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J. R. WORSWICK & E. LEWIS.

Steam-Boilers.

No. 144,378. Patented Nov. 4, 1873.

Fig. I.

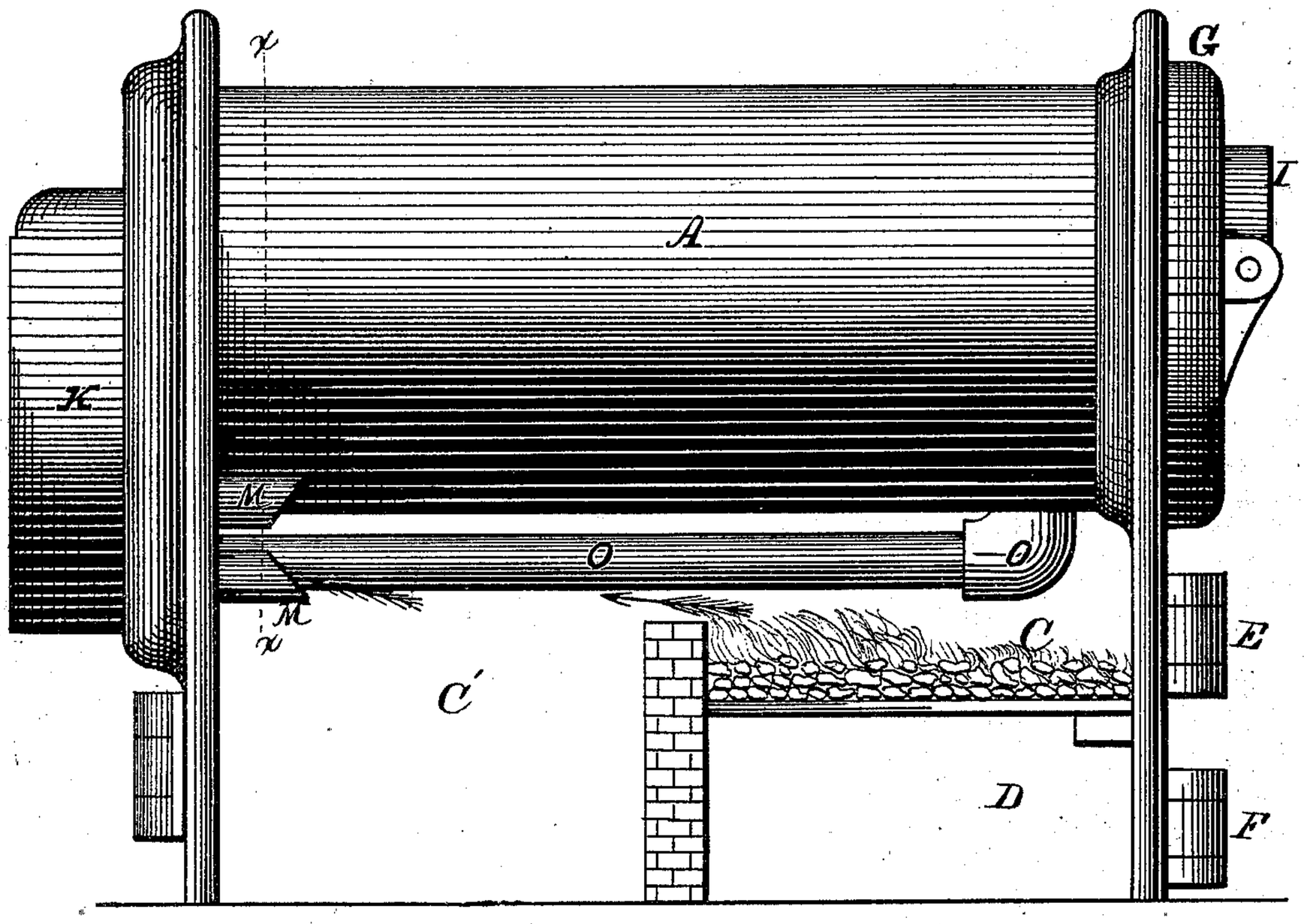

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Fig. 2.

