

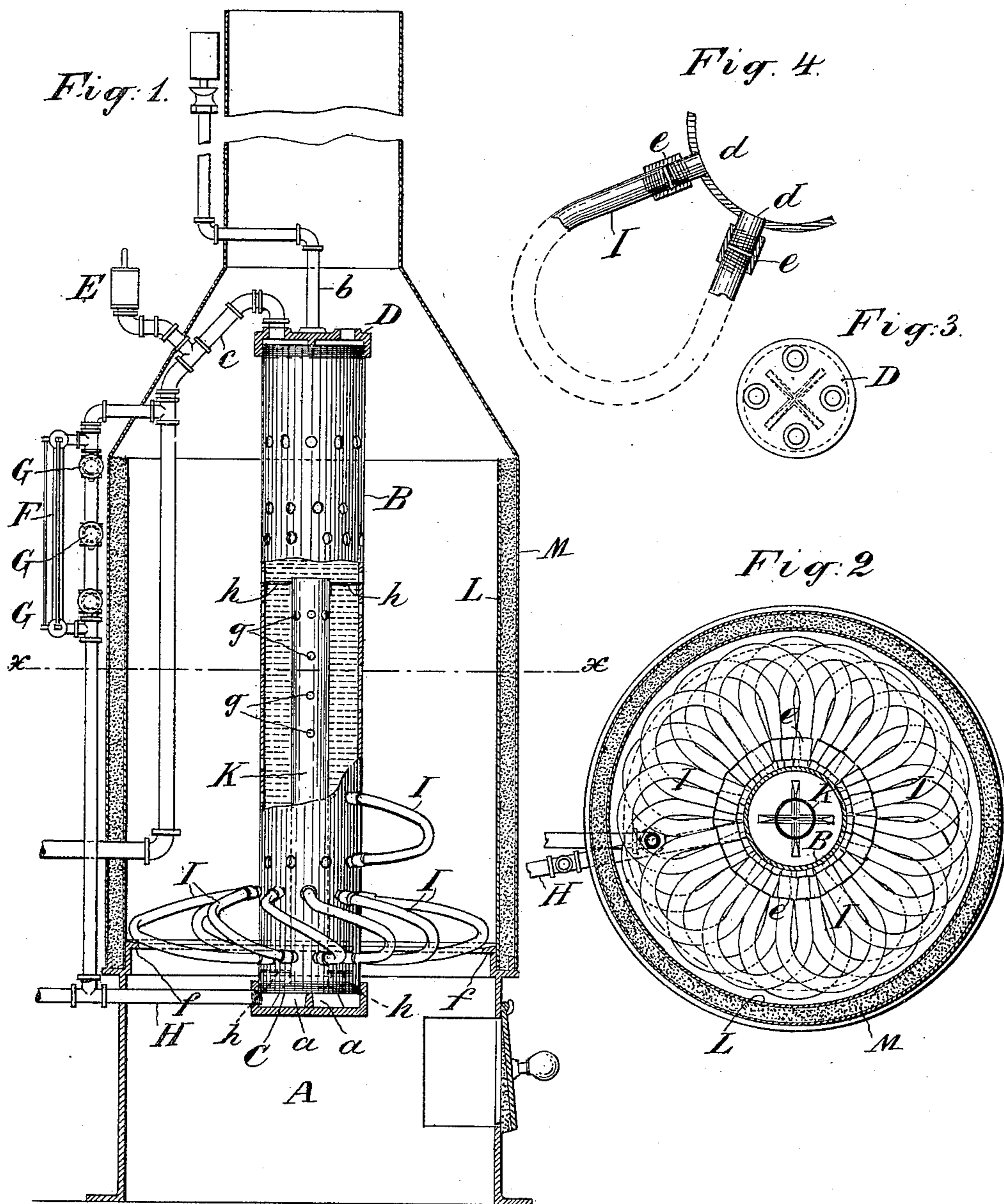
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M. G. LEWIS.
STEAM BOILER.

