L. D. COPELAND.

COMPOUNDING AND CONDENSING APPARATUS FOR LOCOMOTIVE ENGINES.

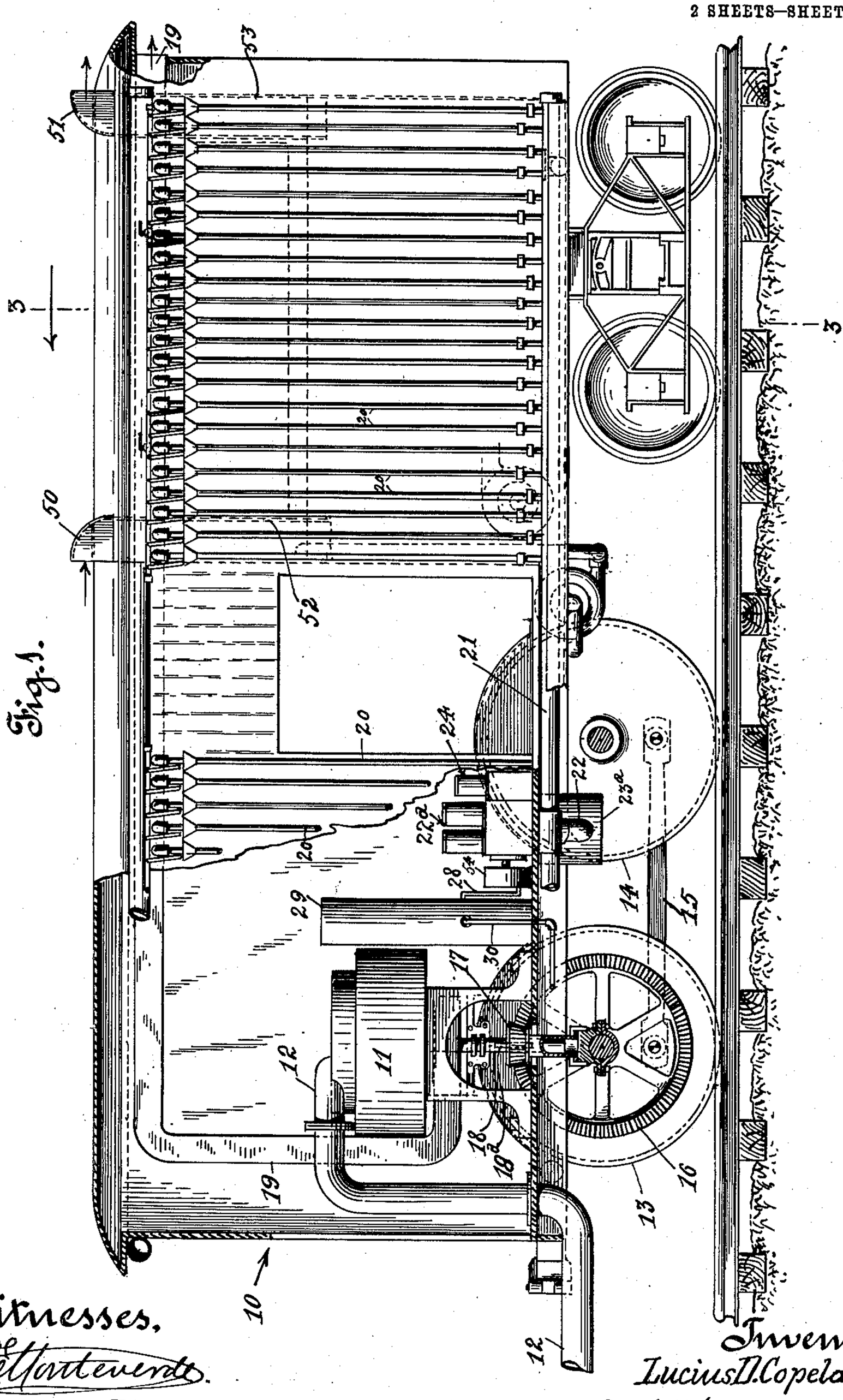
APPLICATION FILED OCT. 25, 1909.

