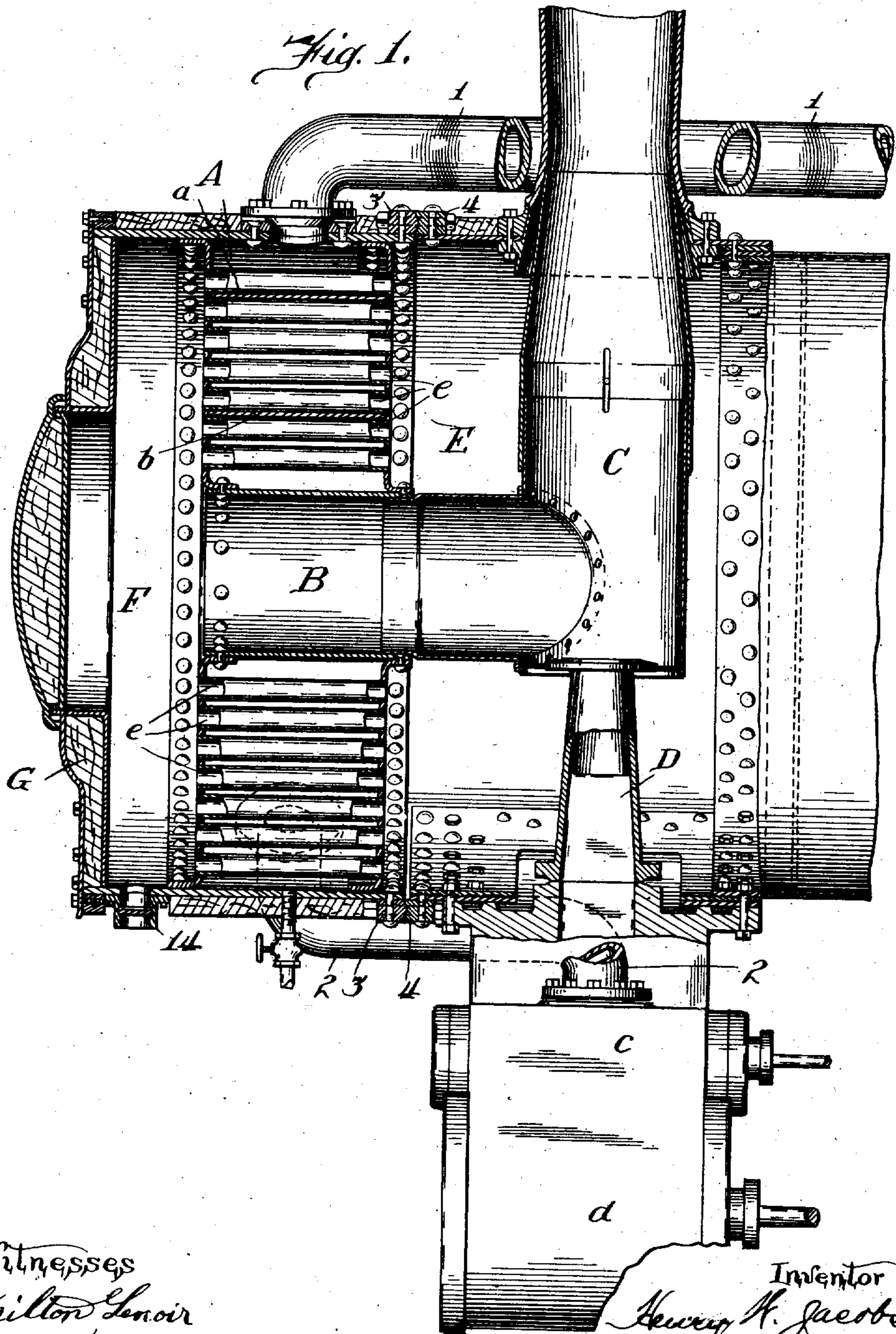


H. W. JACOBS.
STEAM SUPERHEATER.
APPLICATION FILED APR. 7, 1910.

973,662.

Patented Oct. 25, 1910.