(Application filed Mar. 8, 1901.)

(No Model.)



WITNESSES:

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STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 686,857, dated November 19, 1901.

Application filed March 8, 1901. Serial No. 50,296. (No model.)

To all whom it may concern:

Be it known that I, MORTIMER G. LEWIS, a citizen of the United States, residing at New York city, in the county and State of New York, have invented certain new and useful Improvements in Steam-Boilers, of which the following, taken in connection with the accompanying drawings and the letters of reference marked thereon, is a full, clear, and exact specification.

My invention has relation to that variety of steam-boilers wherein tubes or conduits on the outside of the boiler are intended to be impinged upon by the flame or to receive heat from the fire, conducting water from one portion of the boiler and delivering it or the steam arising therefrom to another portion. Heretofore in this variety of boilers great difficulty has been experienced from the fact that the tubes were liable to be damaged or disarranged at or near their unions with the boiler owing to the expansion and contraction arising from the variations in the heat.

The primary object of my invention is therefore to supply the boiler with a number of circulating-tubes arranged on the boiler from the bottom thereof to near the top, each such tube being bent and coupled with the boiler, so that the axis of each coupling will extend in a radial direction from the boiler, said tubes being arranged so that the flame on leaving one set of tubes shall impinge directly upon the next set above, and so on throughout the series, the several tubes being each capable of being removed and replaced without disturbing any of the others. Subordinate objects are means for improving or facilitating the circulation within the water-space of the boiler and the provision of facilities for cleaning the boiler and for removing any or all the parts whenever desired.

To accomplish the aforementioned objects and to secure other and further advantages in the matters of construction, operation, and use, my improvements involve certain new and useful arrangements or combinations of parts and peculiar features of invention, as will be herein first fully described and then pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a vertical view, partly in section and partly in elevation, representing my improved boiler as assembled for use, but showing only a few of the exterior tubes in place, exhibiting perforations in the boiler at which the tubes are to be applied. Fig. 2 is a horizontal view, partly in section and partly in plan, on a plane through line xx of Fig. 1, a number of the circulating-tubes being shown in position for use and extending entirely around the boiler, as the invention contemplates. Fig. 3 is a plan of the boiler-top, omitting the pipes or connections applied at this part. Fig. 4 is a partial section and plan view representing in detail the means of connecting the tubes with the boiler, only one tube and a fragment of the boiler being shown.

In all the figures like letters of reference wherever they occur indicate corresponding parts.

A is the fire-box section, intended to receive the fuel, which may be of any kind, but is preferably liquid or gaseous. Any form of grate or burner may be adopted.

B represents the boiler-shell. That this may be amply strong and durable for the purposes intended and at the same time be cheap and easy to construct I preferably make it of a piece of wrought-metal tube of suitable diameter; but of course it might be made of boiler iron or steel and riveted up, if preferred.

C is the bottom of the boiler, and D the top or cap. These two pieces are preferably made of cast-iron and threaded upon the extremities of the boiler. On the interior of the bottom are ribs a , forming a spider which sustains the lower end of the inner tube, to be hereinafter described, keeping it free from the bottom plate, so that the water may properly circulate beneath the lower end of the inner tube. The cap D is suitably perforated for the purpose and receives the steam outlets or pipes, as for instance, a whistle-pipe b , a steam-outlet pipe c , and any other which it may be desired to apply thereto.

E represents a safety-valve of any form; F, a water-gage; G G, test-cocks, and H a water inlet or supply pipe, the latter being capable of use also as a blow-off pipe whenever the occasion may occur.

I I are the exterior circulating-tubes, exposed to the flame or the heat from the fire. These are made of seamless or other suitable

wrought-metal pipes bent in substantial U shape or form, and they are for small boilers preferably made of copper, the better to transmit the heat to the water within; but they may be made of any other suitable metals. The boiler is perforated at suitable points, and short nipples, as *d*, are threaded or otherwise firmly secured in the perforations and extend in radial directions from the sides of the boiler.

