

(No Model.)

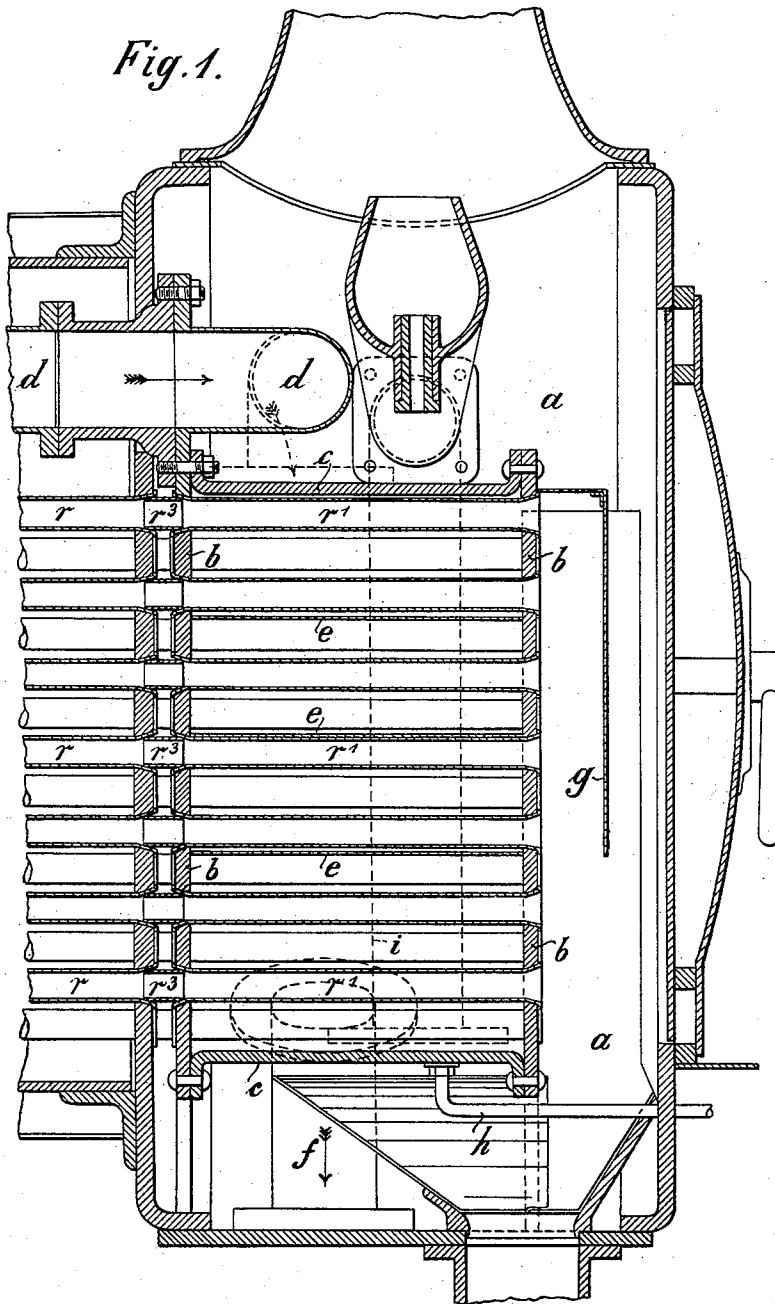
4 Sheets—Sheet 1.

J. VON GRUBINSKI.
SUPERHEATER.

No. 599,780.

Patented Mar. 1, 1898.

Fig. 1.



Witnesses:-

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*Inventor,
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(No Model.)

