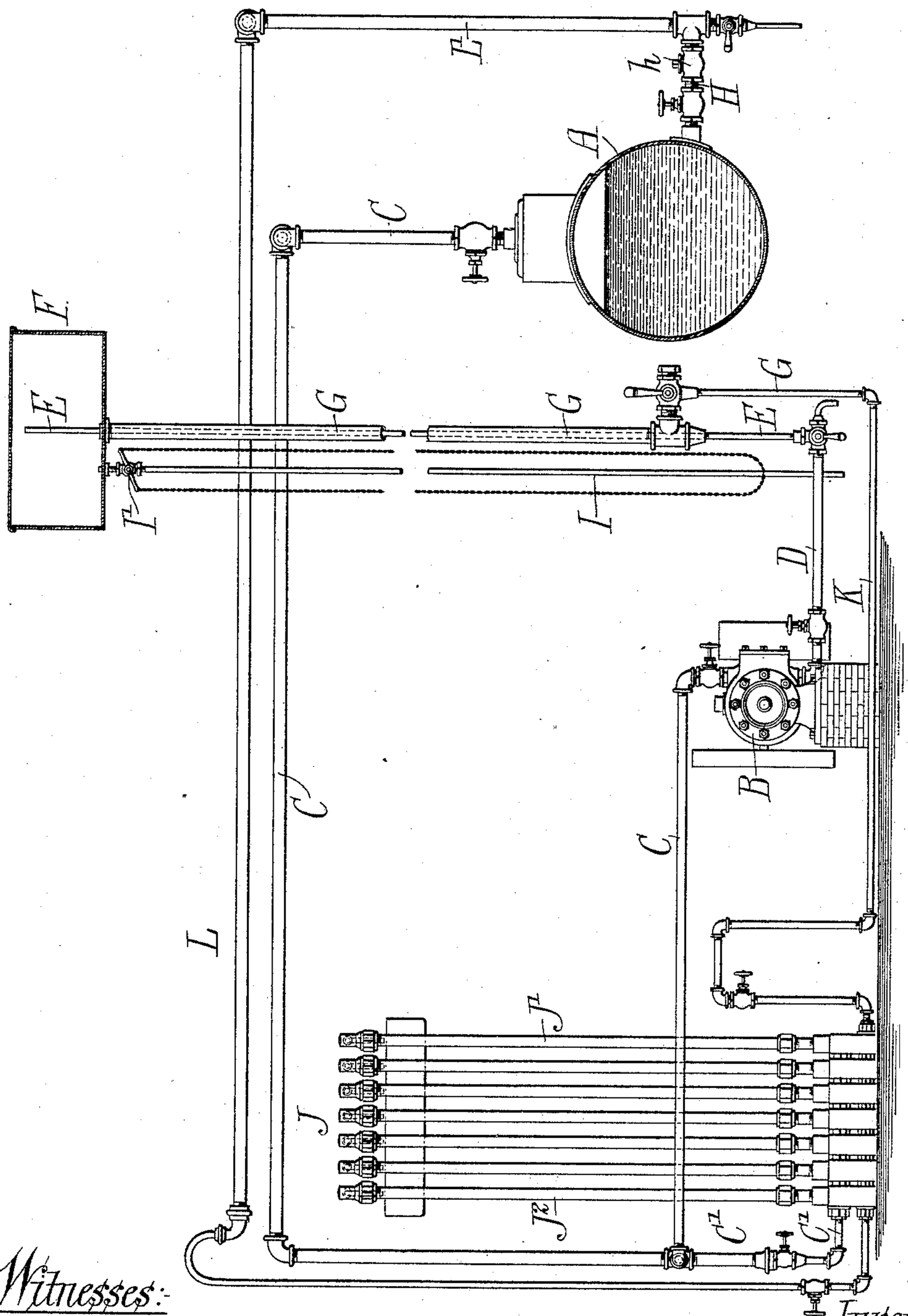
(No Model.)

W. BURNHAM.

STEAM LOOP CONNECTION FOR ENGINES.

No. 474,438. Patented May 10, 1892.



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UNITED STATES PATENT OFFICE.

WALTER BURNHAM, OF CHICAGO, ILLINOIS.

STEAM-LOOP CONNECTION FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 474,438, dated May 10, 1892.

Application filed January 12, 1892. Serial No. 417,885. (No model.)

To all whom it may concern:

Be it known that I, WALTER BURNHAM, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Loop Connections for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to the application of steam-loops to the exhaust of steam-engines; and it has for its object to provide a construction whereby the steam-loop or water-returning devices from the exhaust of an engine may be limited to a height less than that which is due to the difference in pressure between the exhaust and the boiler.