The tubes *I* are coupled to these nipples by short threaded sleeves *e*, a right and left handed thread being employed to effect the union, so that the tubes or any of them may be easily detached whenever required; but any other suitable form of coupling or union may be used, so long as it affords the desirable independent removability of the tubes. The tubes *I* are arranged entirely around the boiler, the lowermost of the series preferably resting upon a suitable interior flange *f*, with which the fire-box is supplied. The object of this is to leave the fire-box clear or free of any central support or post, so that the flames will in no way be impeded thereby. Each tube *I* from its connection with the boiler at its lower part extends up in U shape and is connected with the boiler at a point above the lower union and at one side thereof, the extent of rise varying, of course, with the size of the boiler and the number of tubes employed in connection therewith. In the smaller sizes a rise of two inches, or thereabout, will be found sufficient for my purpose; but generally the rise is about one inch for each foot in length of pipe. The lower series of tubes being applied, the next series is similarly applied, but so that one tube will not be located directly above another. The last series of tubes connect at top with the boiler at a point slightly above the usual water-line, the upper portion of the boiler thereabove being utilized as a steam dome or compartment. It will be understood from the foregoing that any number of these tubes may be applied upon the boiler. The rise of each tube being small, it receives water from the boiler, which is exposed to a high degree of heat when in the tube and quickly returns to the boiler either in the form of water or steam. This occurs in each tube throughout the entire system, the available amount of heating-surface being very great, as will be readily understood.

In the interior of the boiler I locate a central tube *K*, the same being perforated, as at *g g*, at different points. This tube is open at the top and bottom and is sustained by braces, as *h h*, which extend from it to the wall of the boiler, keeping the tube always in central position, or substantially so. The top of this tube is located below the usual water-line in the boiler, and the perforations *g* are for the purpose of admitting water to the interior of this central tube in event that the water in the boiler should fall below the top

of the central tube. As the highly-heated water enters the boiler from the outside tubes, it passes directly up, so that the steam may separate from it within the steam-space, and the central column of water within the boiler, which is less highly heated than the remainder, passes down through the central tube and is discharged at the lower end thereof to find its way out again through the series of tubes *I*, thus keeping up a rapid and easy circulation of the water throughout the system. By uncoupling the boiler-head the central tube may be easily lifted out for cleaning or repairs, if desired. By uncoupling the pipes and removing them and the smoke-stack from the jacket the entire boiler is free to be lifted from the jacket for cleaning or repairs.

The jacket surrounding the boiler and intended to confine the heat from the fire-box is preferably made of an inner sheathing *L* and an outer shell *M*, the space between the two being filled with any suitable non-conducting material, as asbestos; but of course any suitable jacket might be employed. The jacket is made removable from the box, so that the boiler may be reached without disturbing it, if that be preferred to lifting the boiler out of the jacket.

It will be apparent that any expansion of the circulating-tubes will be in the direction of their length, so that the radially-located joints or couplings will not be disturbed either by the expansion or contraction of the tubes.

Having now fully described my invention, what I claim as new herein, and desire to secure by Letters Patent, is—

1. In combination with the boiler-shell, a series of tubes connected therewith by removable couplings or unions, the axes of the connections extending from the boiler in radial directions, and the several tubes in the series being arranged to be independently removable and replaced, the boiler-shell and the applied tubes being sustained by the lowermost of the series of tubes, leaving the fire-box unobstructed beneath the boiler, substantially as shown and for the purpose set forth.

2. In combination with the steam-boiler having a series of circulating-tubes applied thereon in the manner explained, the interior centrally-located perforated pipe or tube, the same being open at the top and bottom and removable from the boiler without disturbing the tubes, substantially as shown and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MORTIMER G. LEWIS.

Witnesses:

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