6 SHEETS—SHEET 1.



Witnesses
Milton Lenoir
E. N. Kernwein

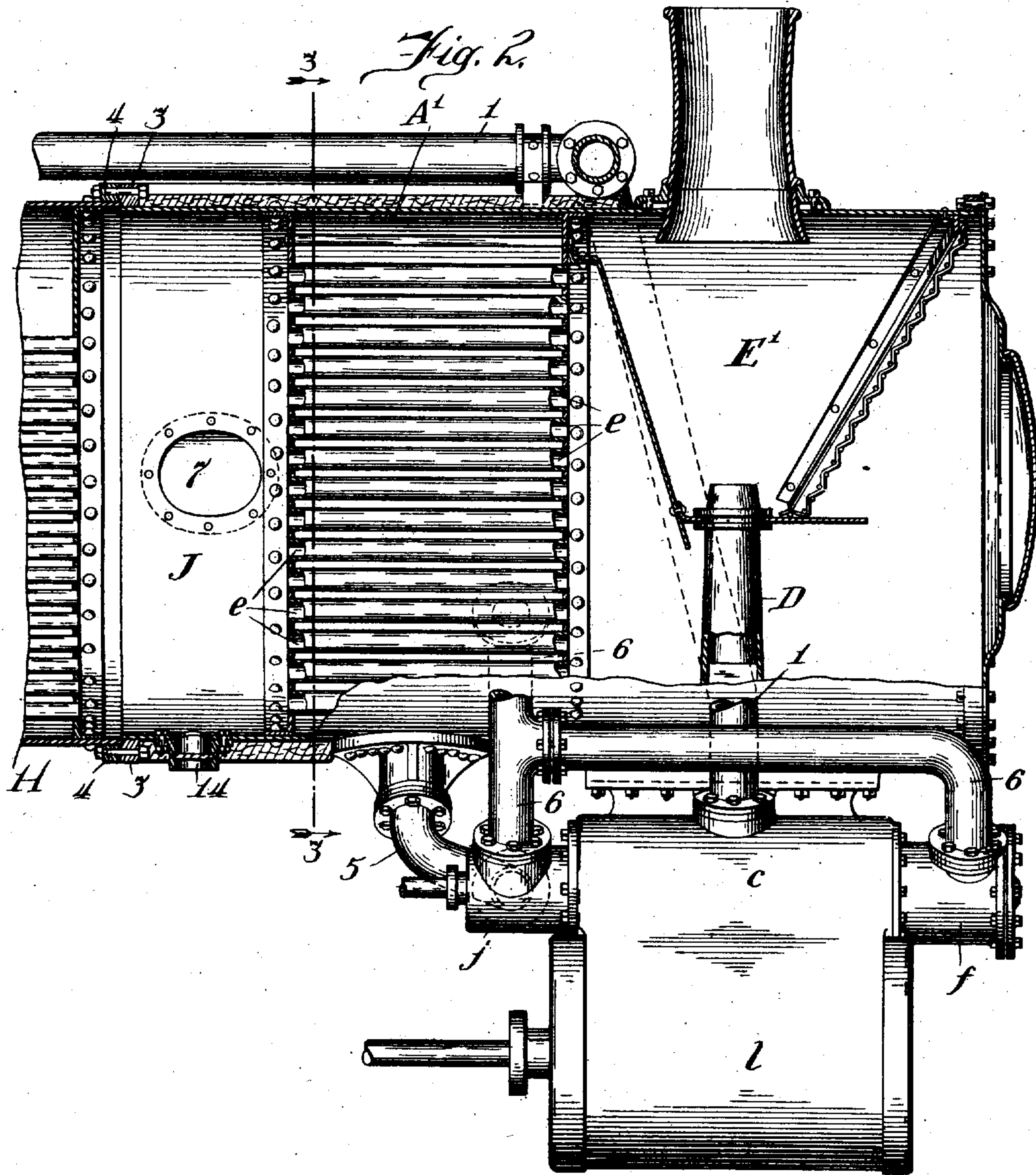
Inventor
Henry W. Jacobs
by Heidman & Steel
Attorneys.

