

N<sup>o</sup> 8288



A.D. 1912

*Date of Application, 6th Apr., 1912.*

*Complete Specification Left, 7th Oct., 1912—Accepted, 27th Feb., 1913*

PROVISIONAL SPECIFICATION.

**Improvements in Steam Superheaters for Tubular Boilers.**

I, GEORGE HUGHES, M.I.Mech.E., M.I.C.E., of Wingfield, Heaton, Bolton, County of Lancaster, Engineer, do hereby declare the nature of this invention to be as follows:—

This invention relates to superheaters applicable to tubular boilers, such as  
5 locomotive, traction and marine.

In the construction of such superheater, it is customary to carry the superheating steam tubes from a header connected with the steam space of the boiler into enlarged fire or flue tubes, and back again to another compartment in the steam header.

10 This invention comprises certain improvements in the construction and arrangement of the parts of this class of superheater, by which a receptacle for the saturated steam is provided at the top of the smokebox, and a separate receptacle for the superheated steam is provided at the bottom of the smokebox, but if it is preferred, the receptacles for saturated steam may be arranged on one side of  
15 the smokebox, and the receptacles for superheated steam on the opposite side of the smokebox.

To the steam pipe connecting with the steam space of the boiler, a header is attached where it projects into the smokebox. This may be cast with the usual T pipe in smokebox, or if more convenient, can be made of separate  
20 attachments, and may have one or more branches to which the ends of the steam tubes are attached.

A superheated steam chamber or header is attached to, or cast with the steam chest of the cylinder or cylinders, to which, or to branches, the other ends of the steam tubes are attached.

25 These steam chambers, or headers, are then so placed and arranged, either above and below, or to the sides of the flue or fire tubes, as not to obstruct or cover the free entrance to the tubes, to permit of cleaning of the latter.

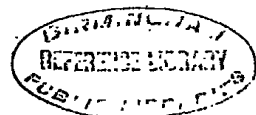
The superheating tubes are connected at one end to the saturated steam header or chamber at the top or one side, and at the other end to the superheated  
30 steam header or chamber at the bottom or other side. Superheating tubes between these headers or chambers enter enlarged flue or fire tubes and around them products of combustion play.

Dated this 4th day of April, 1912.

J. OWDEN O'BRIEN,

35 Successor to and late of W. P. Thompson & Co., of Manchester,  
Patent Agents.

[Price 8d.]



*Hughes's Improvements in Steam Superheaters for Tubular Boilers.*

## COMPLETE SPECIFICATION.

**Improvements in Steam Superheaters for Tubular Boilers.**

I, GEORGE HUGHES, of Wingfield, Heaton, Bolton, County of Lancaster, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to an improved form of superheater apparatus, for 5 locomotive and other smoke or flue tube boilers, of the kind in which the superheating steam pipes pass into and out of the smoke or flue tubes of the boiler the said superheating steam pipes being arranged with return bends within the smoke or flue tubes so that two or more runs of steam superheating pipe are within each smoke or flue tube, and in which separate receptacles or headers 10 are employed for the saturated and superheated steam respectively, the saturated steam receptacle or header being arranged above the smoke or flue tubes and the superheated steam receptacle or receptacles being arranged below the smoke or flue tubes of the boiler which contain the superheating pipes.

In a superheater apparatus according to this invention the saturated steam 15 receptacle is secured in the usual position at the upper part of the smoke box tube plate and the superheated steam receptacle is secured to (or it may be formed integrally with) the cylinder steam chest, and each of the several superheating pipes or elements is run from the saturated steam receptacle or collector into a smoke tube, where it is provided with suitable return bends, and from 20 thence it is run to the superheated steam receptacle or collector, the inlet end of each element being connected to the saturated steam receptacle and the outlet end of each element being connected to the superheated steam chamber.

The superheated steam chamber being in direct communication with the cylinder steam chest of the engine the usual steam pipe or pipes in the smoke 25 box for conveying steam from the superheater apparatus to the cylinders is or are dispensed with.

Further details of construction of a superheater according to this invention will appear from the following description with reference to the accompanying 30 drawings in which

Fig. 1 is a side sectional elevation of a locomotive smoke box showing the superheater arranged therein.

Fig. 2 is a cross sectional elevation of the smoke box.

Figs. 3 and 4 are enlarged views of the superheating elements shown in 35 Figs. 1 and 2.

Fig. 5 is a side sectional elevation of a locomotive smoke box showing a modified form of superheater.

Fig. 6 is a cross section of Fig. 5.

