

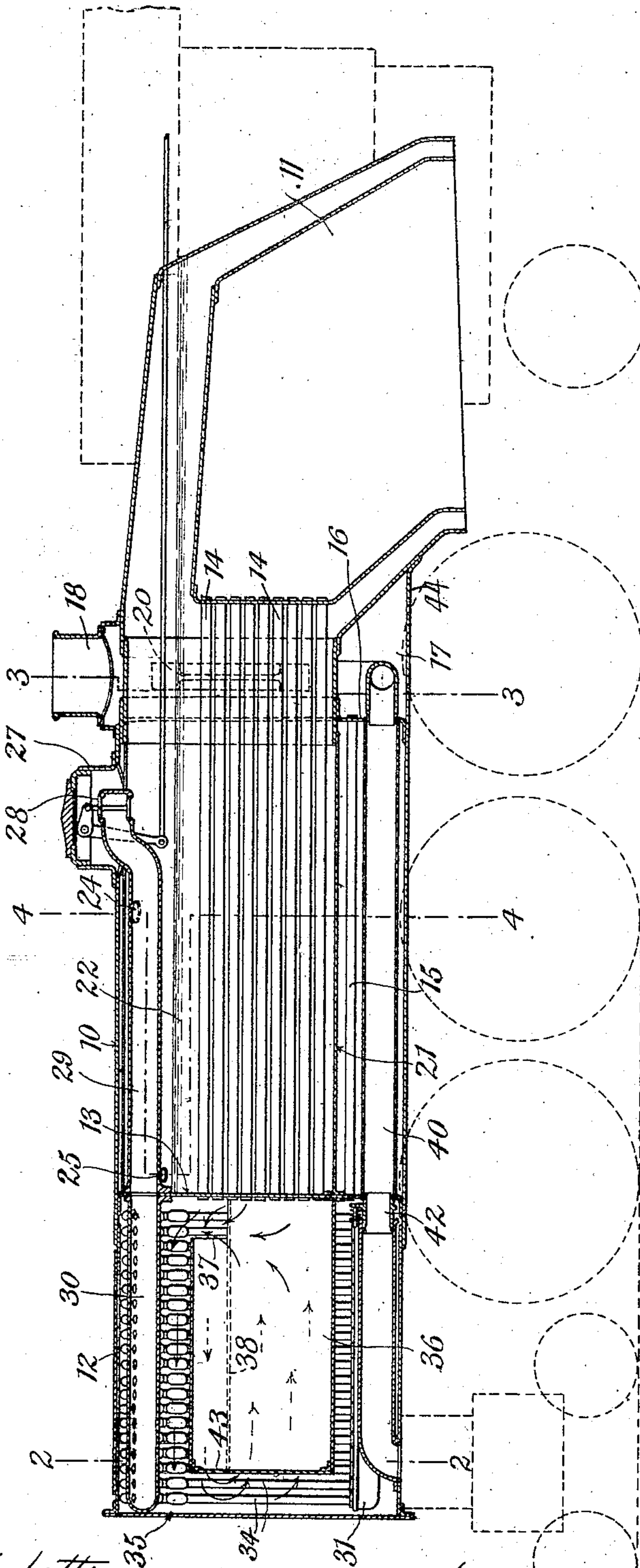
No. 869,805.

PATENTED OCT. 29, 1907.

