

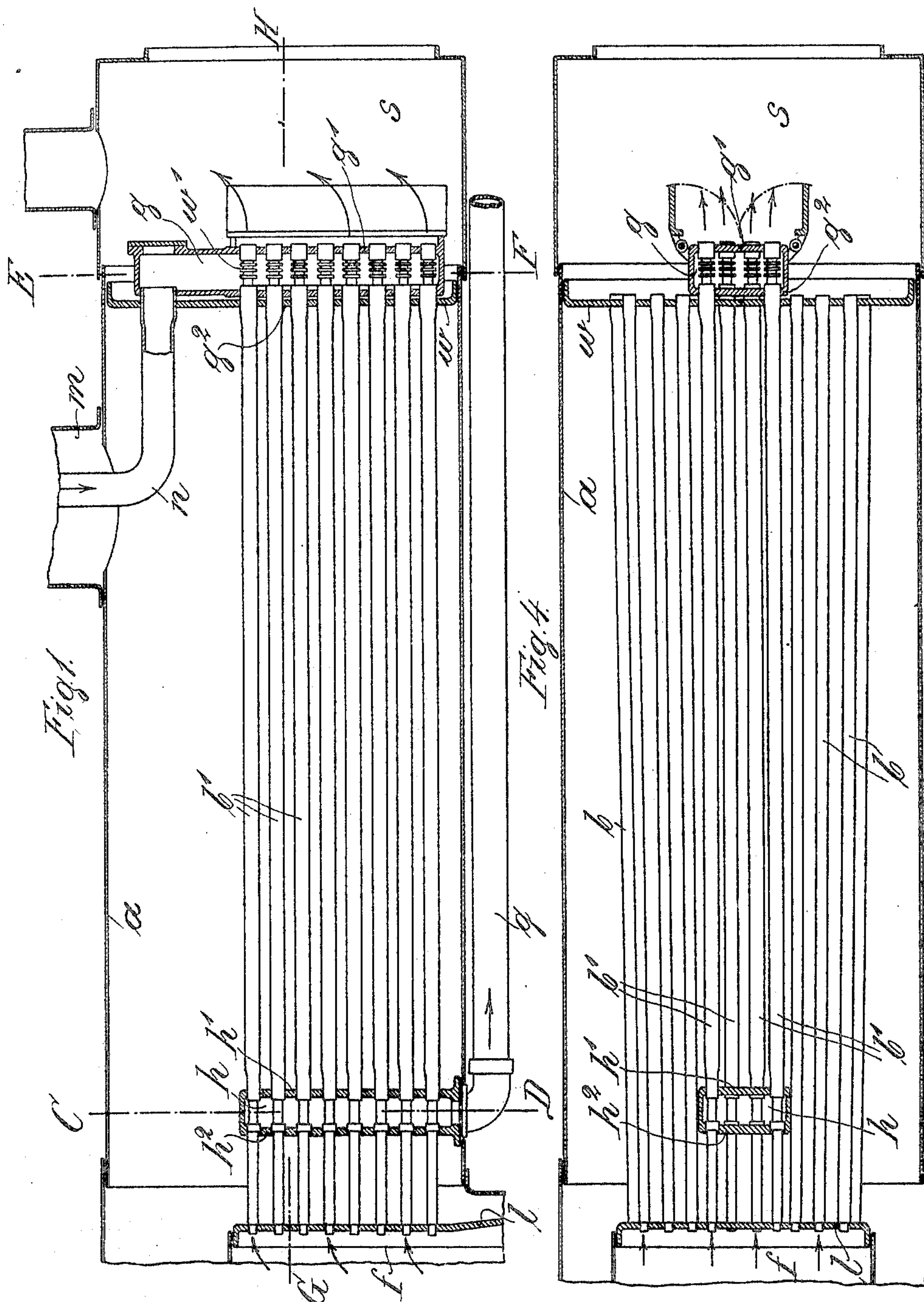
No. 804,557.

PATENTED NOV. 14, 1905.

