

No. 674,879.

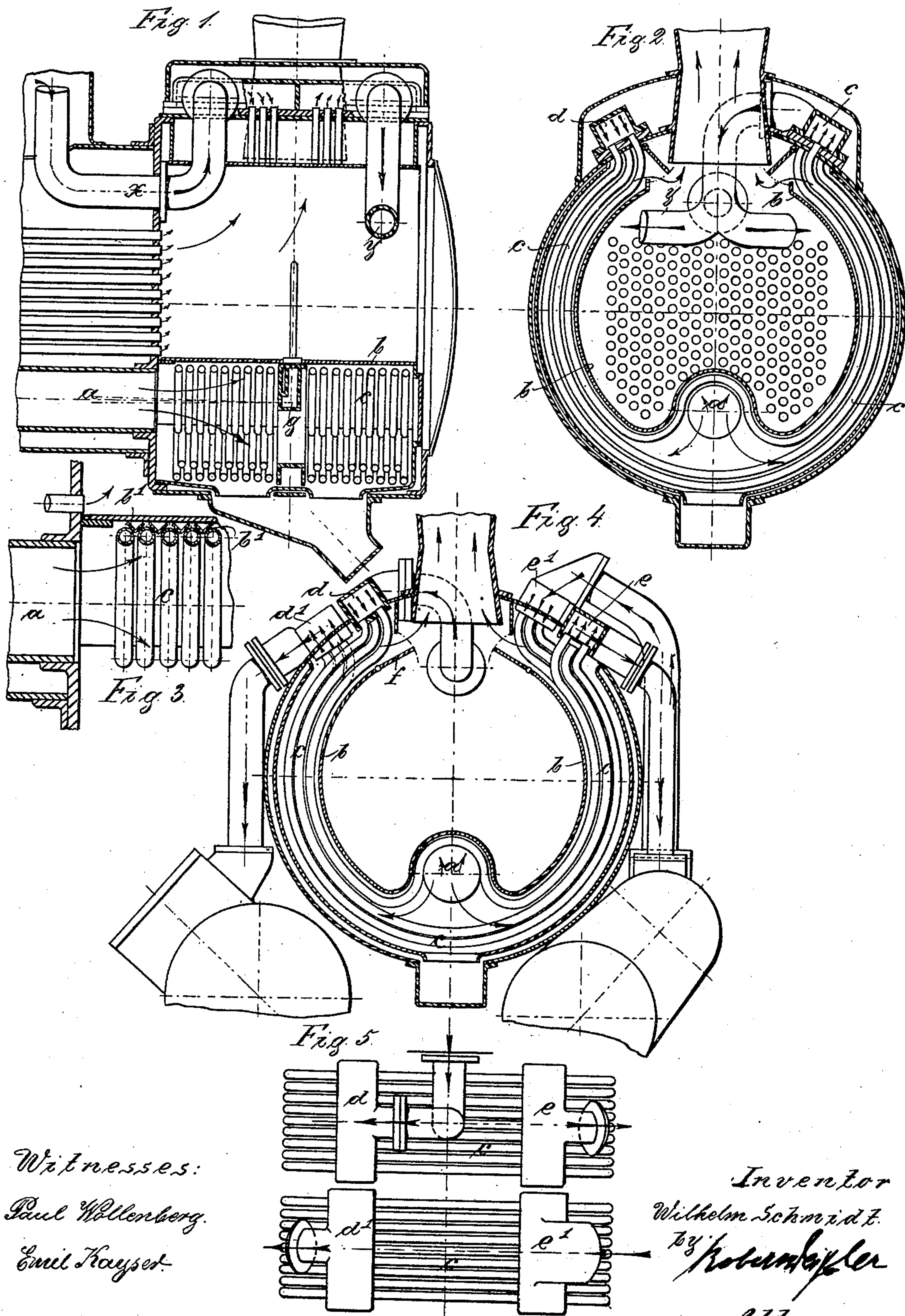
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W. SCHMIDT.

SUPERHEATING APPARATUS FOR STEAM BOILERS.

(Application filed Dec. 12, 1899.)

(No Model.)



Witnesses:  
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# UNITED STATES PATENT OFFICE.

WILHELM SCHMIDT, OF WILHELMSHÖHE, GERMANY.

## SUPERHEATING APPARATUS FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 674,879, dated May 28, 1901.

Application filed December 12, 1899. Serial No. 740,135. (No model.)

*To all whom it may concern:*

Be it known that I, WILHELM SCHMIDT, engineer, of Wilhelmshöhe, near Cassel, in the Province of Hesse-Nassau, German Empire, have invented a new and useful Superheating Apparatus for Tubular Boilers, of which the following is a specification.