Fig. 7 is an enlarged view of the superheater element shown in Figs. 5 and 6.

Figs. 8, 9 and 10 show respectively in side elevation, cross sectional elevation 40 and plan a method or means, hereinafter described, which may be employed for connecting the superheater elements to the headers.

Referring to Figs. 1, 2, 3 and 4 *a* is the boiler of the locomotive, *d* being the enlarged flue tubes for receiving the superheater elements and *d*<sup>1</sup> the ordinary 45 smoke or flue tubes. *b* is the saturated steam receptacle or header, which may be a casting. This saturated steam receptacle or header *b* is secured in the usual position on the upper part of the smoke box tube plate of the boiler and is in communication with the steam pipe from the regulator. As shown on the drawing this saturated steam receptacle or header *b* is provided with a number of branches *b*<sup>1</sup> and *b*<sup>2</sup> which may be cast integrally with the receptacle or header *b* 50

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or may be separate attachments. These branches  $b^1$  and  $b^2$  receive the inlet ends  $c$  of the superheating elements or pipes  $e^1$ , which are secured to the said branches  $b^1$  and  $b^2$  in any suitable manner. For instance, the superheating element ends  $c$  might be provided with flanges  $f$  by which they could be secured to the aforesaid branches  $b^1$  and  $b^2$  by means of bolts, studs or the like. If desired instead of providing the receptacle or header  $b$  with branches the said receptacle or header  $b$  might be so constructed in one chamber that the superheating elements  $e^1$  could be secured directly to the underside thereof.

Each superheating element  $e^1$ , is bent as shown on the drawing so that it enters one of the enlarged smoke tubes  $d$ ; it is continued along this smoke tube  $d$  to within a short distance (as usual) of the fire box where a return bend  $g$  (see Figs. 3 & 4) is provided. It then returns along the smoke tube  $d$  and takes a downward bend to the superheated steam chambers  $e$ . If desired the superheating elements  $e^1$  might be provided with three return bends  $g$  (as usual) so that four runs of superheating pipe traverse each smoke tube  $d$ ; this arrangement is shown in Figs. 5, 6 and 7 and is hereinafter described.

The superheated steam receptacle or collectors  $e$ , which may be castings, are secured to the upper sides or other convenient part of the steam chest or chests of the engine or they might be formed integrally therewith. The outlet ends  $e^2$  of the superheating elements or pipes are secured to the said receptacles or collectors in a suitable manner such as hereinbefore described with reference to the attachment of the saturated steam inlet ends  $c$  of the elements. As shown on the drawing the superheated steam receptacles or headers  $e$  are provided with branches  $e^1$  and  $e^2$  to which the elements are secured but they might be constructed in one chamber so that the said elements could be secured directly thereto.

The saturated steam leaving the boiler enters the saturated steam receptacle or header  $b$  from whence it passes through the branches  $b^1$   $b^2$  along the superheating elements  $e^1$  and through their outlet ends  $e^2$  to the superheated steam receptacles  $e$ , the superheated steam entering the receptacles  $e$  through their branches respectively  $e^2$ ,  $e^1$ .

Referring now to Figs. 5, 6 and 7 the saturated steam receptacle or header  $b$  is similar to that described with reference to Figs. 1 and 2,  $b^1$  being the branches to which the inlet ends  $c$  of the superheating elements  $e^1$  are secured. The superheated steam receptacle or header  $e$  in this case however is formed as a single casting so as to communicate with the steam chest or steam chests of the engine. This is advantageous in that the full supply of superheated steam is available for either cylinder when the valve is open for admission. The superheating elements  $e^1$  are run in a similar manner to that described with reference to Figs. 1 and 2, either two or four runs of pipe being within each smoke tube  $d$ . Fig. 7 illustrates the method by which four runs of pipe are arranged to traverse each smoke tube,  $e^1$  being the superheating pipe and  $g$  the return bends which may be of any of the various known and suitable kinds.

It should be understood that in the arrangement shown in Figs. 1 and 2 it is not necessary to have separate superheated steam receptacles or headers  $e$  for each steam chest; these headers might be constructed in a similar manner to that shown in Figs. 5 and 6 or the headers  $e$  of Figs. 1 and 2 might be placed in communication with one another by means of a suitable pipe or the like so that the full supply of superheated steam would be available for each cylinder of the engine.

In order to facilitate the withdrawal of either the saturated or superheated steam headers or receptacles for the purpose of making or remaking the joint between the said headers or receptacles and the tube plate or the steam chest respectively, withdrawable liner plates or distance blocks  $f^1$ ,  $f^2$  may be employed; see Figs. 8, 9 and 10.