W. SCHMIDT.  
SUPERHEATER.

APPLICATION FILED MAY 8, 1905.

3 SHEETS—SHEET 1.



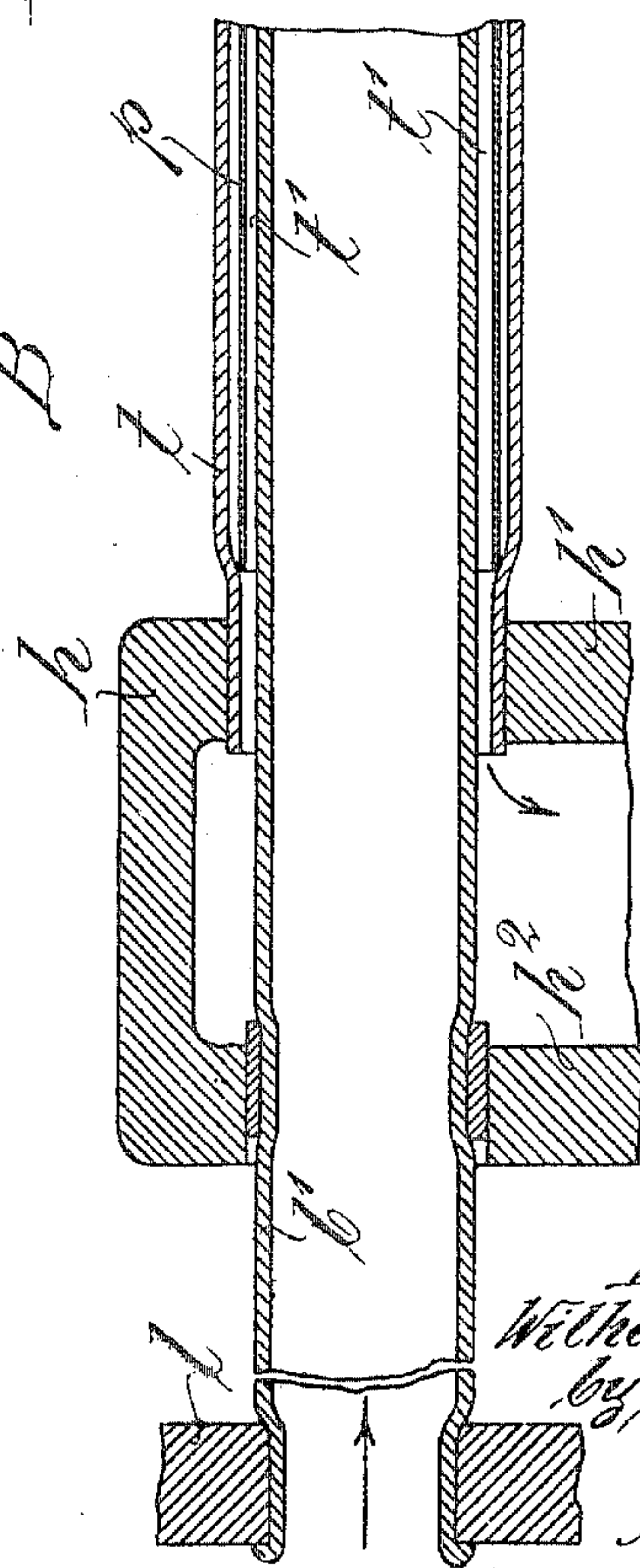