976,554.

Patented Nov. 22, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

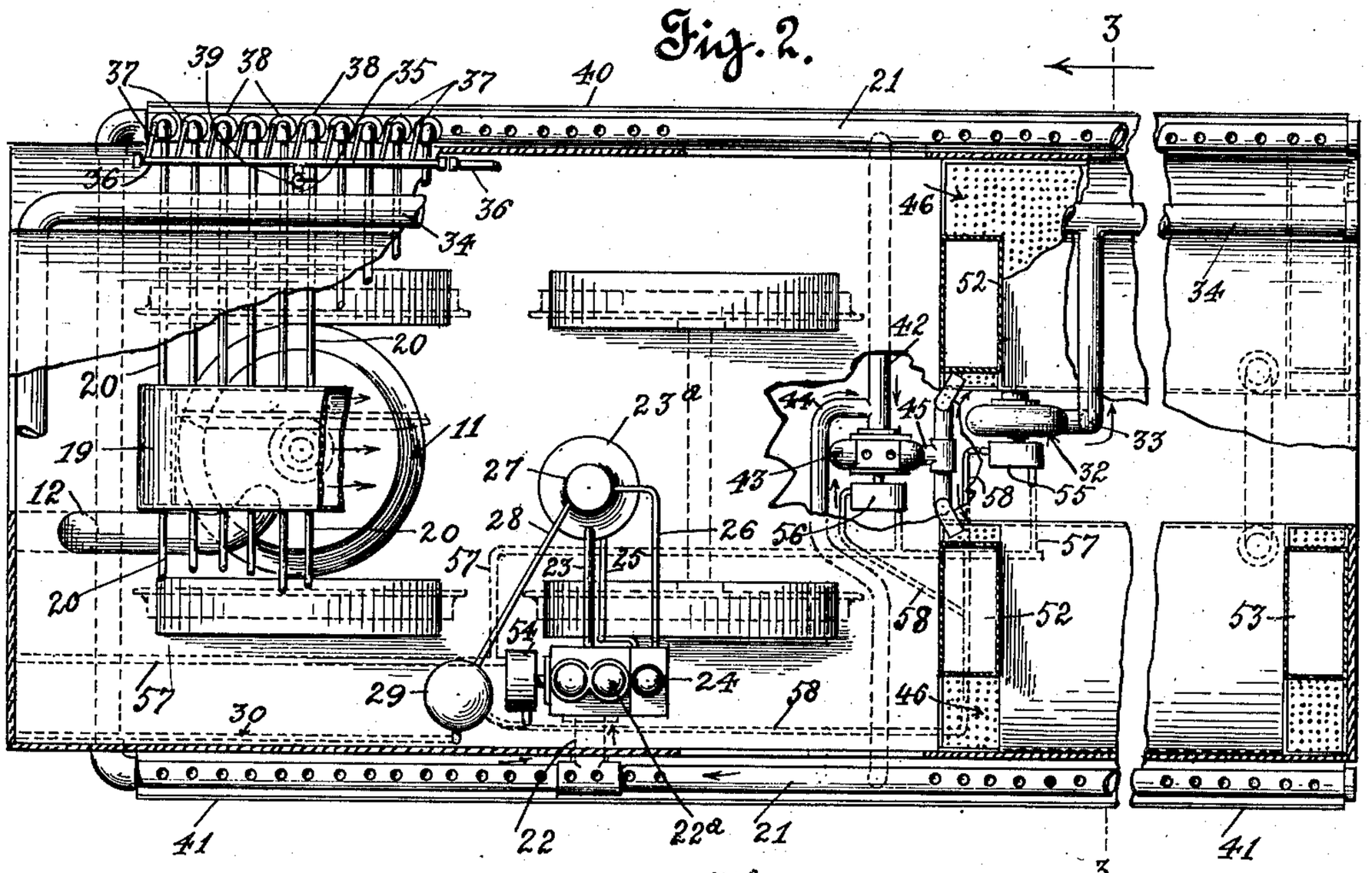


Fig. 3.

