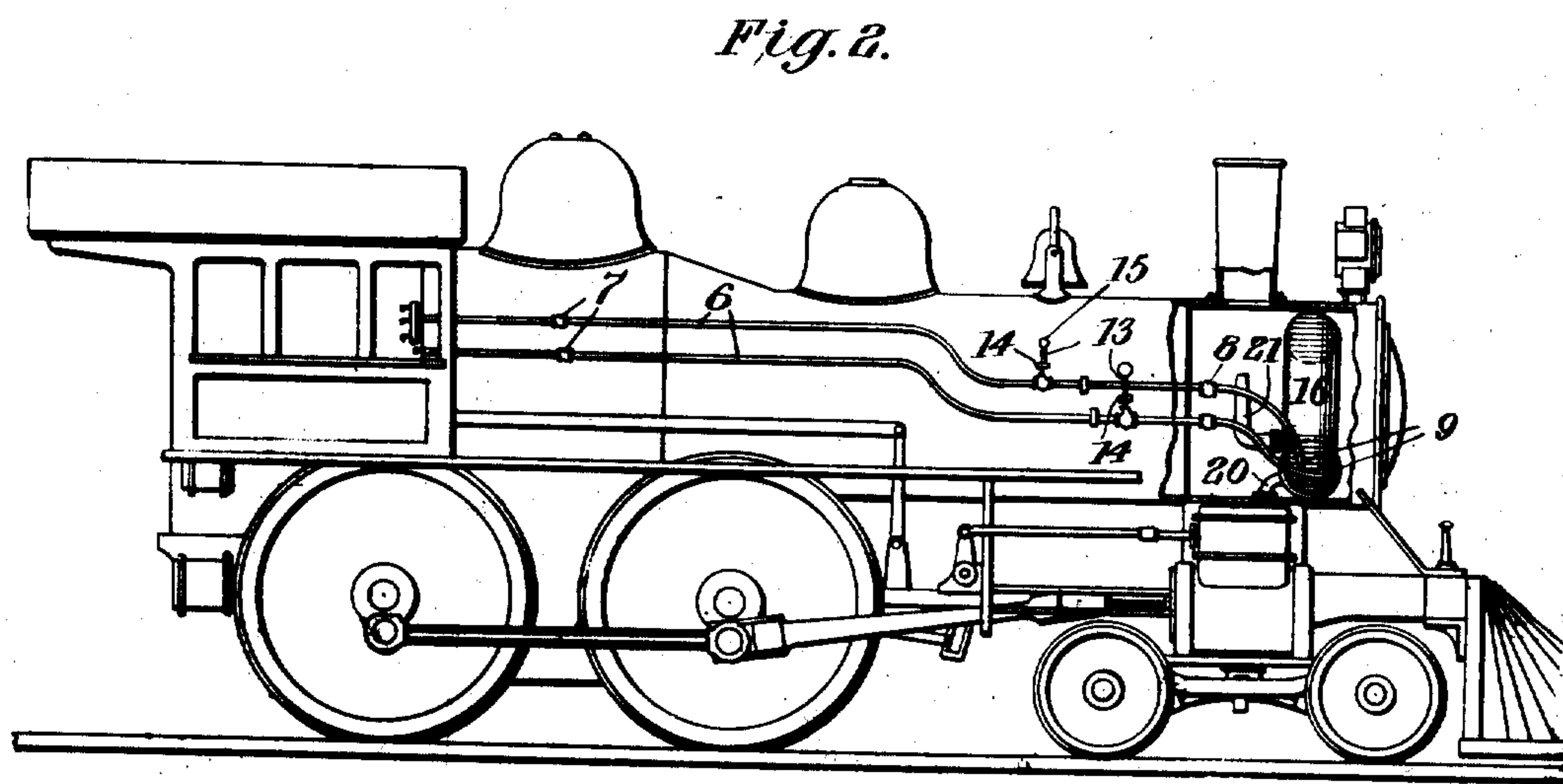