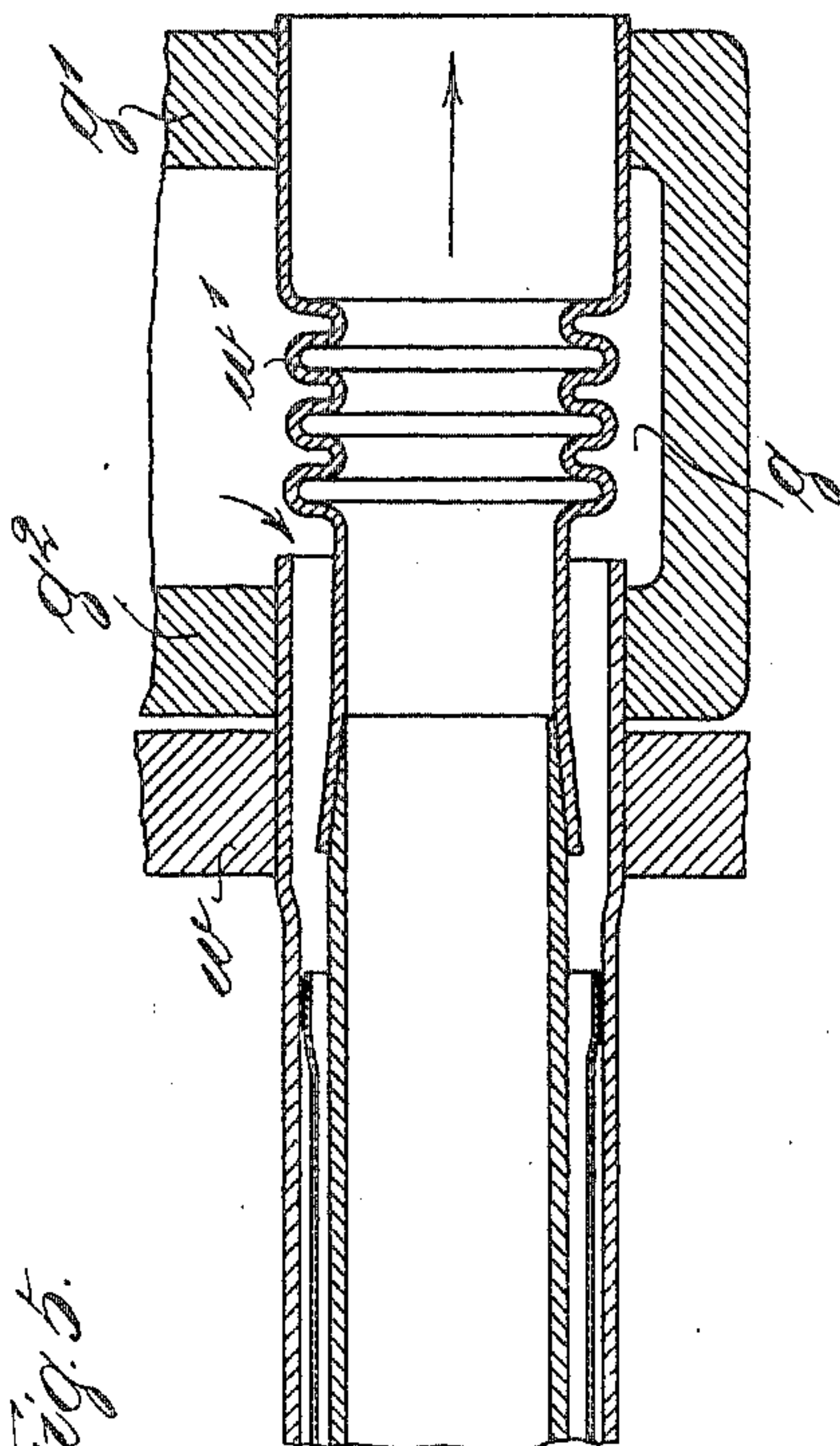
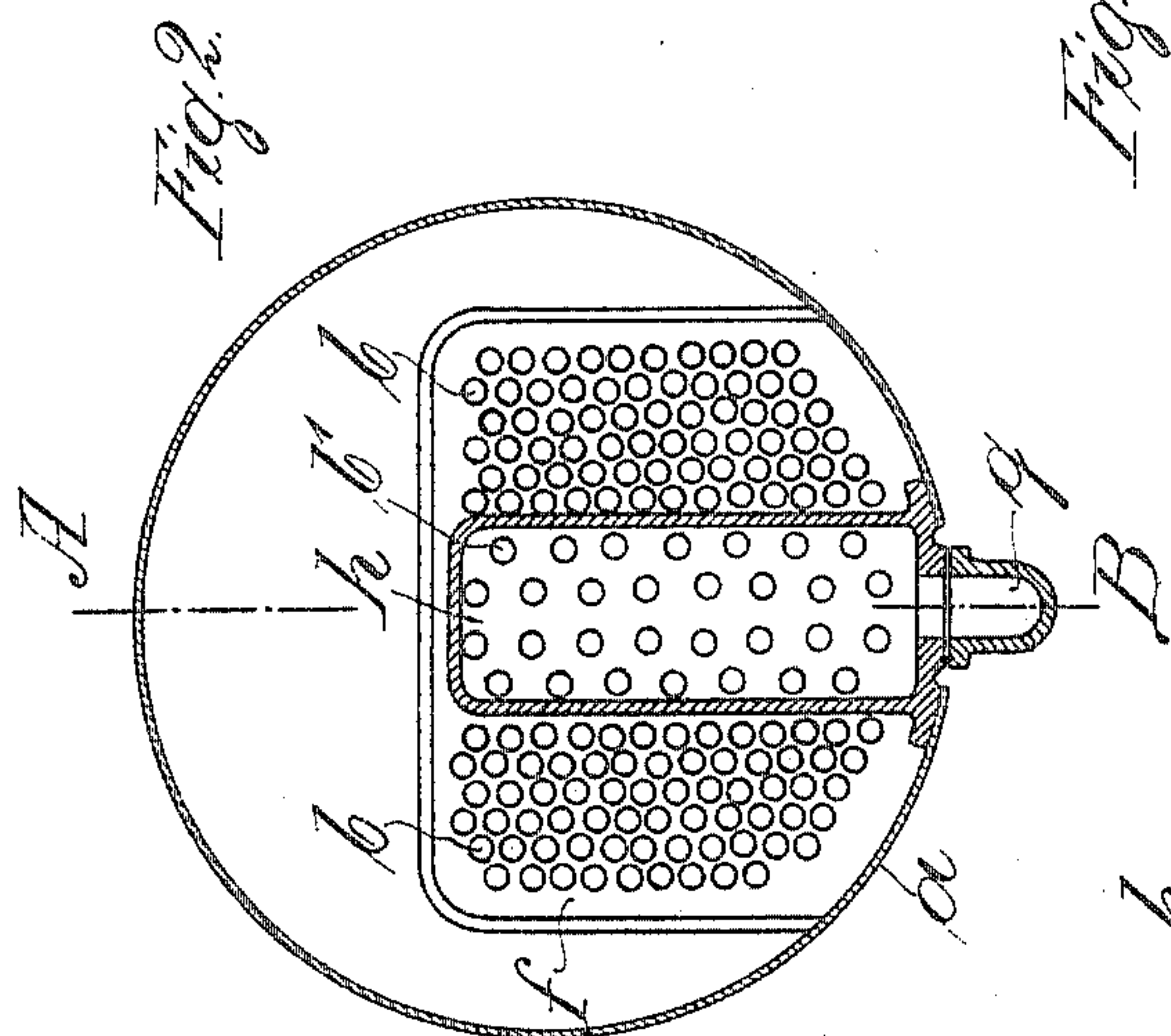