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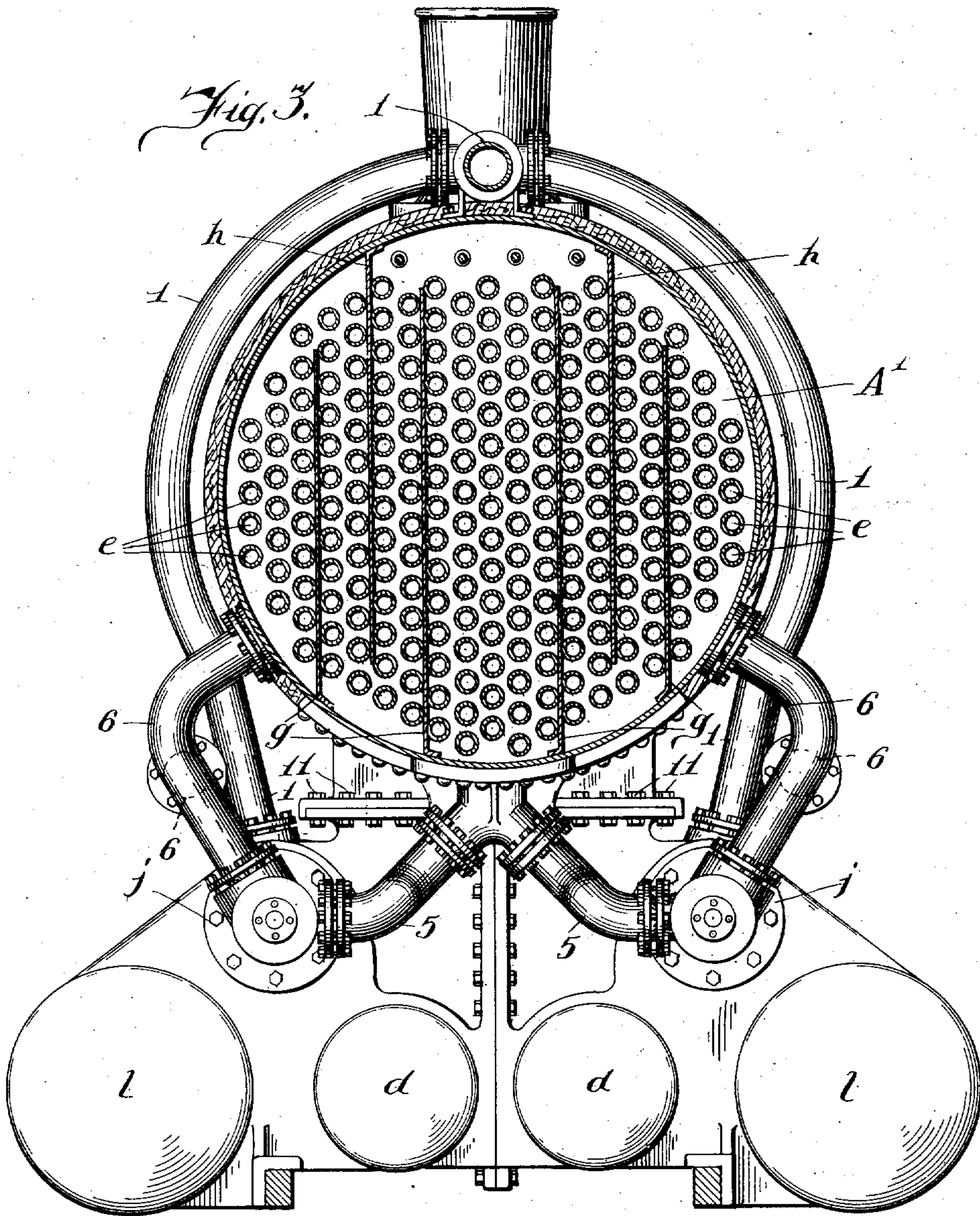
Inventor
Henry W. Jacobs
by Heidman & Stead
Attorneys.

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5 SHEETS—SHEET 3.