S. A. REEVE.
LOCOMOTIVE BOILER.
APPLICATION FILED DEC. 17, 1906.

3 SHEETS—SHEET 1.

Fig. 1



Witnesses
Raphael Ketter
J. Blake

Inventor
S. A. Reeve
By his Attorney
Robert M. Pearson

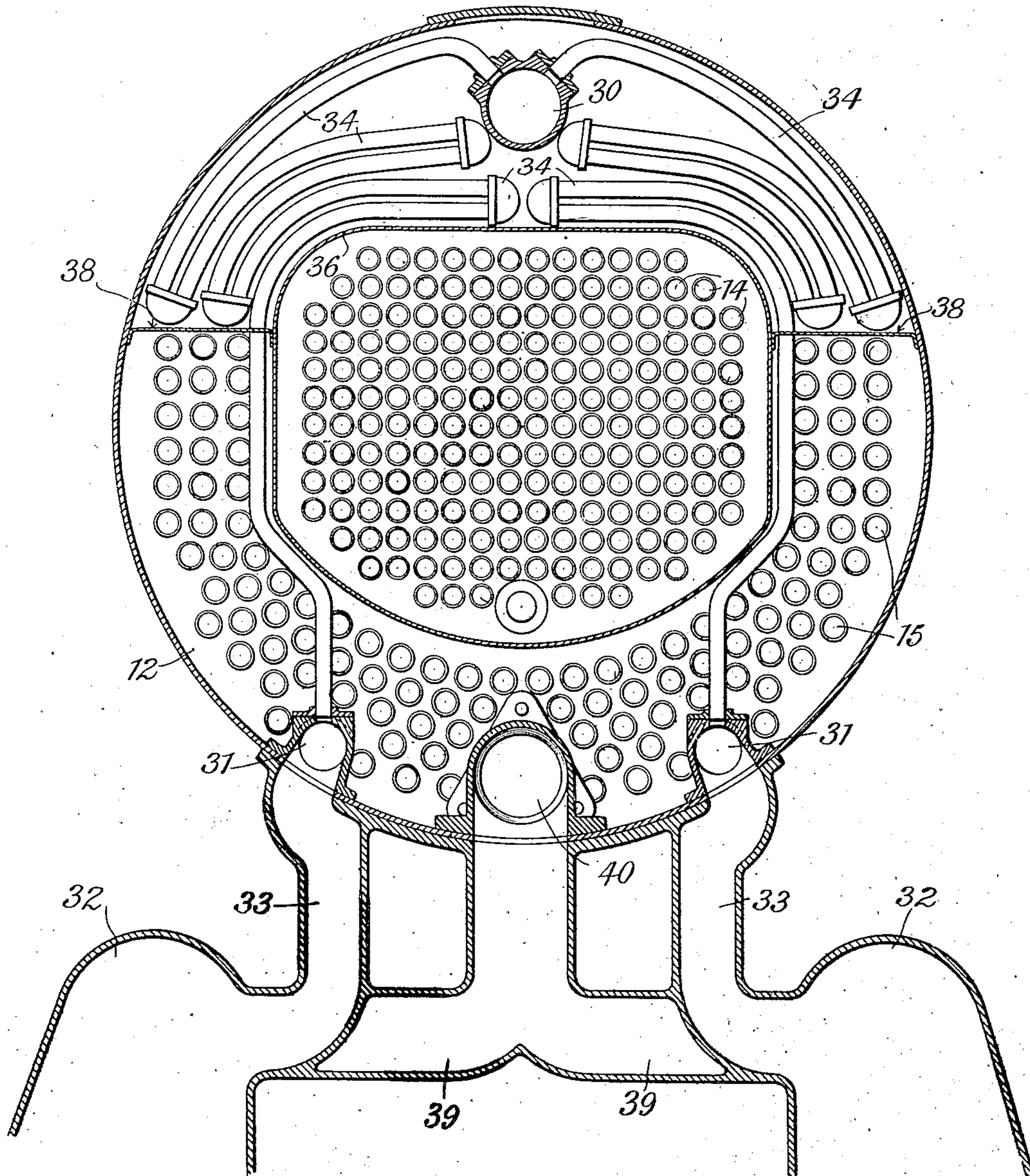
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3 SHEETS—SHEET 2.