These liner plates or distance blocks  $f^1$  and  $f^2$  are placed between the superheater element flanges and the header or receptacle and are made in such a manner that when they are removed there is sufficient clearance between the

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flanges of the superheater elements and the header to allow the latter to be lifted clear of the studs by which it is secured to either the tube plate or the steam chest thus avoiding the necessity of disturbing the element when removing the headers.

Although as shown in Figs. 8, 9 and 10 the liner plates or distance blocks  $f^1$ ,  $f^2$  5 are only shown in connection with the bottom header the same method can be employed for the top header if necessary.

The saturated and superheated steam receptacles or headers being separate chambers or castings of simple design they can be produced and fitted in an economical manner. Further the saturated and superheated steam receptacles 10 or headers,  $b$  and  $c$  respectively, being widely separated from each other, and the usual smoke box steam pipes being dispensed with, loss of superheat during the passage of the superheated steam from the outlet ends of the superheater elements or pipes to the engine valve chests is reduced to a minimum as compared with superheaters of the types now generally used. 15

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. In a steam superheater, for locomotive and other fire tube boilers, of the kind set forth, the combination of a saturated steam collector or header arranged 20 within the smoke box above the flue tubes of the boiler and a superheated steam collector or header (or superheated steam collectors or headers) arranged within the smoke box below the said flue tubes and secured to or formed integrally with the cylinder steam chest (or cylinder steam chests) of the engine so as to be in direct communication therewith, the saturated steam inlet ends of the super- 25 heater elements being connected to the said saturated steam header and the superheated steam outlet ends of the superheater elements connected to the said superheated steam header or headers.

2. Steam superheaters, including the steam collectors or headers, constructed and arranged substantially as described and illustrated by the accompanying 30 drawings.

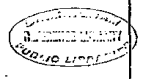
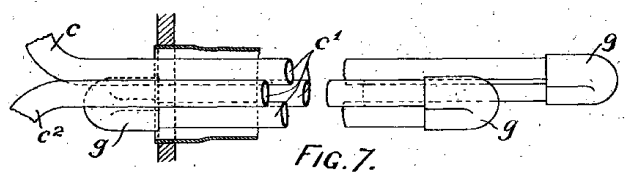
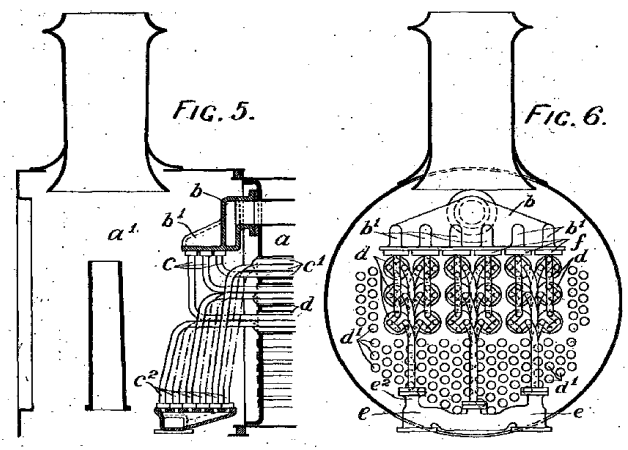
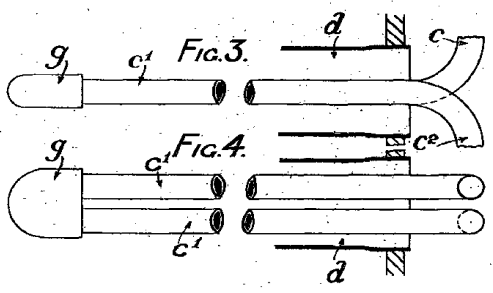
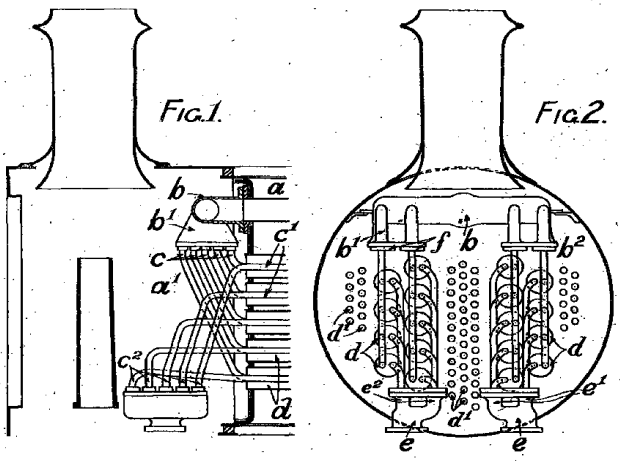
Dated this 7th day of October, 1912.

