No. 672,553. Patented Apr. 23. 1901.

N. L. HAYDEN.

FEED WATER PURIFIER.

(Application filed Jan. 7, 1901.)

(No Model.) 2 Sheets—Sheet 1.

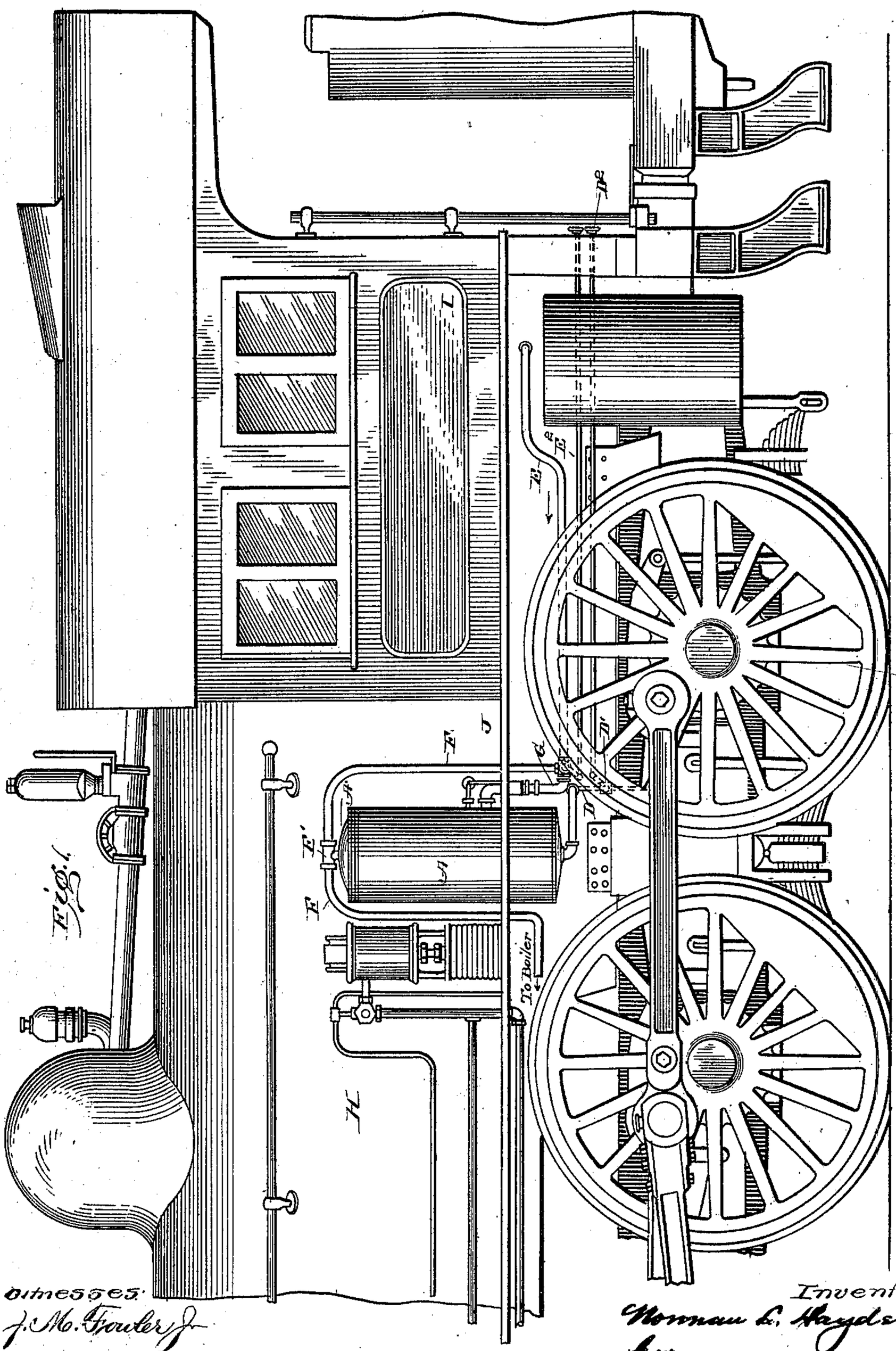

Fig. 1.