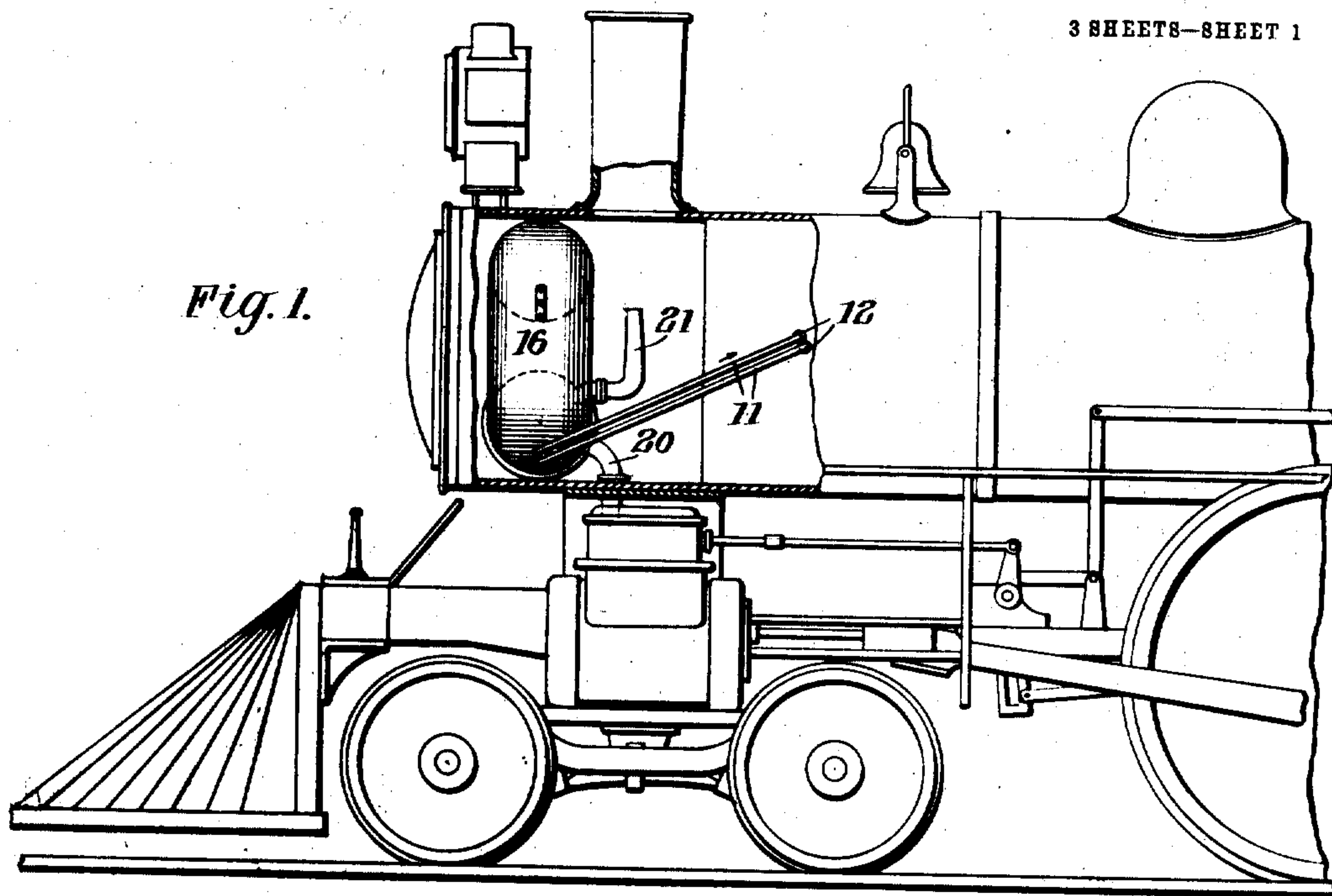