JOHN P. O'DONNELL,  
Fel. Chart. Inst. P.A., M. Inst. C.E.,  
Agent for Applicant, 35  
Palace Chambers, Westminster, S.W.

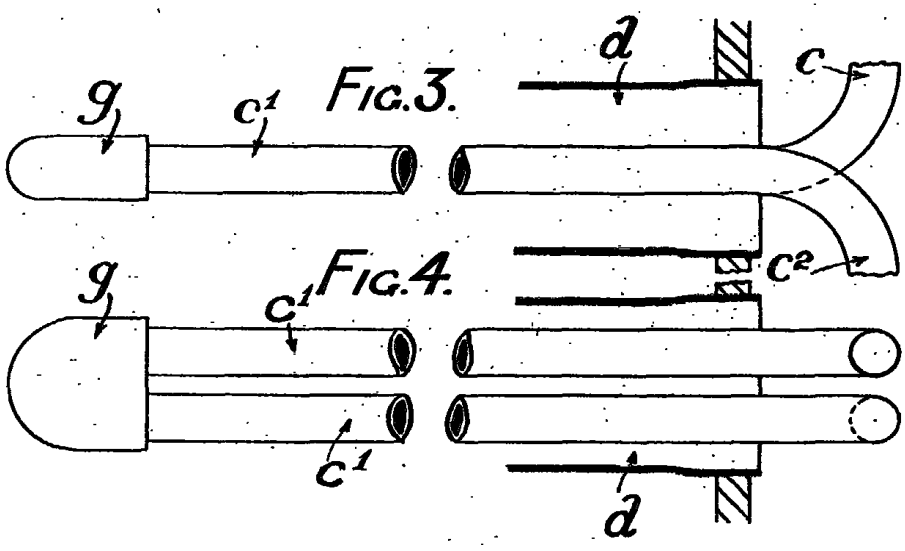
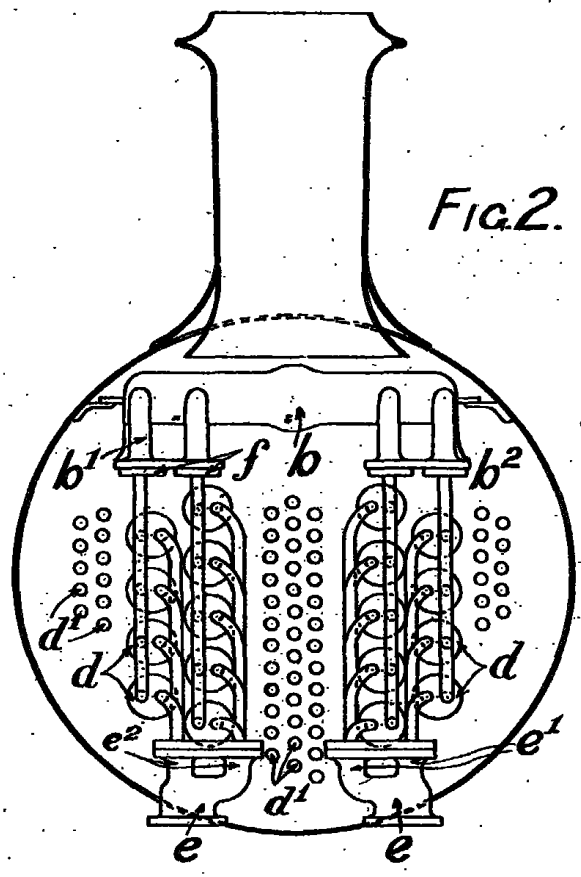
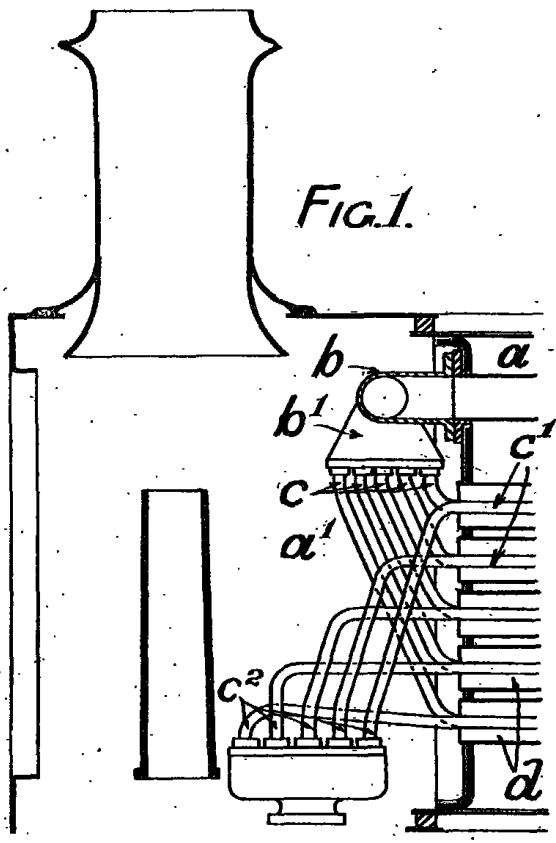
SHEET 1.