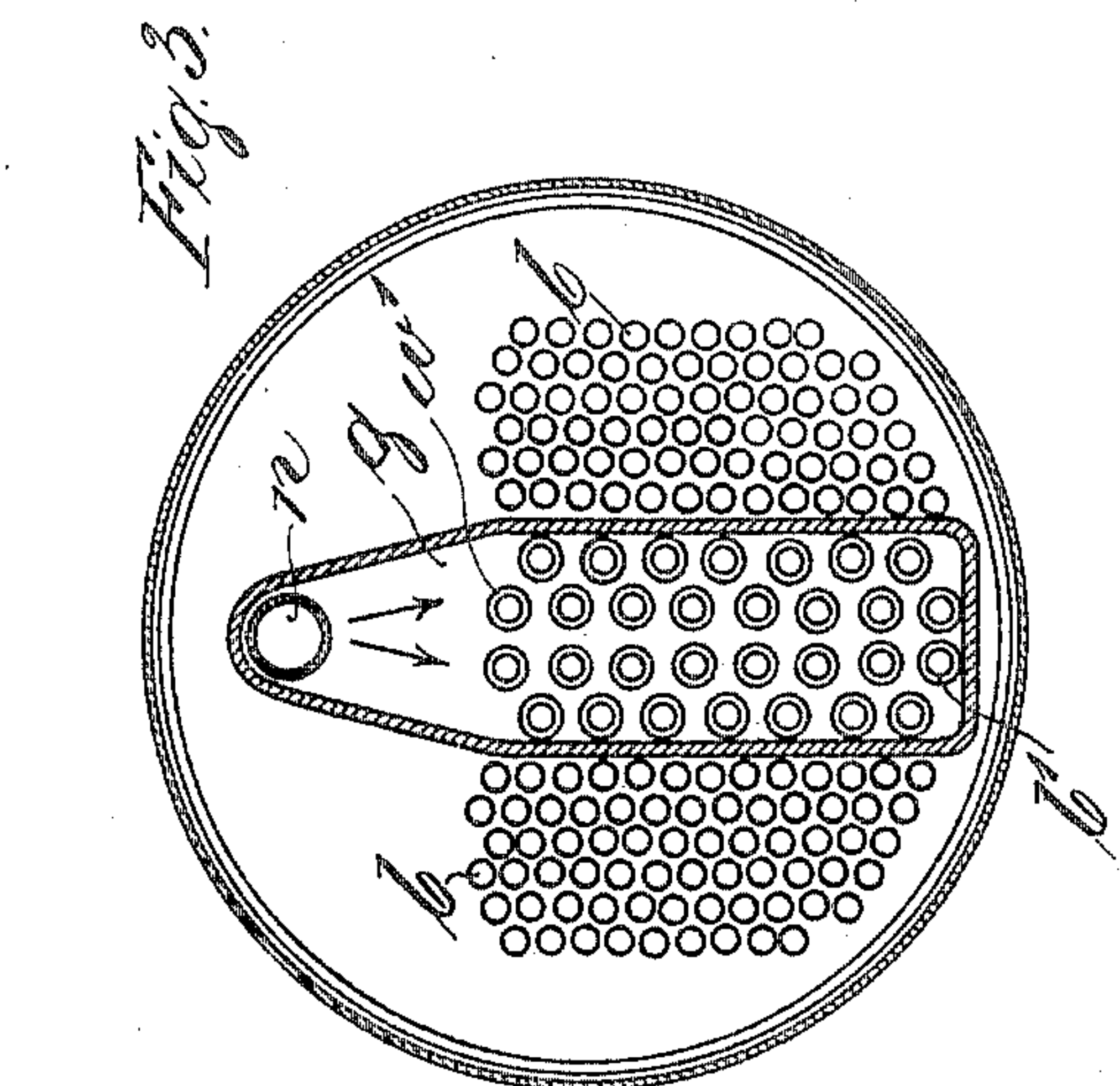
Witnesses:  
Carl Rupp.  
Emil Kayser.