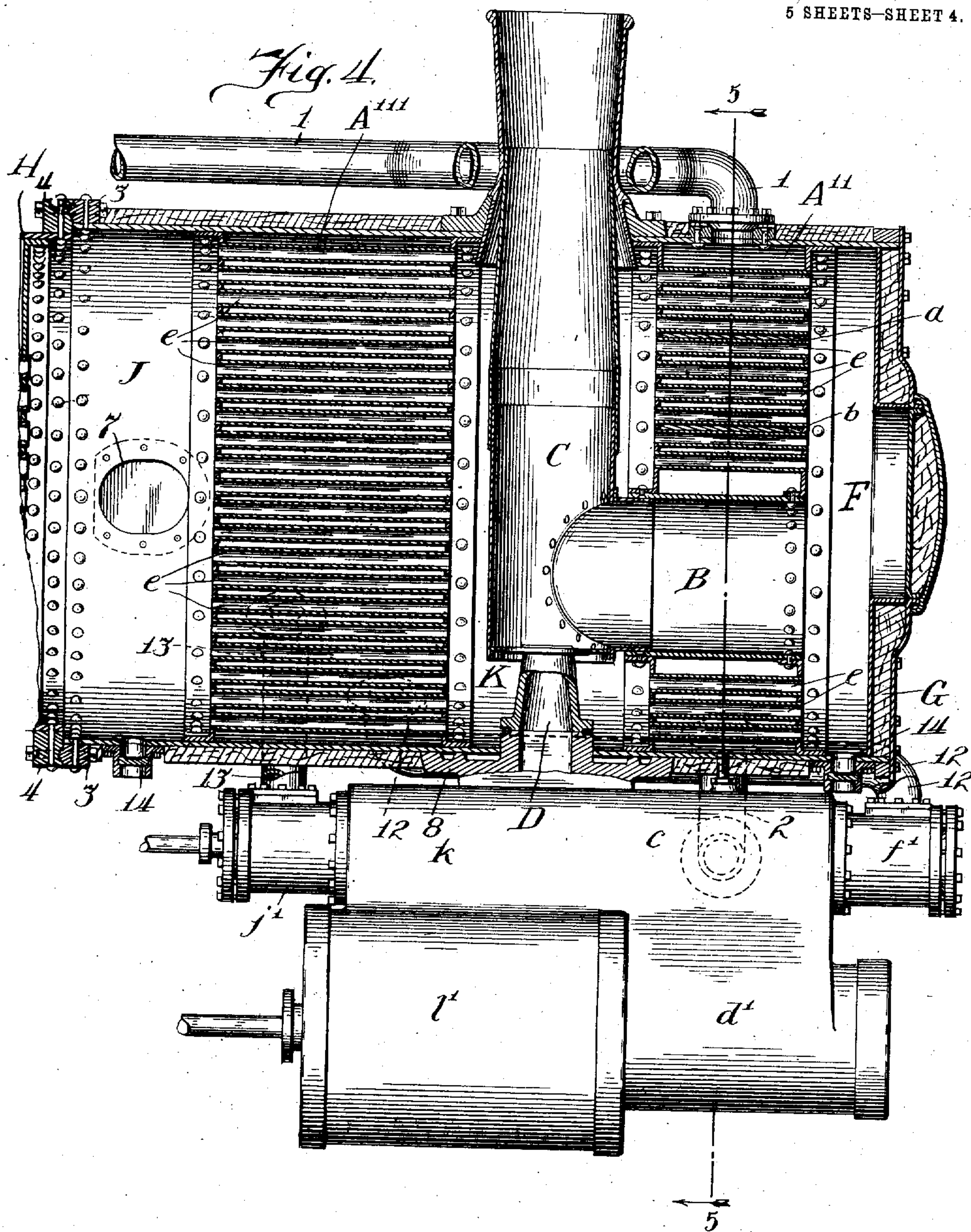


Witnesses
Milton Lenoir
E. N. Kernwein

Inventor
Henry W. Jacobs.
By *Wideman & Street*
Attorneys

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5 SHEETS—SHEET 4.