J. H. KIDWELL.  
FEED WATER HEATER.  
APPLICATION FILED MAR. 27, 1908.

901,245.

Patented Oct. 13, 1908.

3 SHEETS—SHEET 1



WITNESSES

*Samuel E. Wade*  
*J. Middleton*

INVENTOR  
JAMES H. KIDWELL  
BY *Munn & Co.*

ATTORNEYS

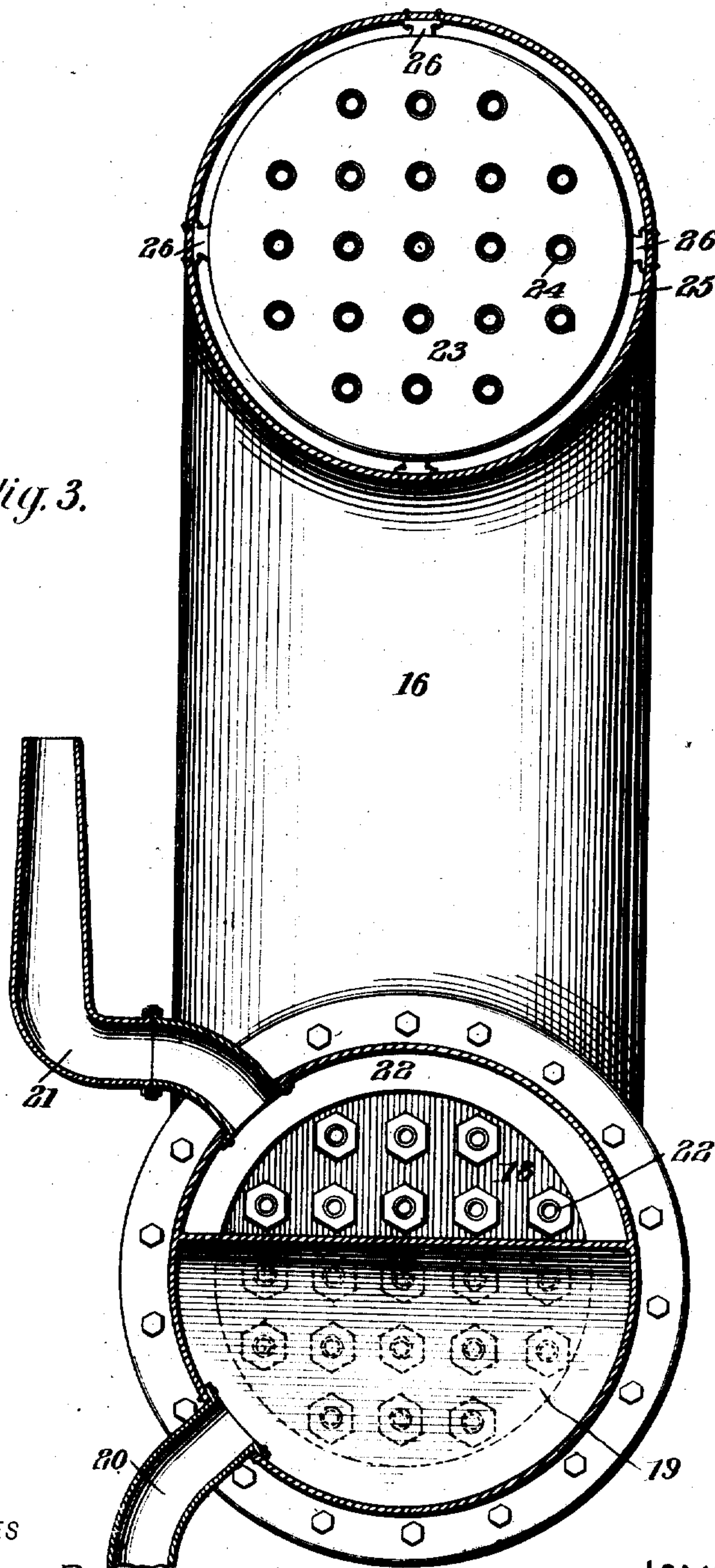
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3 SHEETS—SHEET 2.

Fig. 3.