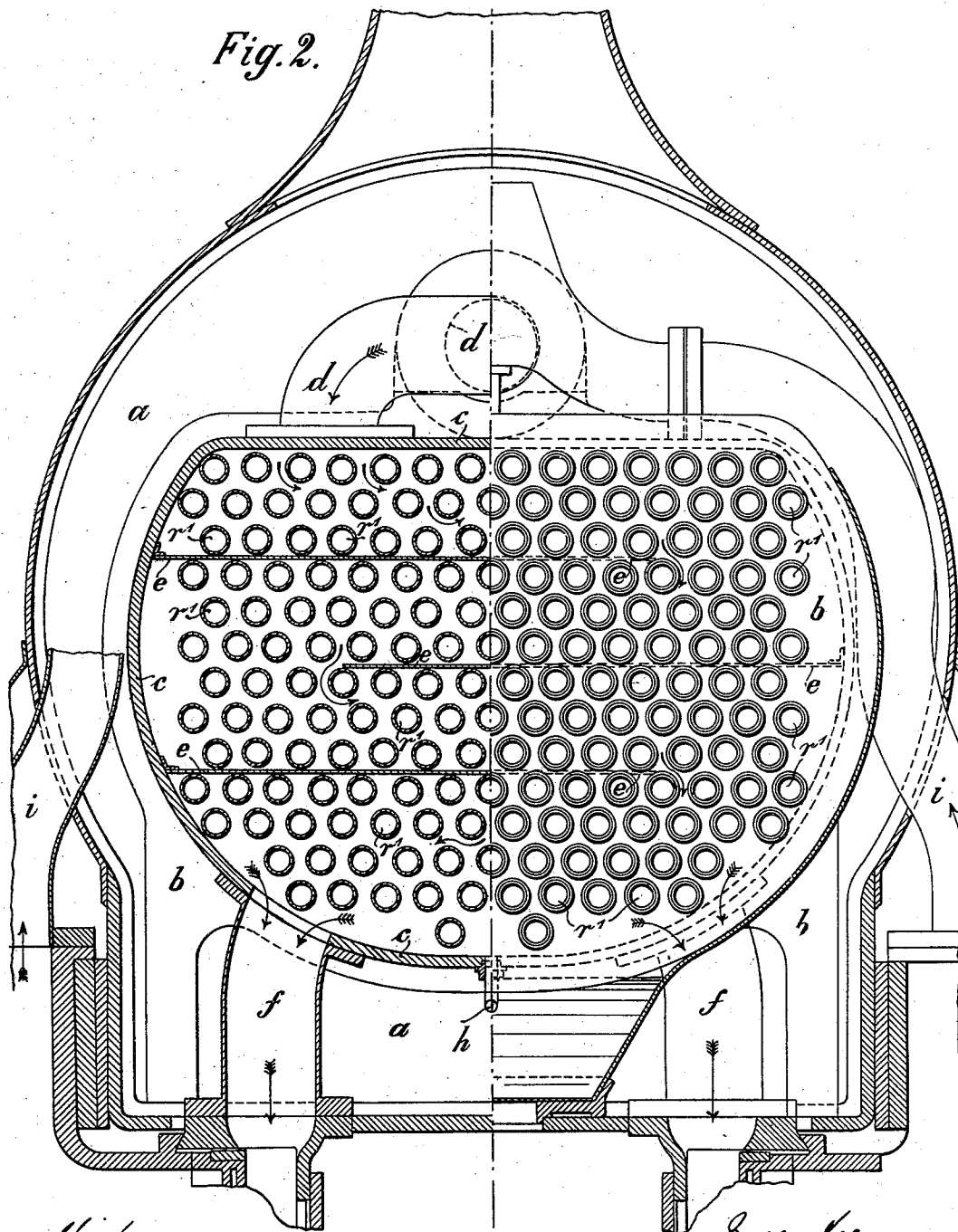
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No. 599,780.

Patented Mar. 1, 1898.

Fig. 2.



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(No Model.)