Fig. 2



Witnesses
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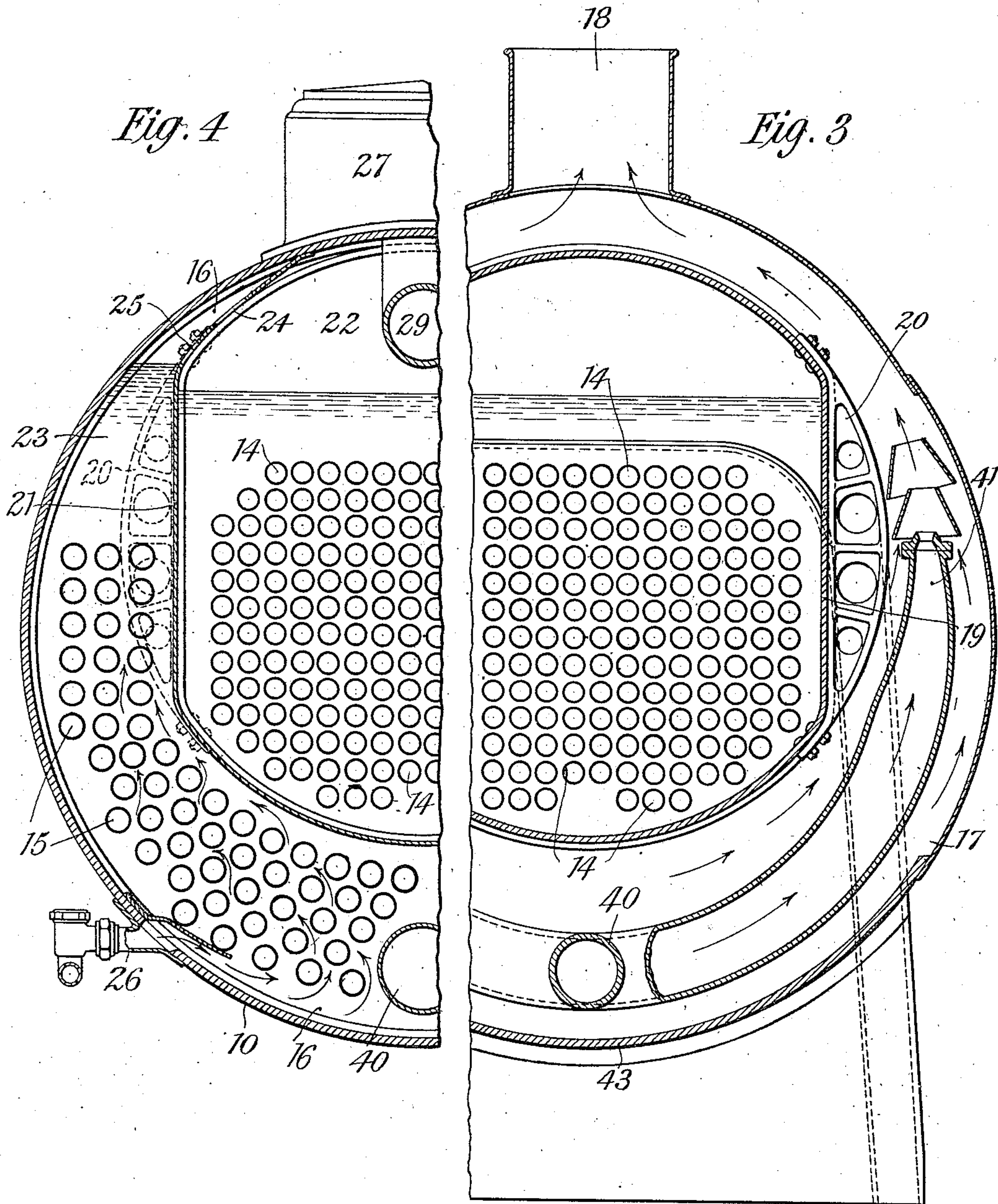
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

SIDNEY A. REEVE, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO CHARLES F. BROWN,
TRUSTEE, OF READING, MASSACHUSETTS.

LOCOMOTIVE-BOILER.

No. 869,805.

Specification of Letters Patent.

Patented Oct. 29, 1907.

Application filed December 17, 1906. Serial No. 348,104.

To all whom it may concern:

Be it known that I, SIDNEY A. REEVE, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Locomotive-Type Boilers, of which the following is a specification.

This invention principally relates to feed-heating and superheating boilers of the locomotive type, of which an example is shown in my prior patents Nos. 799,265 and 803,788, describing a construction in which the combustion gases pass from the fire-box, successively over an evaporating-surface, a superheating-surface and a feed-heating surface on their way to the stack. As there described the gases were compelled to pass three times the length of the boiler, making it difficult to avoid restricting the draft, and also entailing certain complications of construction and operation which I now aim to do away with.

The main objects of the present invention are to decrease the length of travel of the gases and the restriction of the draft, to render the heating-surfaces more readily accessible for cleaning and repairs, to simplify the structure of the main shell, to increase and concentrate the superheating-surface, and to effect other useful results as will more fully appear.

Of the accompanying drawings, Figure 1 represents a longitudinal section of a locomotive boiler constructed according to my invention. Figs. 2, 3, and 4 represent transverse sections thereof on the correspondingly numbered lines of Fig. 1.

The same reference characters indicate the same parts in all the views.