WITNESSES

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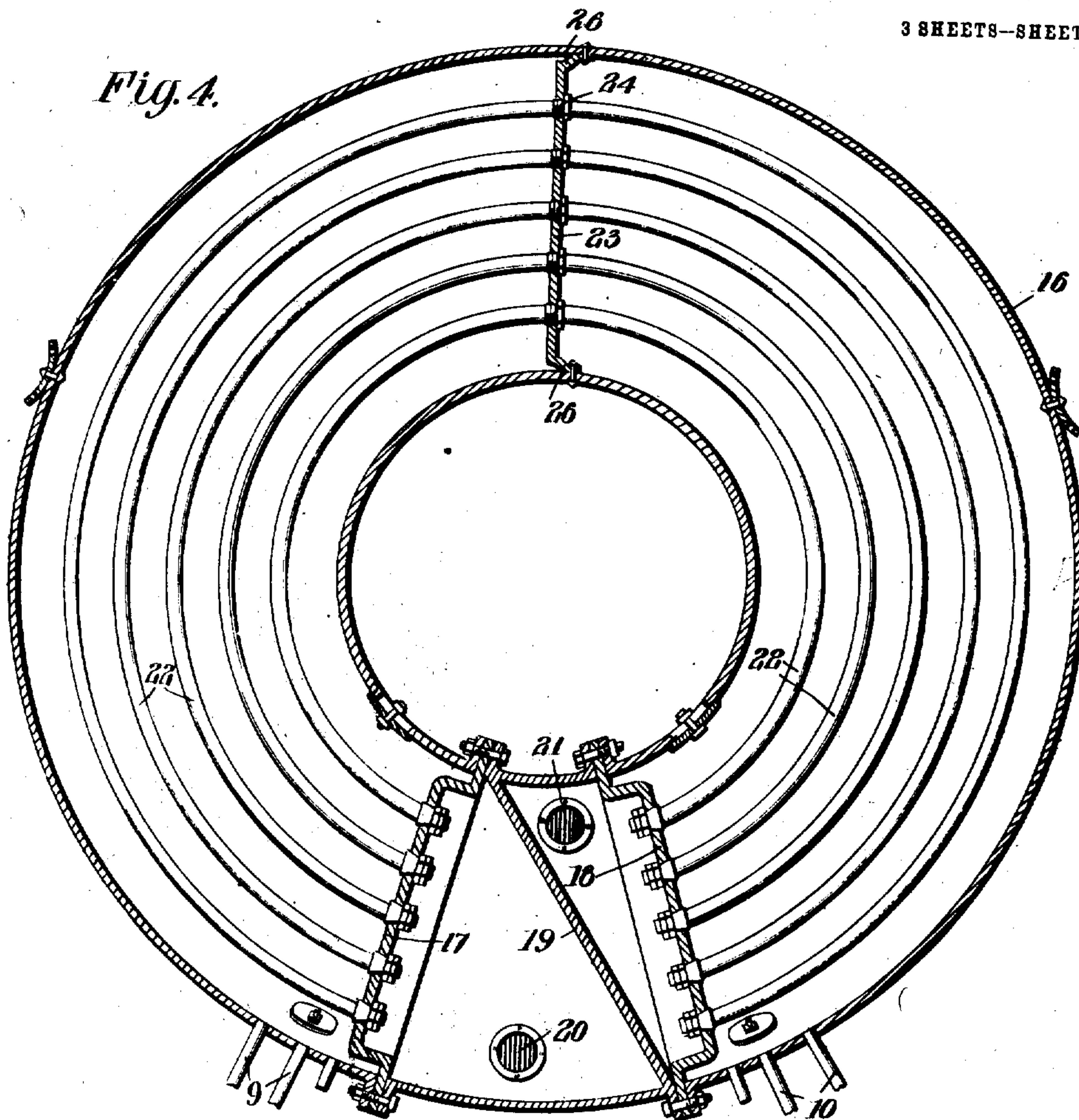
ATTORNEYS