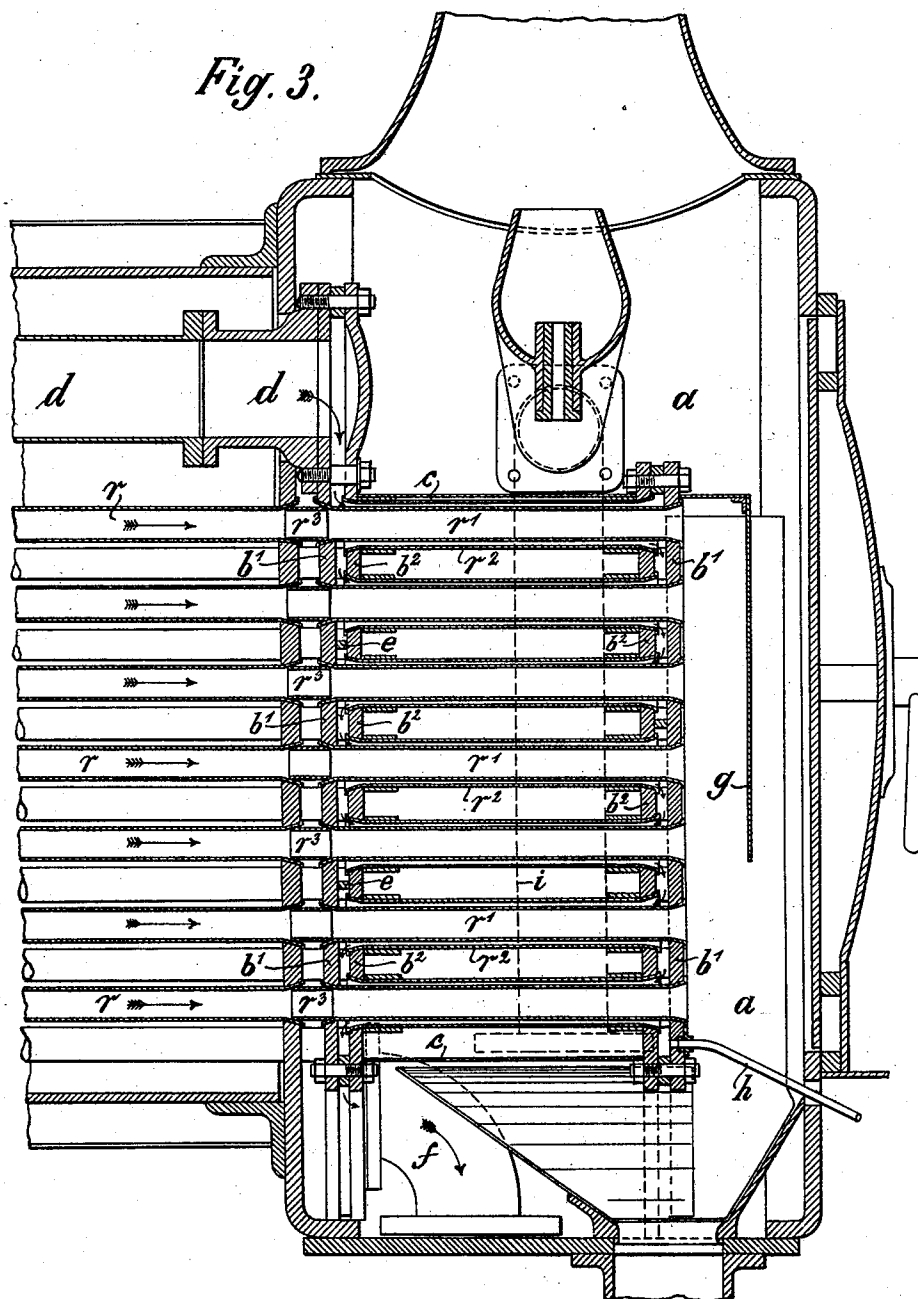
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SUPERHEATER.

No. 599,780.

Patented Mar. 1, 1898.

Fig. 3.



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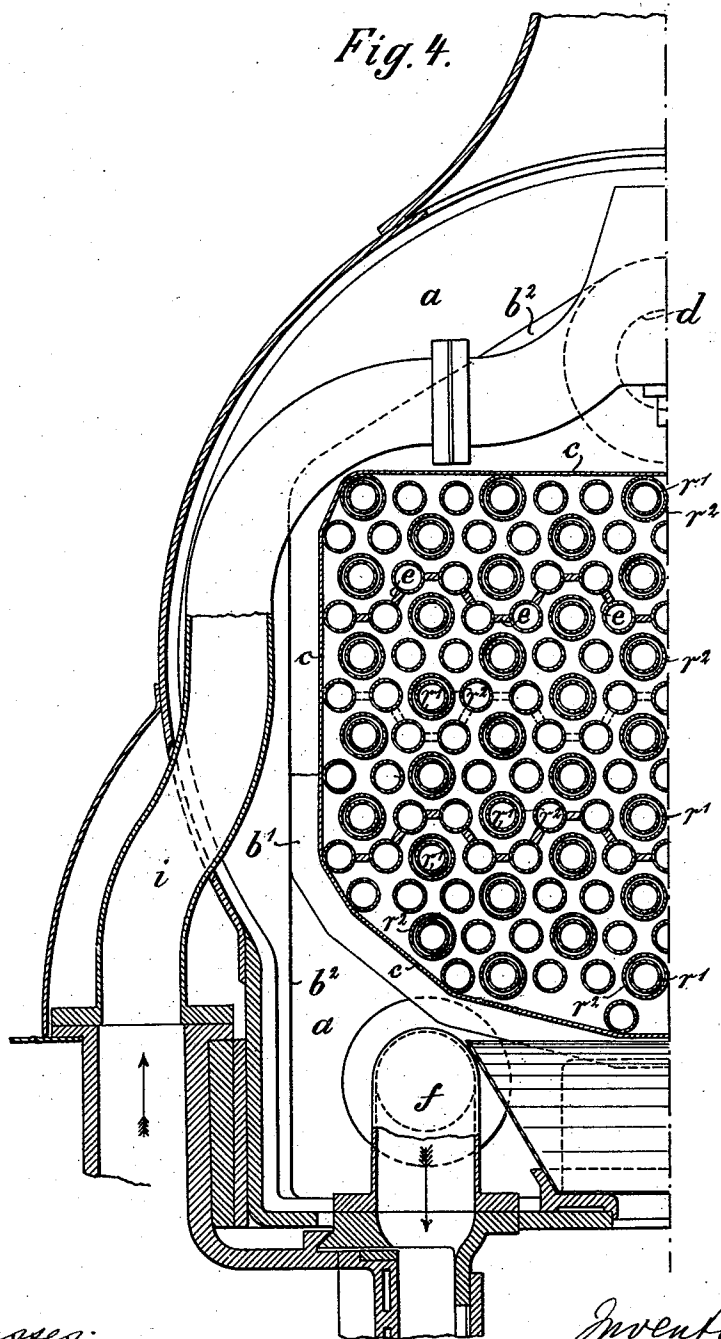
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Patented Mar. 1, 1898.