Inventor:  
Wilhelm Schmidt.  
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SUPERHEATER.

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3 SHEETS—SHEET 2.



Witnesses:  
Carl Rupp.  
Emil Haysen.

Inventor:  
Wilhelm Schmidt.  
by *[Signature]*  
Attorney.



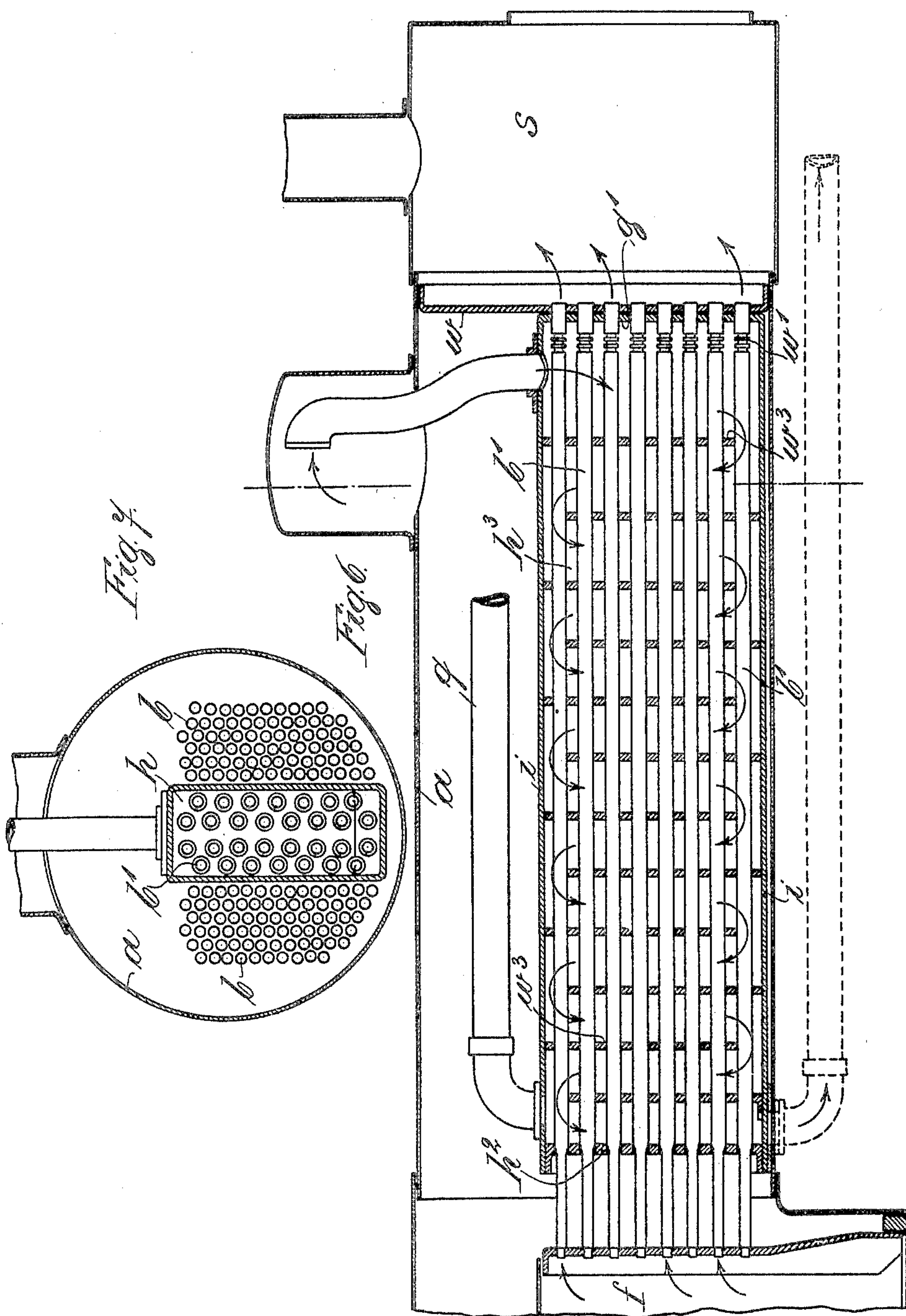
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3 SHEETS—SHEET 3.



Witnesses:  
*Carl Rupp.*  
*Emil Haysen.*

Inventor:  
*Wilhelm Schmidt.*  
*by Rosenfeld*  
Attorney.



# UNITED STATES PATENT OFFICE.

WILHELM SCHMIDT, OF WILHELMSHÖHE, NEAR CASSEL, GERMANY.

## SUPERHEATER.

No. 804,557.

Specification of Letters Patent.

Patented Nov. 14, 1905.