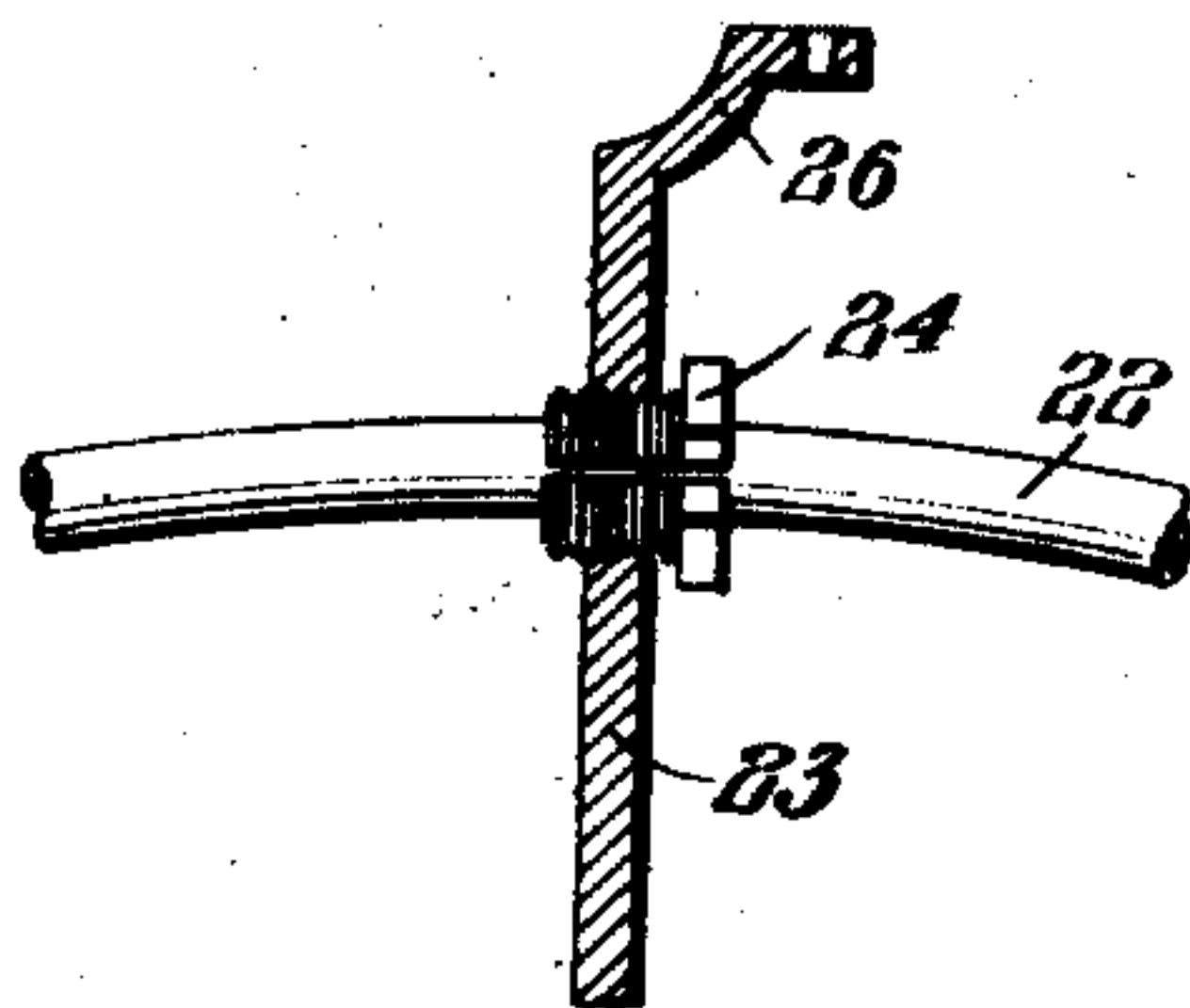
**.901,245.**

3 SHEETS--SHEET 3.

*Fig. 4.*



*Fig. 5.*



Samuel E. Cade  
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**ATTORNEYS**



# UNITED STATES PATENT OFFICE.

JAMES H. KIDWELL, OF STAUNTON, VIRGINIA.

## FEED-WATER HEATER.

No. 901,245.

Specification of Letters Patent.

Patented Oct. 13, 1908.

Application filed March 27, 1908. Serial No. 423,543.

*To all whom it may concern:*

Be it known that I, JAMES H. KIDWELL, a citizen of the United States, residing at Staunton, in the county of Augusta and State of Virginia, have invented a new and useful Improvement in Feed-Water Heaters for Locomotives, of which the following is a specification.

This invention is a feed water heater designed for use on locomotives and characterized by the fact that it utilizes the exhaust steam from the cylinders for the purpose of heating the feed water, as well as using the hot gases and smoke in the smoke box at the front of the boiler for the same purpose.