The application of an arrangement in locomotive-boilers for superheating the steam has, as is well known, great difficulties connected therewith, if it be desired to attain very high temperatures of the steam without considerably modifying the construction of the boiler or substantially reducing the water-heating surface. Up to the present time it has been considered impossible to apply a superheater to an existing boiler, and particularly when one considers the comparatively large amount of the heating-gases required in this kind of boiler. If it is desired to shorten the boiler somewhat in order to obtain sufficiently hot gases, (which do not exclude the obtaining of a high superheating,) so that all the gases shall give off the remainder of their heat to the superheater, then the superheaters become so very large that there is very seldom space enough for the same in or above the smoke-box.

My invention relates to a superheating apparatus obviating all drawbacks found in the apparatus hitherto used.

My invention is represented in the accompanying drawings, in which—

Figure 1 shows a vertical section through a locomotive-boiler. Figs. 2 and 4 are transverse sections through boilers, while Figs. 3 and 5 are detail views.

The construction illustrated in the drawings represents a superheating apparatus especially suitable for tubular locomotive-boilers. With this type of boiler the following conditions must perforce be complied with, owing to their confined build and forced draft: First, the superheater must have a large heating-surface occupying the smallest possible space; second, a large number of tubes parallel to each other of the necessary sectional area for the purpose of permitting of the passage of a large volume of steam; third, the leaving free of the middle part of the smoke-box for permitting of access to all the boiler-tubes for the application of the ex-

haust and the like, and, fourth, the placing of the center of gravity not higher than the middle of the boiler and the rigid attachment of all parts of the superheater to the boiler in view of the shocks or oscillations to which it will be normally subjected; but especially in the case of large express-locomotives another arrangement will be necessary.

The hot gases passing off from the fire-box are conducted to an annular chamber by the large tube *a*, Fig. 1, which chamber is formed by the walls of the smoke-box and the inner wall *b*, the latter terminating below the chimney or uptake.

As indicated by the arrows, Fig. 2, the hot gases divide at the lower end of the annular chamber into two streams and pass over the superheater-pipes *c* to their collecting-boxes *d* and *e*.

The passage of the hot gases from the fire-tube *a* to the superheater-casing is obtained by corresponding bends of the inner superheater-tubes. The connecting-channel is therefore formed by the heating-tubes, which is of an importance not to be underrated, because a guiding-channel without special arrangements for keeping same cool during the passage of the hot gases easily becomes distorted, not taking into account the unavoidable loss of heat, which is hereby prevented, for the walls of the connecting or guiding channel form effective heating-surfaces in the superheater.

In order to protect the inner wall *b* of the smoke-box from being overheated, the inner heating-tubes are, as shown in Fig. 3, provided with angular pieces *b'*, which prevent the hot gases from coming into direct contact with the inner wall *b* of the fire-box. The flow of the hot gases is regulated by means of the flaps *f* at the exit-openings of the annular chamber. This arrangement gives the advantage that the middle part of the smoke-box is not encumbered by any kind of superheater parts or casings. The fire-tubes can easily be swept, and, further, it is possible to put the steam or exhaust pipes inside of the smoke-box in the usual way.

*g* is a device arranged between the superheater-pipes or in the middle of the connecting-channel for the purpose of blowing the ashes out of the large tube *a*.



In Figs. 4 and 5 is shown an arrangement for a compound machine in order to permit of superheating the steam distributed to both cylinders in such manner that the steam to the low pressure is also superheated. The live steam enters the box *d*, passes through one half of the superheater-tubes, is collected in the box *e*, then passes to the high-pressure cylinder, and from thence exhausts into the box *e'*. It then flows through the other half of the superheater-tubes into the collecting-box *d'* and passes thence into the low-pressure cylinder. In Fig. 4 the collecting-boxes are shown out of place for the sake of clearness, while the plan section, Fig. 5, shows them in their proper positions one behind the other. It should further be noted that also, as shown in Figs. 1 and 2, the chambers *d* and *e* are divided in the middle in such manner that the steam must pass twice through the superheater-tubes *c*, only there are not, as in the compound-engine arrangement, high and low pressure steam in the half-chambers or half-

sets of tubes, but the live steam, entering by the pipe *x*, takes the course indicated by the arrows—that is to say, it is compelled to pass through the annular chamber twice before it reaches the pipe *y*.

What I claim as my invention, and desire to secure by Letters Patent, is—

In tubular boilers with superheaters, the combination with the smoke-box, of an annular channel mounted on the inner wall of the smoke-box, of a tube *a* connecting the fire-box with said channel, of superheating-tubes *c* arranged within said channel and terminating in collecting-boxes, a series of said tubes being arched to form a distribution-channel, substantially as described and shown, and for the purpose as set forth.

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

WILHELM SCHMIDT.

Witnesses:

WOLDEMAR HAUPT,  
HENRY HASPER.