Application filed May 8, 1905. Serial No. 259,342.

*To all whom it may concern:*

Be it known that I, WILHELM SCHMIDT, a subject of the King of Prussia, German Emperor, and a resident of Wilhelmsöhe, near Cassel, in the Province of Hesse-Nassau, German Empire, have invented certain new and useful Improvements in Superheaters, of which the following is an exact specification.

My invention relates to steam-superheaters which are formed by the flue-tubes of the flue-tube boilers and by mantles surrounding them.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side section on the line A B of Fig. 2. Fig. 2 is a cross-section on the line C D of Fig. 1. Fig. 3 is a cross-section on the line E F of Fig. 1. Fig. 4 is a horizontal section on the line G H of Figs. 1 and 2. Fig. 5 illustrates the detail of such a tube forming with its mantles the superheater. Figs. 6 and 7 show in the same manner a modified arrangement of the superheater, illustrating the same invention applied for this modified form.

In the drawings, *a* is the locomotive-boiler, in which the flue-tubes *b* are arranged in well-known manner between the fire-box *f* and between the smoke-chamber *s*. One part of the well-known flue-tubes of the boiler is surrounded by tubes *t* of larger diameter, so that between each flue-tube and the mantle *t* an annular space is formed, through which the steam passes which is to be superheated. Those flue-tubes which are used as superheating-tubes are named with *b'*. The mantles *t* are fastened on one side to the wall *w* of the locomotive-boiler and on the other side to a chest *h*, which is only of small length, as to be seen from Fig. 1, and which extends substantially vertically, as shown in Fig. 2. As easily to be seen, only the middle part of the flue-tubes *b'* is provided with mantles *t* and is fastened to and penetrates the chest *h*. As shown in Fig. 5, the mantle-tubes *t* are firmly attached to the front wall *h'* of the chest *h* and the flue-tubes *b'* to the back wall *h<sup>2</sup>* of the chest *h*.

The steam taken from the boiler by the steam-dome *m* passes through the tube *n* and enters the chest *g*, arranged on the rear side of the smoke-chamber. In the front wall *g'* of this chest are firmly attached the superheater-tubes *b'*, which possess transverse corrugations *w'* for the purpose of imparting to these tubes *b'*, which serve as superheating-

tubes, a certain elasticity for the purpose to be described later on. This arrangement of transverse corrugations on the tubes *b'*, which form the inner tubes of the superheater, I consider and claim as my invention.

The mantle-tubes *t*, which surround the flue-tubes *b'*, are, as seen in Fig. 5, attached to the back wall *g<sup>2</sup>* of the steam-chest *g*, as well as they are firmly and steam-tight attached to the wall *w* of the boiler.

As shown in Fig. 5, the mantle-tubes *t* are still provided with an inner tube *t'*, which has only the purpose to form an annular space *p'* between *t* and *t'*, so that the steam which is to be superheated and which passes the annular space between the flue-tube *b'* and the tube *t'* is not too strongly cooled by the action of the boiler-water surrounding the tubes *t*. The annular space between *t* and *t'* protects the steam to be superheated when it passes the superheater-tubes.

The fire-gases naturally pass in the common manner through the tubes *b* and in that part of the tubes *b'* which is surrounded by the tube *t* and *t'*. The steam coming from the chest *g* and passing the annular space *p* is strongly superheated and gets into the chamber *h*, as seen in Fig. 5, and from there to the lower side of the boiler through the tube *q* to the cylinders of the boiler of the steam-engine. (Not shown in the drawings.)

It is still to be described the purpose which the transverse corrugations *w'* have which are formed on the flue-tubes *b'*.