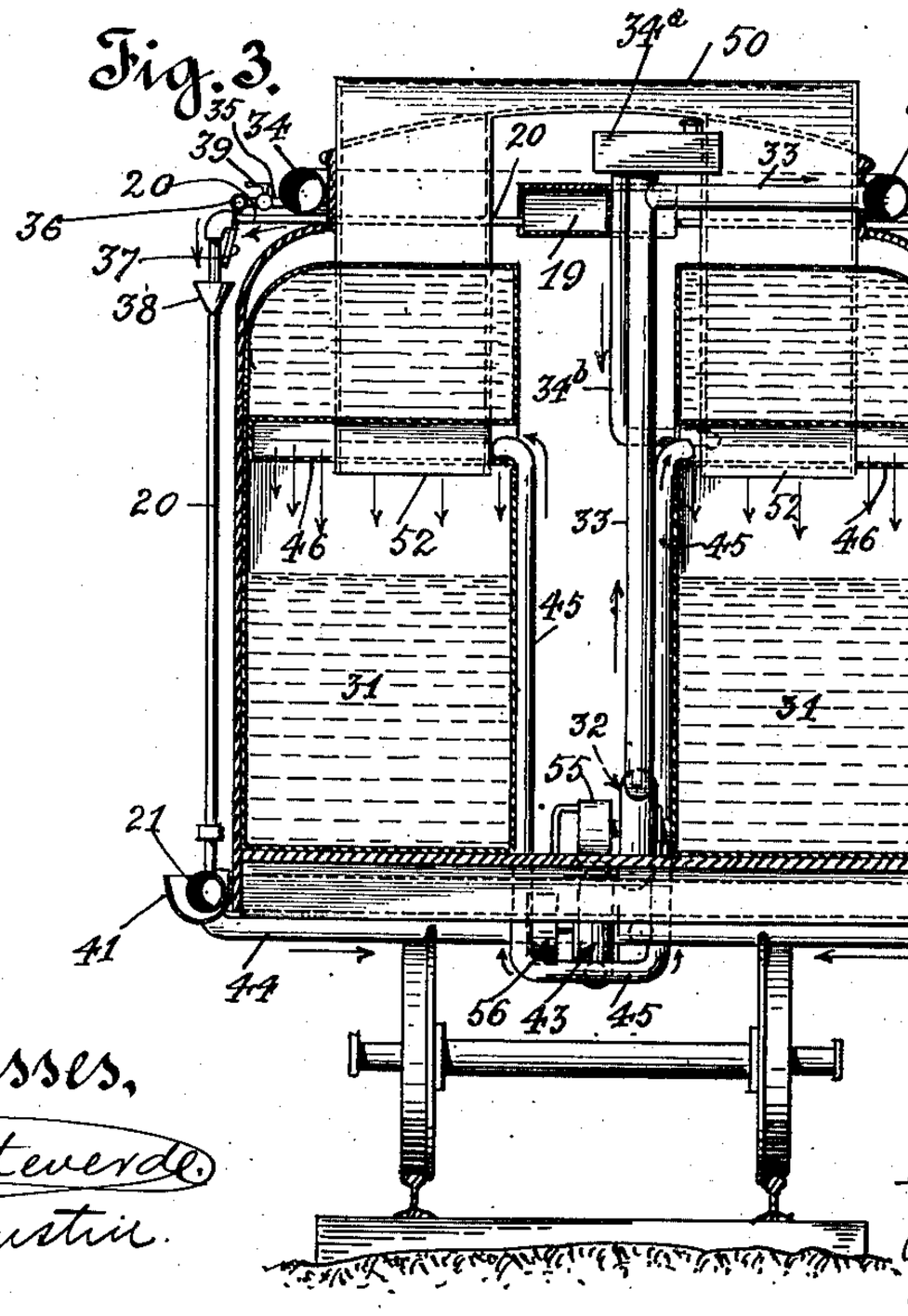


Fig. 4.