Fig. 4.



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UNITED STATES PATENT OFFICE.

JAN VON GRUBINSKI, OF WARSAW, RUSSIA.

SUPERHEATER.

SPECIFICATION forming part of Letters Patent No. 599,780, dated March 1, 1898.

Application filed December 22, 1896. Serial No. 616,613. (No model.) Patented in Austria September 2, 1896, No. 46/4,888; in England September 3, 1896, No. 19,512; in Russia October 8, 1896, No. 282; in Hungary October 12, 1896, No. 7,811; in France October 21, 1896, No. 260,621; in Belgium October 26, 1896, No. 124,188; in Italy November 10, 1896, No. 42,991; in Sweden November 12, 1896, No. 8,006, and in Norway November 19, 1896, No. 5,227.

To all whom it may concern:

Be it known that I, JAN VON GRUBINSKI, a subject of the Emperor of Russia, and a resident of Warsaw, in the Russian Empire, have
5 invented certain new and useful Improvements in Tubular Boilers and Superheaters for the Same, (patented in Great Britain, No. 19,512, dated September 3, 1896; in France, No. 260,621, dated October 21, 1896; in Austria, No. 46/4,888, dated September 2, 1896;
10 in Hungary, No. 7,811, dated October 12, 1896; in Italy, No. 42,991, dated November 10, 1896; in Russia, No. 282, dated October 8, 1896; in Sweden, No. 8,006, dated November 12, 1896;
15 in Belgium, No. 124,188, dated October 26, 1896, and in Norway, No. 5,227, dated November 19, 1896,) of which the following is a specification.

The objects of my invention relate to a tubular boiler, which is to be applied to locomotives, portable steam-engines, and ships and is provided with a superheater for the purpose of effecting a substantial saving of fuel as well as obtaining a large volume of dry
20 steam in the smoke-chamber.

The essential feature of the superheater is that the boiler-tubes are extended into the smoke-chamber and there arranged in an impermeably-closed box or chest which is suitably connected with the steam-dome by means of a pipe and beyond this is provided with partition-walls, so that the saturated steam is forced to diffuse itself in a zigzag way through the boiler-tubes lying in the smoke-chamber to become superheated, assume a large volume, and to pass over into the working cylinder in a completely-dried state.

Referring to the drawings which form a part of this specification, they show two examples of the practical carrying out of the invention.