SHEET 2.

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[This Drawing is a reproduction of the Original on a reduced scale.]



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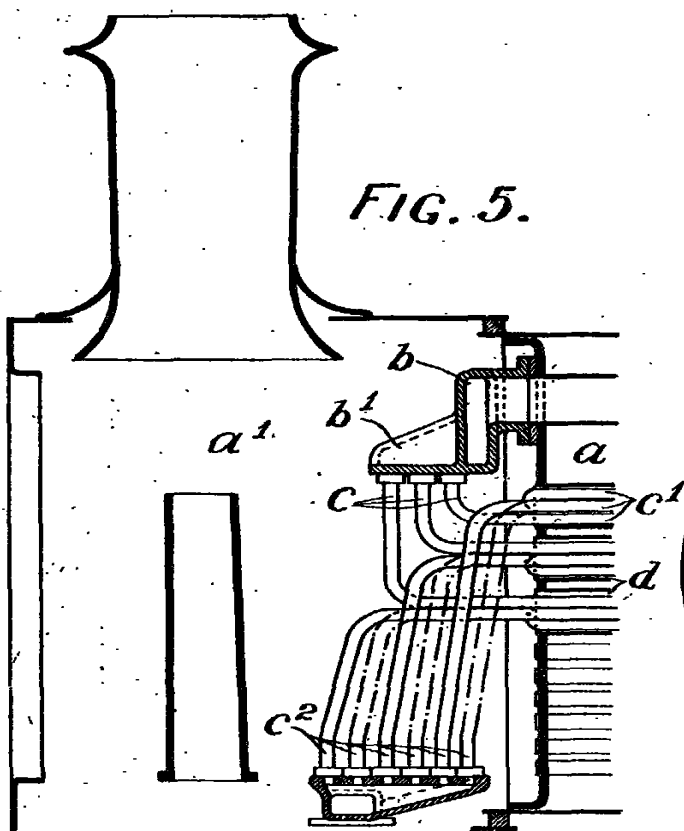


FIG. 5.

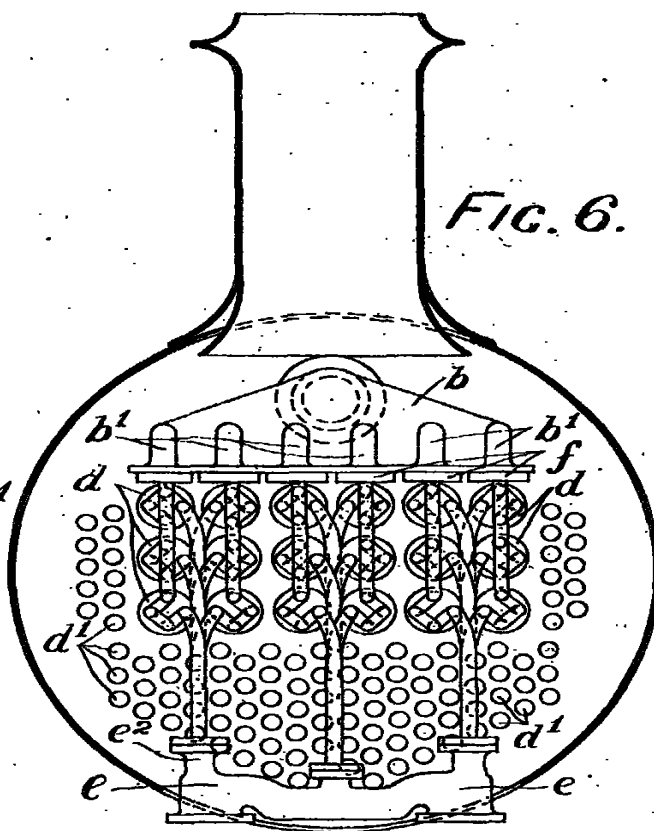


FIG. 6.

