steam-generators.

It is well known that it is dangerous to introduce cold water into a highly-heated boiler, and that many accidents occur from such practice. It is also well known that when  
20 cold water is introduced it has a tendency to greatly lower the pressure of steam, and chill it, also interfering with the smooth running of the engine. It is also well known that a sluggish circulation is detrimental in the economical generation of steam. It is  
25 also well known that large volumes of water introduced into the boiler is disadvantageous and should be avoided. Therefore to overcome these defects is a further object of my  
30 invention.

My invention consists, first, in locating the heater in the generator in such position that it will not interfere with the draft through the tubes of the products of combustion.

35 It consists, secondly, in the construction of its external shell whereby it can be removed from the boiler bodily without loosening bolts or rivets.

It consists, thirdly, in having a shell of  
40 smaller diameter centrally located within the outer shell or heater, with an inner water-pipe for the purpose of spraying the water in proportionate volumes, according to the pressure exerted on the water, the inner shell being suitably supported by ribs or webs resting within the necks of the outer shell.

It further consists in automatically establishing a circulation of the water in the boiler and the feed-water heater, by which a more  
50 rapid generation of steam is effected, and in other details of construction, as will hereinafter appear.

Referring to the accompanying drawings, Figure 1 shows a side and end elevation in perspective, a part of the fire-box of the boiler  
55 being broken away, showing the heater in position. Fig. 2 is a side elevation of the boiler, showing the automatic regulating device in position. Fig. 3 illustrates a vertical cross-section of the boiler on the lines *x x*,  
60 Fig. 2, clearly showing the heater in central longitudinal section in front of the tube-sheet.

In the drawings, A is the fire-box of the boiler, in this instance of the locomotive  
65 type; B, the tube-sheet; C, the grate-bars, and D the feed-water heater. The heater D is preferably cylindrical in form, slightly bellied on its under side *a*, forming a sediment-pocket for the reception of any foreign  
70 substances that may enter with the feed-water. This depression or belly presents to the heat a larger heating-surface than if the vessel was round, and at the same time permits the accumulation of foreign substances,  
75 which may be withdrawn by removing the plug *b*. The feed-water heater D has on each of its ends supporting-necks *c d*, the neck *d* being the longer. This is done for the ready  
80 insertion or removal of the heater bodily from the boiler.

The long neck *d*, when to be inserted, is pushed through the opening *f* in the side of the fire-box from the inside sufficiently so as to permit the end *c* to enter the spring *g* in  
85 the opposite side of the fire-box, and thus the heater is snugly supported in its place, the depressed portion by its greater gravity retaining it in its proper position.

The open necks or ends *c* and *d* are provided  
90 with female screws into which are screwed plugs or bushings *h i*, and they in turn are also provided with female screws for the reception of inlet and exit pipes *j k*, which are also screw-threaded to fit said bushings or plugs  
95 in the ends of the heaters.

Within the heater I locate a pipe E, provided with wings or ribs *m m*, by which it is supported in the necks of the heater *c d*. This pipe E is open at one end to permit the con-  
100 tents to escape to the heater, and within pipe E, I insert pipe F, which is provided with perforations gradual in size, so that equal quantities of water will pass through the perfora-



tions. I do this for the reason that I hold that there is greater pressure of water near where it enters than where it escapes, as it lessens its pressure while it is passing through to the last perforation, and the perforations being increasing as the pressure is decreasing I have equal quantity passing out against the sides of the heater. By this means the feed-water passes three times through the heater, first through the perforated pipe, secondly back through pipe E, and thence through the heater to pipe n, to the boiler. The water is thus thoroughly heated, and in such condition that if there be any sediment or foreign substances they are separated and precipitated to the pocket or belly *a* of the heater. Furthermore, by breaking up the volume of water as it enters the heater it is disintegrated and has a greater affinity for the heat and will more readily take it up and transmit the heat to the water in the boiler.

Referring to the automatic regulating device, and its function of establishing a circulation of the water in the boiler, *o* is the feed-pipe and *p* a vertical pipe arranged near the feed-pipe and in communication therewith, and secured to the feed-pipe by a T *q*. On the upper end of the pipe *q* is an arm *r*, and to this arm *r* a rod *s* is secured, having a step or tripper *t*, which engages with another tripper *u*, which operates a lever and valve *v*, and which controls communication with the water in the boiler. When the valve *v* is closed, there is no circulation between the body of the boiler and the heater, or while the boiler is being fed, but when the water in the boiler is sufficiently high, and the pump or injector stops and the steam has sufficient temperature, the pipe *r* expands, raising the rod *s*, and throwing the tripper *u*, thereby permitting the weight *w* to drop, opening the valve *v*, and establishing a circulation between the heater and the boiler. In this way circulation is established between the water-legs, the heater, and the body portion of the boiler. Should the injector or pump fail to work, the circulation of the water in the boiler will estab-

lish itself through the heater by the same means, the same as if the injector was purposely stopped, and thus the heater is prevented from burning out. Of course it is obvious that the heater forms an auxiliary to the boiler, as it is itself a rapid generator.

*x* is a check-valve in the feed-pipe *o*, interposed between the injector and the boiler, in the usual manner, and *a'* is the injector. *b'* is the pipe to the feed-water tank and *c'* is the steam-pipe from the boiler to the injector. These pipes have the usual valves.

The operation of the apparatus will be readily understood from the foregoing description. It is obvious that changes may be made and the working parts be differently arranged without departing from the spirit of my invention.

What I claim is—

1. The combination in a steam-generator, of the removable feed-water heater D having necks *c*, *d*, integral with the body of the heater and provided with plug connections outside of the heating-surface, the depressed portion *a*, by which the sediment is collected to a given point and water connections with the body of the boiler, and the water-legs, substantially as described.

2. The feed-water heater having supporting-necks, and the depressed body portion, the central pipe E, and inner pipe F in combination with the boiler, as set forth.

3. A feed-water heater consisting of the body provided with supporting-necks, the central pipe E, perforated pipe F, the bushings *h*, *i*, the pipes *o* and *p*, and the tripping device for establishing circulation between the boiler and the heater, substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JOHN W. CASEY.

Witnesses:

E. C. DUFFY,  
C. M. WERLÉ.