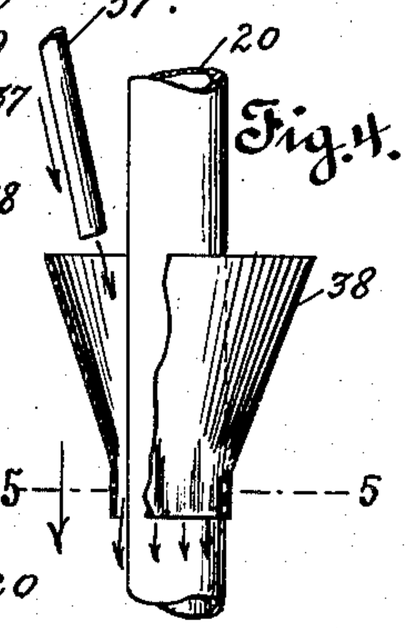
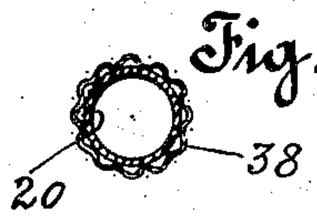


Fig. 5.



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UNITED STATES PATENT OFFICE.

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COMPOUNDING AND CONDENSING APPARATUS FOR LOCOMOTIVE-ENGINES.

976,554. Specification of Letters Patent. Patented Nov. 22, 1910.

Application filed October 25, 1909. Serial No. 524,324.

To all whom it may concern:

Be it known that I, LUCIUS D. COPELAND, a citizen of the United States, residing in the city of Alhambra, county of Los Angeles, State of California, have invented new and useful Improvements in Compounding and Condensing Apparatus for Locomotive-Engines, of which the following is a specification.

My invention relates to an apparatus to be attached to a locomotive engine of the simple type, whereby the cylinders are compounded, or to a compound engine, and further compounding the same and for condensing and otherwise utilizing the exhaust steam of the locomotive to the same extent that the same is utilized in stationary and marine engine practice; and the object thereof is to provide a simple and durable apparatus for that purpose whereby increased power from the engine is obtained. I accomplish this object by the mechanism described herein and illustrated in the accompanying drawings in which,

Figure 1 is a side elevation partly broken away and partly in section of a locomotive tender equipped with my improved apparatus. Fig. 2 is a plan of the tender with parts broken away and with parts in section. Fig. 3 is a section on the line 3—3 of Fig. 2. Fig. 4 is an enlarged fragmentary portion showing a portion of the condenser mechanism. Fig. 5 is a section on the line 5—5 of Fig. 4.

In the drawings 10 is the tender which is coupled to the engine (not shown) in the place of the ordinary tender, and in like manner. It is provided with suitable apertures or openings at the ends and sides which are closed by doors through which access is obtained to the tender.

On the tender, preferably in the forward end is mounted the low pressure engine, preferably a steam turbine 11 of any approved construction, which is connected by pipe 12 to the exhaust of the engine not shown. This pipe leads the exhaust of the engine into the turbine. The forward end of the tender is carried by a pair of driving wheels 13 and 14 which are connected by parallel rod 15. Driving wheel 13 is provided with a cog gear 16 which meshes with bevel gear 17 mounted on shaft 18. Gear 17 is slidable longitudinally upon shaft 18 and is held from rotation thereon by spline 18ª, the purpose of thus mounting it being to allow for a vertical movement of the shaft which is connected to the turbine without moving the gear vertically. The exhaust steam operates the turbine and the power generated thereby is utilized for train propulsion through the driving wheels. The exhaust steam passes from the turbine through exhaust conduit 19 which passes upwardly to near the roof of the tender and then rearwardly and is closed to the atmosphere. To that portion of the exhaust conduit which leads along the roof to the rear of the car are connected a large number of condenser pipes 20 which run from the conduit to the outside of the car and then turn downwardly and open into condenser header 21. Header 21 runs along the sides of the tender at the bottom thereof and across one end making a U-shaped condensed water collecting pipe, which is connected by pipe 22 with vacuum pump 22ª. The vacuum pump is connected by pipe 23 with and delivers the water into hot well 23ª. Boiler feed pump 24 has its suction port connected by pipe 25 with the hot well. This pump forces the water through pipe 26 into filter 27 from which it passes through pipe 28 into the feed water heater 29, from which heater it is led by pipe 30 to the boiler on the engine, not shown.