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Fig. 2

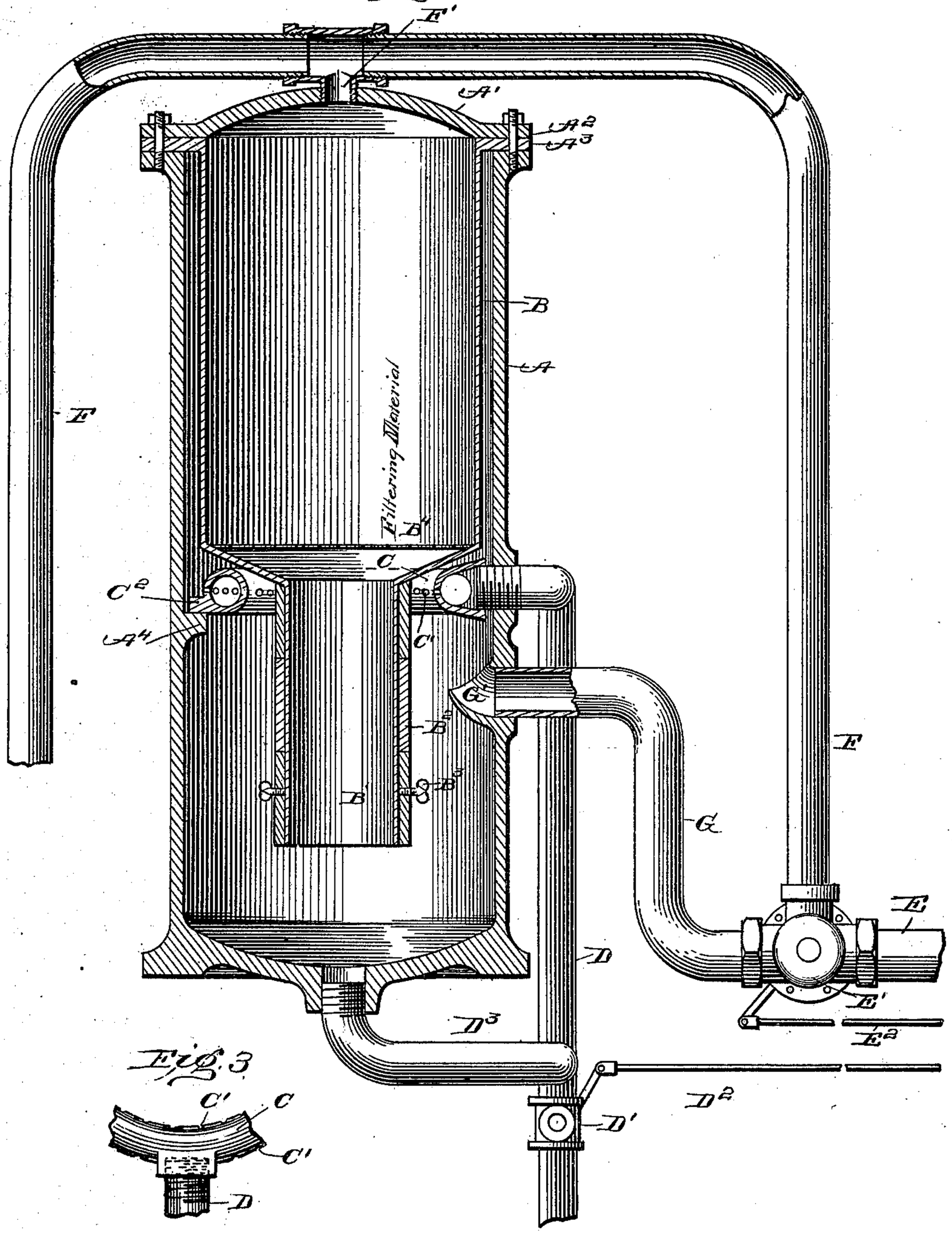

Fig. 3

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UNITED STATES PATENT OFFICE.

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FEED-WATER PURIFIER.