In the drawings, 10 indicates the main barrel or body of the boiler embodying an outer pressure-retaining shell with a furnace or fire-box 11 at the rear end and a gas-chamber 12 at the forward end which takes the place of the usual smoke-box as regards its location. A single transverse tube-sheet 13 separates the interior of the chamber 12 and the pressure-retaining shell 10 and forms a forward terminus for the ends of all the fire-tubes. These tubes are composed of a set of vaporizing-tubes 14 having their rear terminus in the front tube-sheet of the furnace 11 and a set of preheating or feed-heating tubes 15 which looked at endwise, form a substantially U-shaped group embracing the vaporizing tubes as shown in Fig. 2. The preheating-tubes have their terminus in a tube-sheet 16 which is located forward of the rear termination of the vaporizing-tubes 14 and forms the front wall of a rear gas-chamber 17 having a stack or gas-discharge outlet 18. The wall of the vaporizing-chamber where it traverses this rear gas-chamber is of reduced diameter and is embraced or surrounded by said gas-chamber. Its sides at this point are flattened as indicated at 19 in Fig. 3 in order

to give additional space for the location of preheating-tubes and I provide cast buttresses 20 of segmental form, to truss or brace these flat portions within the rear gas-chamber 17. The reduced inner shell just mentioned is continued within the pressure-space, forward of the tube-sheet 16, as a partition 21 which divides the interior of the barrel into a vaporizing-compartment 22 containing the vaporizing-tubes 14, and a preheating-compartment 23 which contains the preheating-tubes 15 and embraces said vaporizing-compartment. The upper part of this partition is pierced at 24, 25 to give the two compartments a common steam-space, and feed-water which is supplied to the preheater by way of an inlet 26 overflows into the vaporizing-compartment through the lowermost hole or holes 25. It will be seen that this construction locates the preheater mainly at the sides of and below the vaporizer, but this only represents one of a number of ways in which the two chambers may be related without departing from the general arrangement described.

27 is a steam-dome on the main shell located just forward of the smoke-stack 18 and containing a throttle-valve 28 at the entrance to a dry-pipe 29 which terminates in a manifold 30 in the upper part of the forward gas-chamber 12. In the lower part of said gas-chamber are two parallel receiving manifolds 31 communicating with the steam-chests 32 of the engine by the passages 33 and these lower manifolds are connected with the upper manifold 30 by two groups of flat superheating-coils 34 whose main convolutions are located above the level of the superheating-tubes 15 so as not to interfere with free access to the forward ends of said tubes through the front end of the gas-chamber 12 which has a removable end-cover 35 like an ordinary locomotive smoke-box, to open up its interior. The superheating-coils are attached to the manifolds by removable couplings and the arrangement may be such that any individual coil may be replaced without disturbing the others, or the whole superheater may be removed longitudinally by uncoupling the manifolds.

The gases emerge from the forward ends of the vaporizing-tubes 14 into a gas-box 36 within the gas-chamber 12 and out among the superheater-coils through an opening 37 at the rear end of said gas-box. The gases pass forwardly among the upper convolutions of the superheater over two horizontal baffles 38 (Fig. 2), and thence return and enter the forward ends of the preheating-tubes 15 through which they pass into the rear gas-chamber 17 and out of the stack 18. The gases are impelled by means of exhaust steam from the engine which is carried from the exhaust passages 39 through a rearwardly-extending horizontal pipe 40 to a pair of blast-nozzles 41 located on opposite sides of the vapo-

5 rizing-chamber in the rear gas-chamber 17. This
exhaust-pipe where it traverses the preheating-com-
partment serves to impart some heat to the colder water
in the lower part of said compartment and where the
preheater section of said pipe joins the forward gas-
chamber section is a suitable expansion joint 42. The
gas-box 36 is provided with a removable cover 43 at its
forward end to give access to the interior thereof and to
the interior ends of the vaporizing-tubes 14.

10 The locomotive boiler above-described embodies the
advantages of the boiler shown in my prior patents but
is not subject to the same restriction of draft since the
furnace gases according to my present arrangement
traverse the length of the boiler only twice instead of
15 three times. This also simplifies the interior construc-
tion of the pressure-retaining shell and gives increased
steam-space. The superheating-surface is concen-
trated at the forward end of the boiler and may be in-
creased in extent without restricting the draft, besides
20 which the superheating elements are more readily re-
placeable. It is to be specially noted that all of the
heating-surfaces may be reached and cleaned through
the forward end of the boiler. An incidental advan-
tage is secured in locating the smoke-stack at the rear
25 end of the boiler where the smoke and steam will afford
less of an obstruction to the vision of the engineer.