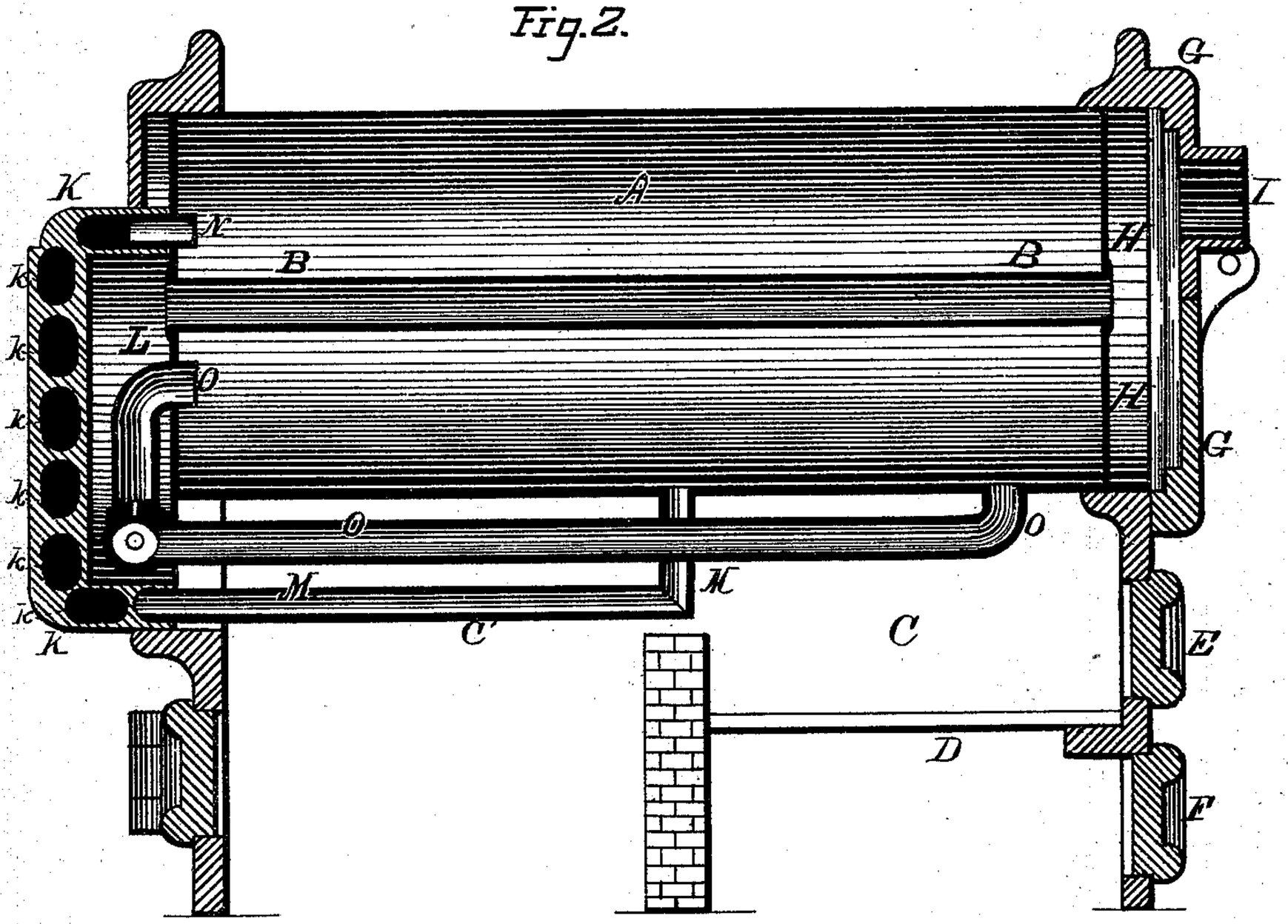

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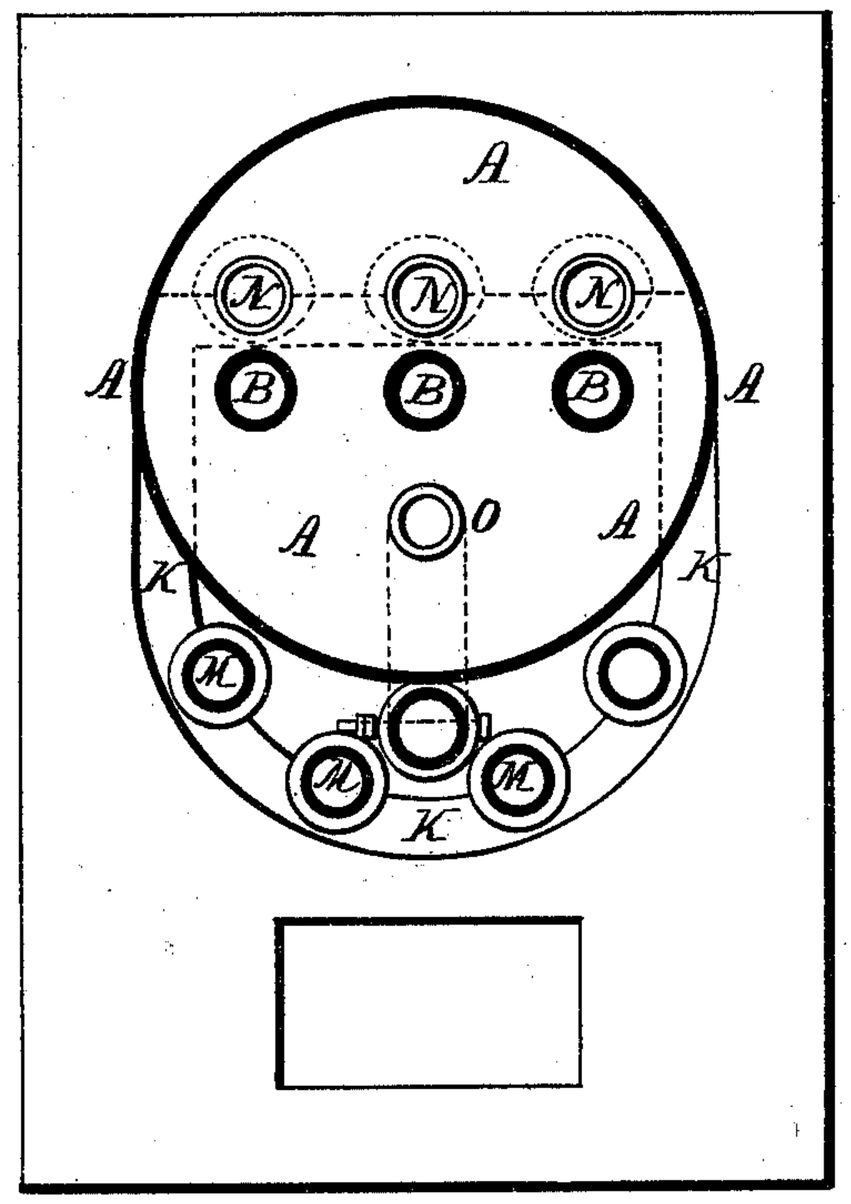
Fig. 3.



WITNESSES.

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UNITED STATES PATENT OFFICE

JAMES R. WORSWICK AND EDWARD LEWIS, OF CLEVELAND, OHIO.

IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. **144,378**, dated November 4, 1873; application filed August 8, 1873.

To all whom it may concern:

Be it known that we, JAMES R. WORSWICK and EDWARD LEWIS, of Cleveland, in the county of Cuyahoga, and in the State of Ohio, have invented certain new and useful Improvements in Steam-Boilers; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings making a part of this specification, in which—

Figure 1 is a side elevation of our improved boiler with the side wall or casing removed, so as to show the interior arrangement of parts. Fig. 2 is a vertical central section upon a line extending from front to rear, and Fig. 3 is a cross-section upon line *x x* of Figs. 1 and 2.