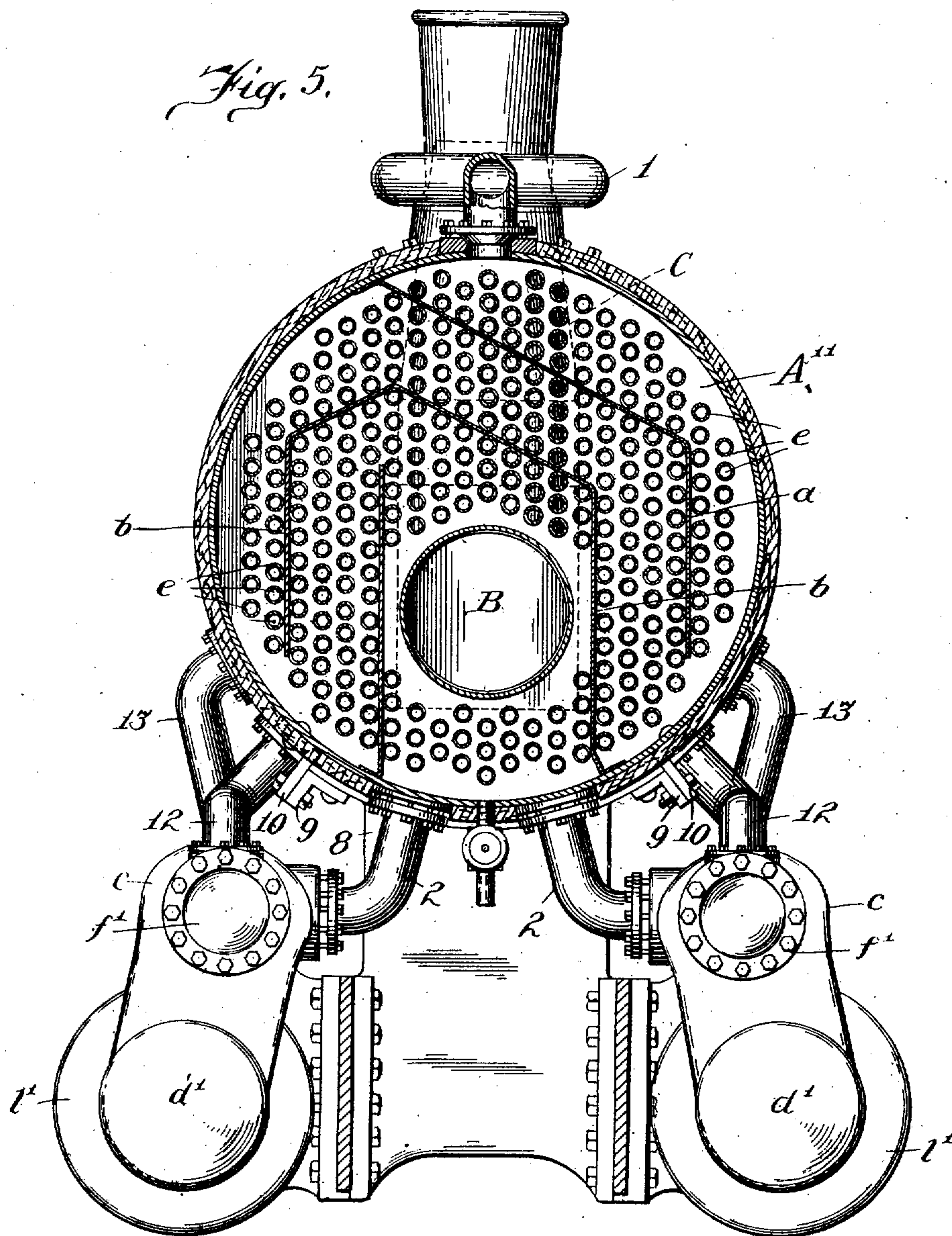
Inventor
Henry H. Jacobs,
Kidnapper & Thief.
Attorneys.

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5 SHEETS—SHEET 5.



Witnesses
Milton Lenoir
E. N. Kernwein

Inventor
Henry W. Jacobs,
by *Heideman & Street*
Attorneys.

UNITED STATES PATENT OFFICE.

HENRY W. JACOBS, OF TOPEKA, KANSAS.

STEAM-SUPERHEATER.

973,662.

Specification of Letters Patent.

Patented Oct. 25, 1910.

Application filed April 7, 1910. Serial No. 553,936.

To all whom it may concern:

Be it known that I, HENRY W. JACOBS, a citizen of the United States, and resident of Topeka, in the county of Shawnee and State of Kansas, have invented certain new and useful Improvements in Steam-Superheaters, of which the following is a description, reference being had to the accompanying drawings, which form a part of my specification.

The object of my invention is to provide a detachable superheater which is simple in design and construction; and in which all the steam pipe joints will be on the outside of the boiler sheet, where they are easily accessible to be readily fitted and tightened, and where a leakage in any of the joints can be quickly detected.

My invention can be applied to all classes of locomotives as is apparent from the following description and the drawings illustrating the adaptation of the invention to different types of locomotives.

In the drawings:—Figure 1 is a longitudinal cross-sectional view of the smoke-box of a simple engine with the superheater in place. Fig. 2 is a cross-sectional view of a modified construction, illustrating the superheater applied to a balance compound locomotive, the superheater being arranged between the exhaust-stand and the boiler. Fig. 3 is a cross-sectional view taken on the line 3—3 of Fig. 2, looking forward. Fig. 4 shows a longitudinal cross-section of the smoke box of a tandem compound engine, illustrating the arrangement of the superheater. Fig. 5 shows a transverse cross-section of the same, taken on line 5—5 of Fig. 4.