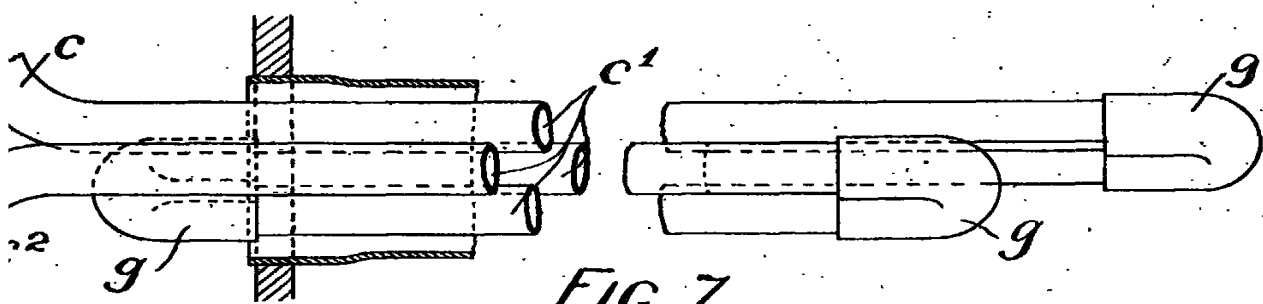


FIG. 7.

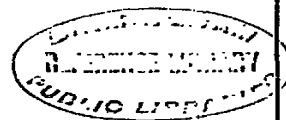


FIG. 8.

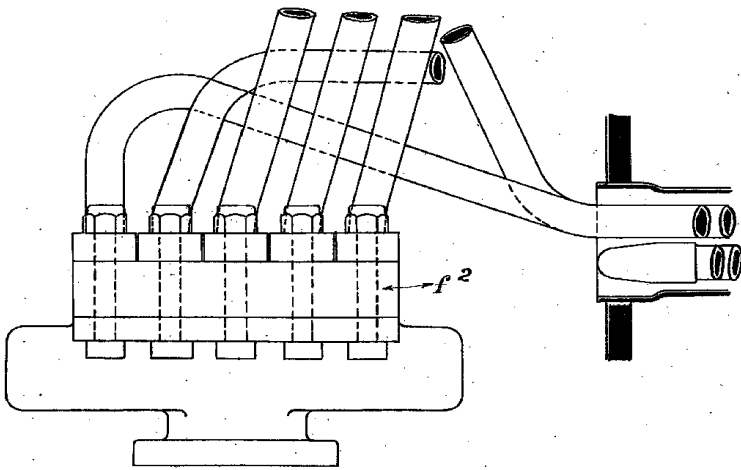


FIG. 9.

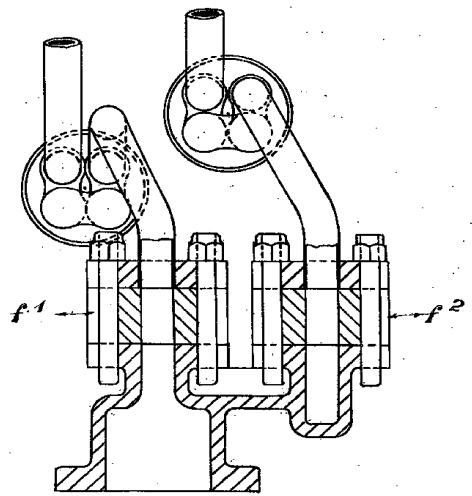
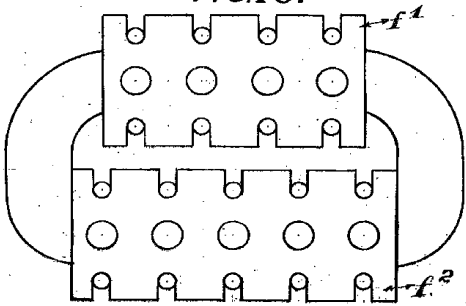
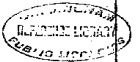


FIG. 10.