The heater comprises an annular casing or shell which is placed in the smoke box and which contains a series of tubes through which the exhaust steam flows from the cylinders, and the feed water entering at one end of the shell flows through the same and around the tubes, whereby it is heated, the outside of the shell at the same time being exposed on the outside to the gases in the smoke box. Means are provided for cutting out the heater and feeding direct to the boiler when necessary or desirable. The device uses heat which would otherwise be wasted and raises the feed water to a high temperature before it reaches the boiler. A considerable saving of fuel, and quicker steaming, is thereby effected.

The invention is illustrated in the accompanying drawings, in which

Figure 1 is a partial side elevation, part of the boiler shell being broken away, of the left side of a locomotive provided with the device. Fig. 2 is a similar view of the right side. Fig. 3 is a vertical longitudinal section of the heater. Fig. 4 is a vertical cross section. Fig. 5 is a detail in section.

Referring specifically to the drawings, 6 indicates the two feed pipes leading from the injectors to the boiler and these are provided with check valves at 7 and 8 and enter through the boiler shell into the smoke box where they are connected to one end of the casing of the feed water heater at 9. The outlet from the heater to the boiler is provided by two pipes 11 leading from the opposite end of the heater shell into the boiler, and provided with suitable check valves as at 12. For direct supply to the boiler each pipe 6 has a branch 13, leading

directly to the boiler and provided with plug cocks 14 and check valves 15; and by opening the plug cocks the water will be injected into the boiler directly through the branches.

The heater consists of a tubular casing 16, of annular form, and of proper size to fit within the extension or smoke box at the front of the engine. This shell or casing is closed at opposite ends by heads 17 and 18, located opposite to each other in the lower part of the casing and spaced apart to form a chamber which is divided by an inclined partition 19 into two parts, one of which receives the exhaust steam from the cylinders through a pipe 20 and the other of which opens into the exhaust nozzle 21 located as usual under the stack. The inlet and outlet chambers in the heater are connected by a plurality of tubes 22 which extend around within the shell and between the heads 17 and 18 to which their ends are fastened by suitable nuts. The tubes are braced at the middle by a plate 23 with tapped holes large enough to allow the tubes to pass through and to receive split threaded bushings 24 to hold the tubes in place. The brace plate is spaced at its edges from the shell, as shown at 25, to allow the water to circulate, and is held in place by lugs 26 bolted to the shell.

Steam entering through the pipe 20 passes around through the tubes 22 and out through the nozzle 21. Water injected through the pipes 9 circulates around said tubes and to the other end of the casing, and thence to the boiler through pipes 10. As stated, the casing is in the smoke box and is thus exposed on the outside to the smoke and gases after they pass through the boiler tubes. This utilizes heat which would otherwise be wasted and owing to the resulting high temperature of the heater there is very little condensation of the exhaust steam. The feed water is, in effect, between the steam on the inside and the fire on the outside, and inasmuch as the heater is at all times under boiler pressure the water can be heated to a very high degree before being delivered to the boiler. Necessarily the heater will be built sufficiently strong and heavy to stand the pressure under which it has to work, and owing to its annular form will fit conveniently into the extension front of the boiler shell.



The construction is capable of modification and no limitation with respect thereto is implied.

I claim

- 5 1. A water heater for locomotives, comprising an annular shell having a water inlet at one end and a water outlet to the boiler at the other end, steam tubes extending around lengthwise within said shell and connected at one end to the exhaust pipe from the cylinders and at the other end to the exhaust nozzle, and a brace plate extending across the shell intermediate the ends of the tubes and having holes through which said  
10 pipes extend, said brace plate having openings for the circulation of water in the shell.
- 15 2. A water heater for locomotives, comprising an annular shell, said shell being pro-

vided with heads spaced apart from each other to form a chamber, an inclined partition dividing said chamber into two portions, one of said portions being connected with the exhaust of the locomotive and the other opening into the stack, steam tubes extending lengthwise within the shell and opening into the chamber, and a brace plate extending across the shell intermediate the ends of the tubes and having holes within which said pipes extend, said plates having openings for the circulation of water within the shell. 20 25 30

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