In another application for patent filed of even date herewith—to wit, Serial No. 417,884—I have pointed out the advantages of a steam-loop applied to the exhaust of a steam-engine and delivering the water taken or condensed from the exhaust-pipe of the engine into the generator, thus placing the engine and boiler in a single closed circuit. In said simultaneous application for patent I have recognized the fact that in some cases the steam-loop would require to be objectionably high in order to accommodate the water column necessary to the return of the water of condensation to the boiler.

In the present application is set forth a combination, with the engine and generator, of a system of loops under graduated or varying pressures, the first taking from the exhaust of the engine and delivering into the next of somewhat higher pressure, this delivering into another of still higher pressure, and so on until the last delivers into the boiler, all the loops being of moderate and allowable height.

The general principles of what is called a "combined loop" are set forth in Letters Patent of the United States No. 394,828, granted to me on the 18th of December, 1888.

In another application for patent filed simultaneously herewith—to wit, Serial No. 417,887—I have illustrated and described a particular construction of such a combined loop, which is also shown in the present application, as being the best form now known to me in which said combined loop may be made. The later form of such combined loop is, however, not necessary to the present invention, and reference may therefore be had only to my aforesaid patent for a full understanding of this.

The accompanying drawing illustrates a complete apparatus, embracing a generator, a steam-engine, a steam-loop connected with the exhaust of the steam-engine, and a system of combined loops under graduated pressures, through which the exhaust-loop is connected with the generator.

A represents a steam-generator; B, a steam-engine; C, a steam-pipe leading from the generator to the engine, and D the exhaust-pipe of the engine. Of the steam-loop directly connected with the exhaust-pipe D of the engine, and which I will here call the "exhaust-loop," E is the riser, F is the elevated closed condensing-chamber, G is the drop-leg, and I is the pipe containing a valve I′, through which the condensing-chamber F may be exhausted of its air and made to afford a vacuum.

J is a series of loops combined with each other essentially as set forth in my before-mentioned prior patent, No. 394,828, and of the particular construction pointed out in my application for patent filed simultaneously herewith, Serial No. 417,887.

J′ is the section of the combined loop which is under lowest pressure, and J^2 the section under highest pressure.

K is a pipe leading from the lower end of the drop-leg G of the exhaust-loop to the receiving-chamber of the lowest-pressure loop J′ of the series of combined loops J.

L is a final steam-loop taking steam and water from the highest-pressure loop J^2 of the combined series J and delivering water from its drop-leg L′ through the check-valve *h* in the pipe H into the generator A. By this construction, or, in other words, by the employment of the combined system of loops J with the exhaust-loop or loop directly connected with the exhaust-pipe of the engine, all of the objections to the use of the exhaust-loop alone as a direct means for returning the water of condensation from the engine to the generator are overcome and the advantages of an exhaust-loop delivering directly into the gener-

ator from the engine-exhaust are retained—that is to say, the condensing-chamber of the exhaust-loop does not require in this construction to be placed higher than may be found practicable or convenient. It may desirably be placed on the top of the building in which the apparatus is located, where it will be exposed to the winds or the cool surrounding air for the purpose of attaining greater condensing activity, though if not convenient to place it so high it may be placed at any lower elevation where it may be conveniently supported, though always desirably where it will be exposed to the outer atmosphere.

With the construction shown let it be assumed that the boiler is under seventy-five pounds pressure and that the combined series of loops J give an aggregate reduction of five pounds pressure above atmosphere in the first loop J′ of the series. The condensing-chamber F of the exhaust-loop is at an elevation of, say, fifty feet and is exhausted to a substantially full vacuum, its size and cooling ability being sufficient to maintain such a vacuum. The water column in the drop-leg is then of sufficient height to readily force delivery through the pipe K into the first loop J′ of the series of combined loops against the pressure of five pounds, to which the latter is subjected through the steam-pipe C′ and sundry reducing-valves in the combined loops. The last loop J^2 of the series of combined loops being adjusted to only a few pounds less than boiler-pressure, the loop L easily affords a column in its drop-leg L′ of sufficient height to force water into the generator, or said last loop J^2, if suitably located, may itself deliver into the generator. The vacuum may be produced either by an air-pump or by the introduction of live steam into the condensing-chamber to blow out the air, and then, after closing the valve I′, allowing the steam to condense.

I claim as my invention—

1. In combination with a steam-engine and a steam-generator supplying said engine, a plurality of connected steam-loops under varying pressure connecting the exhaust-pipe of the engine with the generator.

2. In combination with a steam-engine and a generator supplying said engine, a steam-loop leading from the exhaust of the engine and having an elevated condensing-chamber provided with means for producing a more or less perfect vacuum therein and a series of combined loops under graduated pressures interposed between the exhaust-loop and the generator, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

WALTER BURNHAM.

Witnesses:

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