When the burner is heated by the fire-gases passing through the tubes *b* *b'*, the tubes *b*, which are not surrounded by mantle-tubes *t* and *t'* and which do not serve as superheaters, that are the tubes on both sides of the superheater-tubes, are strongly cooled by the boiler-water. These tubes serve, as well known, as stays between the flue-sheets in order to augment the stability of the boiler. Of the tubes *b'* only the fore part can serve as stays between the flue-sheets at the distance from the wall *l* to the back wall *h<sup>2</sup>* of the steam-chest *h*, because the other part of the tubes *b'* of the superheater from the wall *h<sup>2</sup>* to the front wall *g'* of the steam-chest *g* are strongly heated by the fire-gases and are not cooled in such a good manner as the other flue-tubes, so that they cannot serve as stays between the flue-sheets. For those parts of the flue-tubes *b'* the mantle-tubes *t* serve as stays between the flue-sheets for the boiler, and therefore they are firmly and



tightly attached to the front wall  $h'$  of the chest  $h$  and to the wall  $w$  of the locomotive-boiler.

Those parts of the superheating-tubes  $b'$  from the wall  $h^2$  to the wall  $g'$  suffer a greater extension than the other tubes, serving as stays between the flue-sheets, and therefore there must be a certain elasticity, so that they can extend in a greater measure than the other flue-tubes  $b$ , and for that purpose the transverse corrugations on these flue-tubes  $b'$  are arranged.

In Figs. 6 and 7 the same invention is illustrated, the flue-tubes  $b'$  being provided with transverse corrugations  $w'$ . The only difference in the arrangement is that not each of the flue-tubes  $b'$  is surrounded with separate mantles  $t'$ , but a common inclosure-chest  $i$  encircles all those flue-tubes  $b'$  which serve as superheating-tubes and are enlarged within the steam-chest  $h^3$ . The whole space between the walls  $h^2$  and  $g'$  is named  $h^3$  in Fig. 6. Partition-walls  $w^3$  (see Fig. 6) are arranged in the chamber to give a distinct passage to the steam to be superheated. The steam then passes through the tube  $q$  to the steam-cylinder of the steam-engine. (Not illustrated in the drawings.)

Having thus fully described the nature of my invention, what I desire to secure by Letters Patent of the United States is—

1. The arrangement of a superheater in a steam-boiler with flue-tubes, one part of the flue-tubes serving as superheater-tubes, the latter being provided with means for compensating their lengthwise expansion by the heat of the fire-gases, substantially as described and for the purpose set forth.

2. The arrangement of a superheater in a steam-boiler with flue-tubes, one part of the flue-tubes serving as superheater-tubes, and surrounded by walls forming a chamber around the superheater-tubes, the superheater-tubes being provided with means for compensating their lengthwise expansion by

the heat of the fire-gases, substantially as described and for the purpose set forth.

3. The arrangement of a superheater in a steam-boiler with flue-tubes, one part of the flue-tubes serving as superheater-tubes, each superheater-tube being encircled by mantle-tubes  $t'$   $t$  the latter of which is tightly fixed to the steam-chambers  $h$   $g$ , the superheater-tubes  $b'$  being provided with means for compensating their lengthwise expansion by the heat of the fire-gases, substantially as described and for the purpose set forth.

4. The arrangement of a superheater in a steam-boiler with flue-tubes, one part of the flue-tubes serving as superheater-tubes, the latter being provided with transverse corrugations for compensating their lengthwise expansion by the heat of the fire-gases, substantially as described and for the purpose set forth.

5. The arrangement of a superheater in a steam-boiler with flue-tubes, one part of the flue-tubes serving as superheater-tubes, and surrounded by walls forming a chamber around the superheater-tubes, the superheater-tubes being provided with transverse corrugations for compensating their lengthwise expansion by the heat of the fire-gases, substantially as described and for the purpose set forth.

6. The arrangement of a superheater in a steam-boiler with flue-tubes, one part of the flue-tubes serving as superheater-tubes, which part is enlarged and tightly fixed to the steam-chamber  $h^3$ , Fig. 6, the superheater-tubes being provided with transverse corrugations for compensating their lengthwise expansion by the heat of the fire-gases, substantially as described and for the purpose set forth.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

WILHELM SCHMIDT

Witnesses:

HENRY HASPER,

WOLDEMAR HAUPT.