The following detailed description of the different applications of my invention as illustrated in the accompanying drawings will more clearly describe the nature of the invention; the application of the invention to a simple type of engine as illustrated in Fig. 1, wherein the superheater is built or attached to the engine-boiler, being first described.

On a simple engine, as shown in Fig. 1, the steam is carried forward from the steam dome on the boiler through the steam pipe 1, to the superheater section A, through which it is circulated by means of baffle plates shown in section at *a*, and *b*, finally being carried through the steam pipes 2, 2, to the valve chambers *c*, of the engine, thence to the cylinders *d*, then back through the valves

and out through the exhaust-stand D and into the draft-pipe C. The gases of combustion from the boiler pass forward through the superheater flues *e*, into combustion chamber F and return through the large return flue B of the superheater, thence through the L-shaped draft pipe C and out through the smoke-stack.

It will be noted that the superheater is attached to the smoke box by means of the annular ring 3 which is bolted to the annular ring 4, which latter is secured to the smoke-box E. By disconnecting the steam pipes and the joint formed by the rings 3 and 4, the superheater may be readily removed for repairs or to be replaced by a new one immediately after its removal, thus keeping the engine in continuous service.

In Figs. 2 and 3 I have illustrated the method of applying my invention to a balance compound locomotive. In this construction the superheater is placed in the smoke-box between the exhaust-stand D and the front end of the boiler H. The steam, in the construction shown in Figs. 2 and 3, enters the valve-chamber *c*, through steam-pipe 1—(the steam-pipe in this construction, ramifies back of the smoke-stack and enters both valve-chambers)—passes through the high pressure cylinders *d*, *d*, back through the steam-chest *e*, through the hollow piston-valve into the steam pipes 5, 5, thence into the superheater A', where it is carried through a circuitous route by means of baffle plates *g*, and *h*, and leaving the superheater again through the steam pipes 6, 6, into the valve-chamber extensions *f* and *j*, thence into the lower pressure cylinders *l*, *l*, and then back through the valve-chamber into the exhaust-stand D, into the smoke-box E', and outward through the smoke-stack. The gases, after passing through the boiler into the combustion-chamber J, go forward through the tubes *e*, of the superheater A', into smoke-box E' and out through the stack. A manhole 7 is provided in the combustion chamber J, for the purpose of allowing a man to enter and make any necessary repairs. It is apparent, that the smoke-box of this construction may be readily removed from the locomotive-boiler by disconnecting the rings 3 and 4, removing the bolts 11, from the cylinder connections and breaking the steam pipe joints connected thereto.

The arrangement of superheater as illus-

trated in Figs. 2 and 3 can be easily applied to a simple locomotive by making a slight change in the steam pipe connections.

In Figs. 4 and 5 I have increased the heating surface of the superheater, showing the same applied to a compound engine. In this construction the superheater consists of the two sections or compartments A'' and A''', located in the smoke arch or box of the boiler. The front compartment A'' between the exhaust-stand D and the front end G of the smoke-box, serves as the high pressure superheater, while the compartment A''', located between the exhaust stand D and the front end of the boiler H, serves as the low pressure superheater; both sections or compartments being built in the shell of the smoke arch or box. The steam in this construction, travels from the steam dome of the boiler forward through the steam pipe 1, on the outside of the boiler, to the forward or high pressure superheater A'', where it is circulated in a circuitous route by means of baffle plates *a*, and *b*, emerging to the high pressure valve chests *c*, through the steam pipes 2, 2. After working through the high pressure cylinders *d*', the steam is carried off through the hollow piston valve and through the T connections *f*', into the steam pipes 12, 12, thence into the low pressure superheater A''', where it is again circulated through a circuitous route by means of baffle plates arranged substantially similar to the baffle plates *g* and *h* shown in Fig. 3; the steam then passes through the steam pipes 13, 13, into the valve chamber extensions *j*', and then into the low pressure valves *k*, see Fig. 4. Through the low pressure valves *k*, the steam works into and through the low pressure cylinders *l*', *l*', and exhausts through the low pressure valves passing out through exhaust stand D, upward through the draft pipe C, and out through the smoke stack.