In the rear portion of the tender and at the bottom thereof are the cold water tanks 31 which are connected to the suction port of the cold water pump 32. This pump pumps water from the tanks through pipe 33 up into the U-shaped reservoir pipe 34 which passes along the sides of and upon the roof of the car and across one end thereof. From its connection with reservoir pipe 34, pipe 33 extends upwardly and opens into the overflow box 34ª. A pipe 34ᵇ extends from the bottom of the overflow box and delivers water upon the top of screen 46. At suitable distances on the side members are outlet pipes 35 which are connected to distributing pipes 36. These distributing pipes are provided with branches 37 which carry the water from the distributing pipe and discharges the same into funnels 38 which surround the condenser pipes just below the roof of the car. Pipe 35 is provided with a regulating cock 39 to control the quantity of water admitted to the distributing pipe 36. Each distributing pipe is intended to distribute the water to a certain num-

ber of condenser pipes. In the drawings I have shown in Fig. 2 the distributing pipes as adapted to distribute water to ten of the condenser pipes, but it is obvious that they may furnish water to a greater or lesser number as desired. It is obvious that the branches which lead to the individual condenser pipes could be directly connected to pipe 34, but in that event in order to control the amount of water delivered to each condenser pipe each branch would have to be provided with a cock. I have found in practice that by constructing a supply pipe for a limited number of condenser pipes and providing a cock on the connection I can satisfactorily regulate the flow of the water for this number with one cock. The lower portion of the funnel 38 is corrugated as best shown in Fig. 5 so as to cause the water flowing through the funnel to be subdivided and to pass down the condenser pipe all around the same, as thereby a more efficient cooling effect is produced than if the water were discharged upon the pipe at one point. By placing the condenser pipes on the outside of the tender a greater cooling effect is produced than if placed within the tender. After passing through the funnel the water passes downwardly upon the condenser pipe and is caught in collection troughs 40 and 41. Trough 40 is connected by pipe 42 with the suction port of the circulating pump 43. Trough 41 is connected by pipe 44 with pipe 42. The discharge port of pump 43 is provided with a pipe 45 which branches and then leads upwardly and discharges the water from the pump upon the cooling screens 46, which are located in the top of the cold water tanks. The water passes through these screens back into the tanks from which it may be pumped again as before described to cool the condenser pipes. On the roof of the tender above the water tanks are the oppositely faced air funnels 50 and 51, which are connected by pipes 52 and 53 with the water tanks. These pipes extend through the screen and cause a circulation of air over the surface of the water and through the water falling through the screens when the car is in motion. The boiler feed and vacuum pumps are preferably driven by a steam turbine 54 or other suitable power. The cold water pump is driven preferably by a steam turbine 55 and the circulating pump is preferably driven by steam turbine 56. These turbines are supplied by steam from the boiler on the engine through pipe 57 which branches and runs to each of the turbines. The exhaust from the turbines is led into the feed water heater by pipe 58 which has branches running from the exhaust port of each turbine.

Having described my invention what I claim is;

1. A compounding and condensing apparatus comprising a locomotive tender provided with driving wheels; a low pressure steam engine mounted on said tender and adapted to be connected with the exhaust of the locomotive engine and to drive the driving wheels of the tender.

2. A compounding and condensing apparatus comprising a motor vehicle having driving wheels; a low pressure steam turbine on said motor vehicle adapted to be connected with the exhaust of the locomotive engine; a connection from the turbine to the driving wheels of the motor vehicle; and a condenser connected with the exhaust of the turbine.

3. A compounding and condensing apparatus comprising a locomotive tender provided with driving wheels; low pressure steam engine mounted on said tender and adapted to be connected with the exhaust of the locomotive engine and to drive the driving wheels of the tender; in combination with condensing means connected with the exhaust of the low pressure engine; and means to return the condensed water to the boiler of the locomotive.

In witness that I claim the foregoing I have hereunto subscribed my name this 16th day of October, 1909.

LUCIUS D. COPELAND.

Witnesses:

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S. B. AUSTIN.