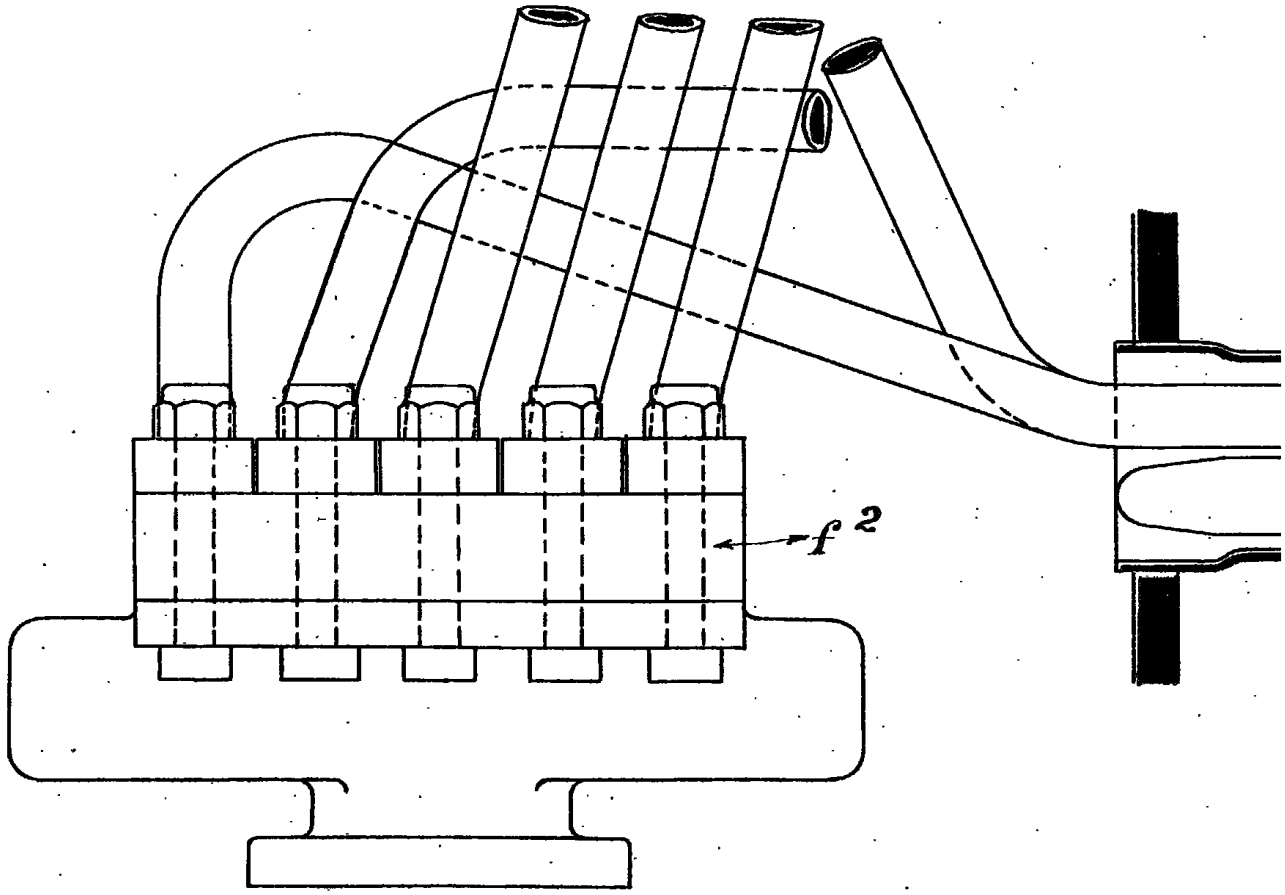


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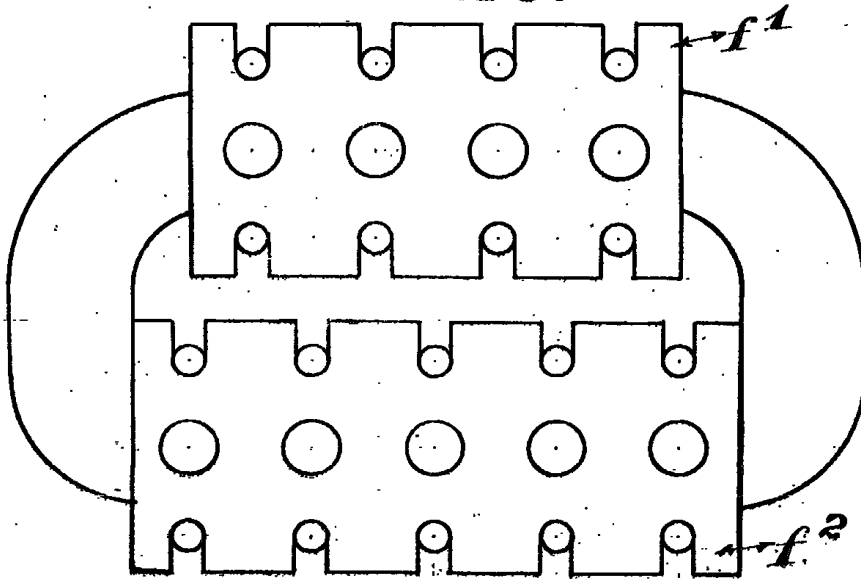