The gases of combustion pass forward through the boiler H, into the combustion chamber J, through the tubes *e*, of the low pressure superheater A''', forward through the combustion chamber K, around the draft pipe C and exhaust stand D, and through the tubes *e* of the high pressure superheater A'', into the combustion chamber F; from the chamber F, the gases pass rearwardly through the large return flue B, located in the high pressure superheater A'', and then into the draft pipe C and out through the smoke stack. I provide a manhole 7 in the combustion chamber J, to allow a man to enter it and make such light repairs as may become necessary on the boiler and superheater flues from time to time; remove the smoke stack, and the flues in combustion chamber K may be repaired; and by opening the front end door, the flues at the front end of superheater A'' may be repaired. It is thus apparent from the drawings and

the foregoing description, that all parts of the superheater are readily accessible.

The superheater in the construction shown in Figs. 4 and 5, is connected to the boiler shell in the manner heretofore described, to wit—by means of the annular rings 3 and 4, and to the cylinder saddle 8 by means of the angle irons 9 and 10. It can thus be readily seen that the superheater may easily be removed from the boiler and engine frame to be repaired or renewed. It will be noted, that all steam pipe connections are made to the outside of the boiler shell where they are accessible for any adjustment or repair.

The combustion chambers may be provided with any suitable construction of cinder hoppers as at 14.

The superheaters comprise drums as shown in the drawings, which are of a diameter corresponding with the diameter of the shell of the smoke-box or arch; the shell of the smoke-box constituting the cylindrical casing of the superheaters. The steam is delivered to these drums as previously described and is compelled to travel in circuitous routes through the drums or compartments by reason of the baffle-plates which are preferably arranged as shown; for example, with the baffle-plates arranged as shown in Fig. 5, the steam entering at the top of the section or compartment is compelled to travel downwardly between the casing or shell and baffle-plate *a*, until it reaches a point near the bottom of the casing where it passes around the plate *a* and into the space between the baffle-plates *a* and *b* and compelled to pass upward and then downward. I prefer to weld all the flues in the drums or casing to insure steam-tight joints; and these flues in the superheater are preferably larger in diameter than the diameter of the boiler-flues, thereby permitting the boiler-flues to be removed and replaced through the flues of the superheater without the necessity of removing the superheater from the boiler.

With the shell of the smoke-arch or box constituting the shell or casing of the superheater, no space is lost between the superheater and outer casing of the smoke-box as was the case with the constructions heretofore employed; therefore, in my present construction, the superheater sections or compartments may be made shorter without loss of any superheating power. By reason of the fact that the smoke-box shell constitutes the shell of the superheater, all steam-pipe connections, either leading to or from the superheaters may be made to the outside of the smoke-box shell, so that any leakage that may occur can be readily detected and adjustment easily made from the outside, thereby obviating the serious objection heretofore encountered.

I have shown and described the preferred constructions and arrangements of my invention whereby the difficulties heretofore encountered are obviated and very beneficial results obtained; but it is apparent that a number of alterations may be made in minor details without departing from the spirit of my invention, and I do not wish to be understood as limiting myself to the exact construction shown and described, but

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

1. The combination in a locomotive, of the boiler, the smoke-box, and the cylinders, with a superheater, the superheater being composed of one or more compartments arranged in the smoke-box, with the shell of the superheater forming a continuation of the boiler-shell and removably secured thereto, said superheater being formed with flues arranged to convey the gases of combustion forward to the front end of the locomotive and an enlarged flue for conveying the said gases rearward for delivery to the smoke-stack of the locomotive, and means located to the outside of the shell whereby communication between the boiler, the superheater and the cylinders is established.

2. In a locomotive, the combination of a

boiler-shell, a smoke-box in line therewith and detachably secured thereto, with a superheater of the fire-tube type arranged in said smoke-box forward of the flue-sheet of the boiler, the outer casing of the superheater constituting part of the shell of the smoke-box, the superheater being formed with an enlarged conduit for conveying the gases of combustion to the exhaust end of the smoke-box.

3. In combination with a steam-boiler and a smoke-box, of a superheater of the fire-tube type so arranged in the smoke-box as to provide combustion chambers at opposite ends of the superheater, longitudinally arranged tubes extending through the superheater whereby the gases are allowed to pass from the boiler-flues to the forward chamber of the smoke-box, an enlarged passage for said gases between said forward chamber and the exhaust end of the smoke-box, the shell of the smoke-box constituting the outer casing of the superheater, and means whereby said casing is secured in place to be readily removed.

HENRY W. JACOBS.

Witnesses:

RICHARD T. WHALEN,
FRANK MITCHELL.