SPECIFICATION forming part of Letters Patent No. 672,553, dated April 23, 1901.

Application filed January 7, 1901. Serial No. 42,316. (No model.)

To all whom it may concern:

Be it known that I, NORMAN L. HAYDEN, a citizen of the United States, residing at New York, in the borough of Manhattan and State of New York, have invented certain new and useful Improvements in Apparatus for Purifying Feed-Water for Locomotives; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to apparatus especially intended for use on locomotives; but certain constituent parts forming complete operative combinations may be used with any steam-boiler of ordinary construction.

The use of some sort of purifier on a locomotive is especially desirable from the fact that locomotives must necessarily use water from natural sources along the line of the road, even though in certain sections such water contains a high percentage of deleterious mineral matter. It is particularly desirable also because a slight amount of deposit or scale makes it difficult to obtain the high efficiency almost indispensable in a locomotive and because the greatly-increased amount of fuel not only costs much money, but compels taking more frequent supplies. Again, such boilers are not readily cleaned, and the frequent repair made necessary by the formation of scale puts each engine out of service a great part of the time and also largely increases the expenditures-of-repair account. These evils have led to many attempts in the direction of purifying; but so far as I am aware none of the devices suggested have been satisfactory and few or none of them are at present in practical use.

My devices are now in successful practical use on two of the most important trunk-lines of this country upon boilers provided with injectors or with feed-water heaters which raise the feed-water to 270° Fahrenheit or upward. At such temperature most scale-forming compounds—for example, the carbonates and sulfates of lime and magnesium—are broken up and deposition or precipitation occurs, acid being set free. I provide for eliminating this acid before the water passes to the boiler and, as the accumulation of sediment is rapid, make use of devices permitting the fireman to discharge or wash out the sediment in perhaps half a minute at any time and without in the least interfering with the working of the locomotive or with his own ordinary duties.

Referring now to the drawings, Figure 1 is a side elevation of a part of a locomotive, showing my devices in place thereon. Fig. 2 is a vertical axial section of my purifier, showing its immediate connections. Fig. 3 is a detail view of a part seen also in Fig. 2.

The body of the purifier is a heavy upwardly-open cylindrical chamber or casing A, Fig. 2, provided with a head or cover A′, secured by bolts A^2. These bolts also pass through and bind fast the flange A^3 of a suspended cylindrical vessel B, open above and provided below with a depending nozzle or large open tube B′. The nozzle is inclosed by a thick tube B^2, of zinc, secured in any suitable way—for example, by set-screws B^3. The zinc tube is preferably made up of distinct sections, as shown, so that if by accident it should slip down it is not likely to rest upon the bottom of the chamber and prevent water from passing through the nozzle. Upon a perforated plate B^4 in the chamber B any suitable filtering material may be placed. Around the upper part of the nozzle and midway between it and the walls of the casing is a tubular ring C, provided with internal and external perforations C′ and having projecting lugs C^2, which rest upon projections A^4 upon the casing. A blow-out tube D, provided with a valve D′, operated by a rod D^2, passes outward from this ring through the wall of the casing A and above the valve is joined by a second blow-out pipe D^3, communicating with the lower central part of the chamber.

E is a pipe leading from any suitable injector or feeder and heater to a three-way valve E′, operated by a rod E^2. From this valve a pipe F passes to the boiler and is provided with a branch F′, leading through the center of the cover into the upper part of the filter-chamber. The third passage governed by the three-way valve leads through a pipe G to an upwardly-turned laterally-inclined nozzle G′ below the ring C. Ordinarily water arriving by the pipe E passes through this latter pipe and is discharged with a cyclonic

effect upon the water in the upper part of the space in which the nozzle B′ lies. Here, owing to the high temperature, the mineral matter is deposited, and as the water is brought into intimate contact with the zinc, for which acids have strong affinity, the larger part of such acids is combined with the zinc and rendered harmless. The water thus entering soon falls and then rises through the nozzle and, passing through the filtering-chamber, is discharged through the pipe F′, whence it passes through the pipe F to the boiler.