*FIG. 8.*

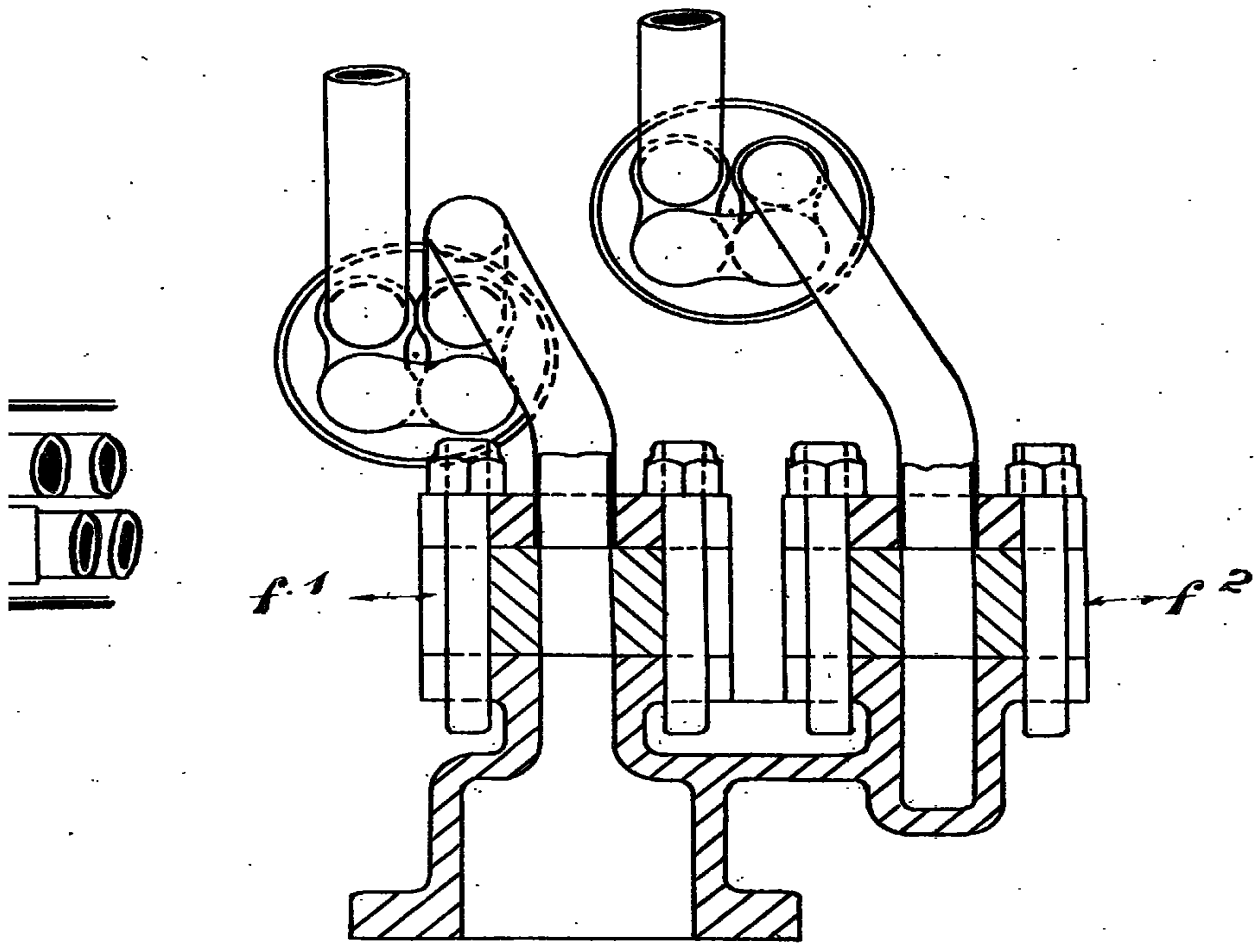


*FIG. 10.*



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FIG. 9.



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