In the arrangement and details represented in Figure 1 by a partially longitudinal vertical section and in Fig. 2 by a cross-section the boiler-tubes are impermeably connected with the tubes in the smoke-chamber by short pieces of piping r^3 , so that the boiler-tubes extend a certain way into the smoke-chamber a . The chest arranged in the last mentioned and serving for the reception of the

tubes r' consists of two plates $b b$, which are impermeably connected with one another by means of a jacket or casing c and is in connection above with the steam-dome by means of a pipe d and below with the working cylinder of the engine by means of pipes $f f$.
55

On the side wall of the jacket or casing c are arranged the horizontal partition-walls $e e$ in such a manner that these, as may be seen from the cross-section Fig. 2, leave alternately right and left a free space for the passage of the steam.
60

The letter g indicates a wall or partition on the front end of the boiler, which is intended to prevent a direct escape of the combustion-gases issuing from the upper heating-pipes or boiler-tubes r' into the chimney and to force the same at first downward and then, mixed with the gases from the lower heating-pipes, to pass upward into the chimney.
65 70

h is a small pipe branching out from the bottom or floor of the chest $b c$ and is intended for the purpose of letting off the condensed water.
75

$i i$ are the pipes for the waste or exhaust steam.

As will be seen from the drawings, the steam from the steam-dome, which still contains about thirty per cent. of water, passes into the impermeably-closed chest $b c$, arranged in the smoke-chamber a , through the pipes d , and in consequence of the uppermost partition-walls e makes its way, while diffusing itself on all sides of the heating-pipes $r' r'$, in the direction of the arrow in Fig. 2 toward the right, then being forced by the middle partition-wall to pass to the left, and hereupon again to the right, and so on, finally, after assuming a large volume, reaching the superheater, and passing in a completely dry state through the pipes $f f$ to the cylinders.
80 85 90

A still more intense superheating and drying of the steam and in consequence thereof a still greater economy of fuel is obtained by employing the arrangement and details illustrated in Figs. 3 and 4. This arrangement differs from that already described chiefly by the fact that the front sides of the chest arranged in the smoke-chamber a consist of
95 100

double plates $b' b^2$, allowing a space between them, and a number of the heating-pipes r' , lying in the chest $b c$, are surrounded each by a second pipe r^2 of larger diameter, while the
 5 partition-walls e have been placed in the space between the front and back plates $b' b^2$ belonging to the chest. Beyond this the space formed by the plates $b' b^2$ is placed above in connection with the steam-dome by means of
 10 a pipe d and below with the working cylinder by means of a pipe f .

From the cross-section Fig. 4 it will be seen that those heating-pipes r' around which a second larger pipe r^2 is arranged are surrounded on all sides by the heating-pipes r' ,
 15 which have no such surrounding pipe. The heating-pipes r' , as may be seen from Fig. 3, are impermeably set in the outer plates b' and the casing-pipes r^2 in the inner plates b^2 belonging to the chest. The space formed between the plates on the left side $b' b^2$ (see Fig.
 20 3) is in free communication with the pipe d , leading to the steam-dome, so that the steam is forced to enter only into the ring-shaped
 25 space between two pipes r' and r^2 , and in consequence of this is greatly superheated and dried not only from within by means of the pipes r' , inclosed by the pipe r^2 , but also from
 30 without by means of the surrounding free heating-pipes $r' r' r'$.

In order to force the steam to run in a zig-zag direction through the space formed by the double pipes $r' r^2$, the partition-walls $e e$, as
 35 already mentioned, are arranged alternately between the two front and back plates $b' b^2$. In the example shown by this arrangement the steam coming from the pipe d enters at

first into the ring-shaped space formed by the double pipes $r' r^2$ lying over the first left side partition-wall (see Fig. 3) and, as may be seen
 40 from the arrow, passes to the right into the space between the two front plates $b' b^2$. By means of the partition-wall here arranged the steam is forced to pass along to the left, and
 45 then in consequence of the partition-wall there makes its way again to the right, here-upon passing again to the left, arriving in this way in a superheated and perfectly dry state
 50 in the working cylinder of the engine, having passed out of the lower part of the space formed by the left side plates $b' b^2$ through the pipe f . In this arrangement also g is the
 55 partition-wall already described in relation to the manner and purpose of that illustrated in Figs. 1 and 2, h is the pipe-conduit for letting off any condensed water, and I are the
 60 pipes for the exhaust of waste steam.

Having now described my invention, what I claim as new, and desire to secure by Letters
 65 Patent, is—

In a steam-boiler, a superheater adjacent to but separated from the boiler, flues connected to the boiler-flues and passing through the superheater, steam-pipes inclosing some
 65 of the superheater-flues, passages connecting said steam-pipes with each other, with the steam-dome and with the steam-cylinder, substantially as described.

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

JAN V. GRUBINSKI. [L. S.]

Witnesses:

WŁADYSŁAW ZANIOWSKI,
 KAJETAN MTODOWSKI.