It will be noted that the lower part of the heavy outer
boiler-shell is extended across the rear gas-chamber 17
to the front wall or water-leg of the fire-box 11 to form
30 a stay 44 which also acts as the lower wall of said gas-
chamber. This heavy stay is employed partly be-
cause of the narrowing of the pressure-chamber at the
point embraced by the gas-chamber 17. To merely
form the gas-chamber wall a heavy sheet is not required,
35 but for bracing purposes a stout stay is desirable. I
may therefore separate the wall and stay functions and
assign them to different members.

I claim:—

40 1. A locomotive-type boiler comprising a furnace, a vap-
orizing-chamber, a preheating-chamber embracing said vap-
orizing-chamber and having a common steam-space there-
with, fire-tubes traversing said vaporizing and preheating
chambers and forming respectively an outward and a re-
turn gas-course, a means for discharging the gases, a gas-
45 chamber at the forward end of the boiler connecting the
vaporizing and preheating tubes, and a steam-superheater
located in said forward gas-chamber.

50 2. A locomotive-type boiler comprising a tubular pres-
sure-retaining shell, a vaporizing-chamber therein, a pre-
heating-chamber therein embracing and having a common
steam-space with said vaporizing-chamber, fire-tubes trav-
ersing the said chambers and forming outward and return
passages for the gases, a gas-chamber at the forward end

of the boiler connecting the vaporizing and preheating
tubes, and a steam-superheater located in said gas-chamber 55
out of line with the fire-tubes so as to permit access to the
ends of said tubes.

3. A locomotive-type boiler comprising a tubular shell, a
vaporizing-chamber therein, a preheating-chamber therein 60
embracing and having a common steam-space with said
vaporizing-chamber, and located mainly in the lower part
of the tubular shell, a gas-chamber in line with the shell
located forward of said vaporizing and preheating cham-
bers, and a steam-superheater situated in said gas-chamber
and composed of a series of superheating-sections located 65
mainly in the upper part of the gas-chamber out of line
with the fire-tubes.

4. A locomotive comprising a furnace, a water-vaporizer
heated thereby, a chamber for the furnace gases embracing
said vaporizer and comprising portions on opposite sides 70
thereof, an engine, and two blast-devices located in the re-
spective portions of said chamber and supplied by the en-
gine exhaust, for impelling the furnace gases.

5. A locomotive having a furnace at the rear end, a for-
wardly extending vaporizer heated by said furnace, a 75
chamber for the furnace gases embracing said vaporizer
adjacent the furnace and having a discharge outlet, an en-
gine, and a plurality of blast-devices located in said gas-
chamber on opposite sides of the vaporizer and supplied by
the engine exhaust. 80

6. A locomotive-type boiler comprising a water-preheat-
ing chamber, a water-vaporizing chamber embraced by and
projecting beyond the end of said preheating-chamber and
having a flattened wall on its projecting portion, and a
segmental buttress-stay for reinforcing the flattened por- 85
tion of said wall.

7. A locomotive-type boiler comprising a gas-chamber,
vaporizing and preheating fire-tubes leading respectively
into and out of said chamber, an inner gas-box including
the ends of the vaporizing-tubes and having an opening 90
into the outer portion of said gas-chamber, and a series of
superheating elements located within said outer portion
of the gas-chamber.

8. A locomotive comprising a boiler-structure having an
engine at the forward end, a gas-discharge outlet at the 95
rear end, and an intermediate water-preheater, a gas-cham-
ber at the forward end of said boiler-structure, an exhaust-
pipe leading from the engine through said forward gas-
chamber and the preheater to the rear gas-chamber, and
an expansion-joint connecting the sections of said pipe 100
which occupy the forward gas-chamber and the preheater,
respectively.

9. A locomotive-type boiler having a furnace, vaporizing
and preheating chambers both subject to the boiler pres-
sure, a gas-chamber between the preheating-chamber and 105
the furnace, and a stay crossing the zone of said gas-
chamber and connecting the wall of the preheating-cham-
ber with the furnace wall.

In testimony whereof I have hereunto set my hand in
the presence of two subscribing witnesses, the sixth day of 110
December, 1906.

SIDNEY A. REEVE.

Witnesses:

R. M. PIERSON,
G. BLAKE.