In applying purifying apparatus to a locomotive it is essential that it be compact, that it shall not interfere with any ordinary part, that it shall be readily accessible, and that it shall be so arranged that it may be cleaned quickly while the train is running and of course without the operator leaving the cab. Fig. 1 shows the relative size and location of my device as now in daily practical use upon a locomotive, it being placed alongside the boiler H in front of the cab I and near the running or foot board J, which it does not obstruct, and provided with valve-operating rods D^2 E^2, extending rearward to the fireman's place in the cab. Now if the rod E^2 be drawn rearward the passage from the valve through the pipe G is closed and that through the pipe F is opened. If the blow-out valve be then opened, water under the full boiler-pressure is forced down through the pipe F′, through the filter, and out through both the pipes D D^3, thereby instantly and forcibly washing out the lower part of the filtering material, the chamber A, and the perforated ring. By having a discharge-valve operated independently of the shifting-valve the sediment floating in the lower chamber and that falling to the bottom of the same may be discharged from time to time by operating the discharge-valve alone for an instant, whereby the clogging of the filter is much delayed and the slower operation of cleaning the same by opening both valves is needed much less frequently than would otherwise be the case. This convenient and effective cleaning is necessary because of the rapid accumulation of sediment when the water is very impure. Through a single apparatus now in use three thousand gallons of water pass in one hour, the distance passed over per day being some four hundred miles, and it is obviously impracticable either to allow the sediment to remain to the end of the run or to stop the engine and clean the apparatus.

What I claim is—

1. In a feed-water purifier, the combination with a casing or chamber, of a discharge-pipe leading from the upper part of the same, a feeder-pipe discharging in the lower part of the casing, a receptacle for filtering material fixed in said chamber and provided with a central dependent nozzle or tube, and a layer of metallic zinc secured upon the surface of said tube.

2. In a feed-water purifier, the combination with an outer casing or chamber, of a discharge-pipe leading from the upper part of said casing, a receptacle for filtering material mounted in said chamber and provided with a dependent tube or nozzle, a sleeve of zinc inclosing said tube, and a feeder-tube discharging against said sleeve.

3. In a feed-water purifier, the combination with an outer casing or chamber, of a receptacle for filtering material fixed in the upper part of said chamber and provided with a central dependent tube or nozzle, a sleeve of zinc inclosing said tube, a pipe discharging in the space below the receptacle through an inclined passage, whereby the water delivered has a cyclonic action, thus washing the zinc and aiding precipitation.

4. In a feed-water purifier, the combination with an outer casing or chamber, of a discharge-pipe leading from the upper part of said chamber, a feeder-tube discharging in the lower part of the chamber, a receptacle for filtering material centrally fixed in the upper portion of said chamber and having a central, dependent tube or nozzle, and a zinc sleeve inclosing said tube, made up of distinct rings, and means for detachably securing the rings in position.

5. The combination with a locomotive, of a purifier mounted alongside the boiler, a discharge-pipe leading from the upper part of the same to the boiler, a feeder-pipe branch leading into said discharge-pipe, a branch pipe leading from the feeder-pipe into the lower part of the purifier, a valve for shifting the flow from one branch to the other whereby the purifier may be cut out, a valve-operating device extending from said valve to the cab, a blow-out pipe leading from the lower part of the purifier, a valve controlling the discharge through the blow-out pipe, and a valve-operating device extending from the valve to the cab whereby each valve may be operated while the locomotive is in motion.

6. The combination with a locomotive, of a feed-water purifier mounted alongside the boiler and having an upper chamber, a lower chamber and a filtering-receptacle separating said chambers and provided with a dependent nozzle or tube externally covered with zinc, a discharge-pipe leading from the upper chamber to the boiler, a feeder-pipe branch leading into the discharge-pipe, a branch pipe leading from the feeder-pipe into the lower chamber, a valve operable from the cab to shift the feed-water from either branch to the other, a blow-out pipe leading from the lower part of the purifier, and a valve operable from the cab to open and close the blow-out pipe.

In testimony whereof I affix my signature in presence of two witnesses.

NORMAN L. HAYDEN.

Witnesses:

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EDWIN S. CLARKSON.