Letters of like name and kind refer to like parts in each of the figures.

The design of our invention is to more thoroughly utilize the heat of fuel employed in producing steam within a steam-boiler, to produce a more perfect circulation of water within the boiler, and to increase the steaming capacity of the same; to which end said invention consists, principally, in the water-bonnet inclosing the rear end of the boiler, provided with suitable water-ways between its inner and outer sides, and connected at its lower end with the water-space at the lower side of the boiler, and at its upper end with the steam or water space above the flues, substantially as and for the purpose hereinafter specified. It consists, finally, in the boiler and its attachments as a whole, when said parts are constructed and combined to operate in the manner and for the purpose substantially as set forth.

In the annexed drawings, A represents a cylindrical boiler, provided with a number of horizontal or return flues, B, and set in the usual manner, so as to form beneath its forward portion a fuel-chamber, C, and ash-pit D, access to which is had through suitable doors E and F, respectively. The forward end of the boiler is inclosed by means of a casing, G, which forms at such point a suitable chamber, H, and is provided with an opening and collar, I, for the reception of the exit flue or pipe; while at its rear end said boiler is inclosed by means of a bonnet or hood, K, that has the general form shown in Figs. 2 and 3, its lower portion being extended or offset rearward, and carried downward somewhat below the lower side of said boiler, so as to form an enlarged chamber, L, that extends upward to a point above the flues B, and has its front lower side opening into the combustion-chamber C′. The bonnet K is provided between its inner and outer sides with a series of intersecting channels, *k*, the lower ends of which are connected with the interior of the boiler A by means of a number of pipes, M, which extend horizontally forward from laterally equidistant points therefrom to a point near the longitudinal center of said boiler, and from thence pass vertically upward into the same. From the upper ends of the channels *k* another series of pipes, N, extend horizontally forward through the rear head of the boiler, and connect said channels with the space above the flues B.

As thus constructed, it will be seen that free passage is furnished for water from the lower portion of the boiler, through the pipes M, water-channels, and pipes N, to the upper portion of said boiler, while the heated escaping products of combustion from the fuel-chamber pass rearward around said pipes M, upward against the inner side of the bonnet K, and thence into and through the flues B, to the exit-flue, during which passage of said gaseous products a large proportion of heat that would otherwise have been wasted is imparted to the water contained within said bonnet and its connecting-pipes, causing said water in a highly-heated state to pass rapidly upward into the upper portion of said boiler, while its place is filled by cooler water from the lower portion of the same.

The result produced by the employment of the bonnet and its connecting-pipes is to largely increase the steaming capacity of the boiler, and to materially reduce the consumption of fuel, the latter effect being, in part, the result of a better application of the heat, and in part due to the small percentage of heat wasted by being radiated from the rear end of the boiler, as compared with those of ordinary construction.

The efficiency of the boiler is still further increased by means of one or more pipes, O, which extend from near its front end into the fuel-chamber C, from thence horizontally rearward beyond the rear end of said boiler, and

from thence upward and forward into the same at a point below the flues B. The direct action of the heated gases upon the entire length of the pipe O raises the temperature of the water contained therein to a very high point, and causes it to pass rearward and upward with great rapidity.

If desired, the pipes N may enter the boiler above the water-line, in which event no upward circulation of water would take place through the bonnet; but as the connections of the latter are so direct and capacious, water within said bonnet and boiler would always have a uniform height, a sufficient supply entering the lower end of the former to compensate for such as was converted into steam and passed from its upper end into said boiler.

The improvements described largely increase the steaming capacity of a boiler and its economy in the use of fuel, while from their nature and construction but a slight increase is made in its cost.

Having thus fully set forth the nature and merits of our invention, what we claim as new is—

1. As a means for inclosing the rear end of a return-flue boiler, a bonnet or hood provided with water-ways, which are connected with the upper and lower portions of the boiler, substantially as and for the purpose specified.

2. In combination with the boiler A, constructed as described, the bonnet K and pipes M, N, and O, when arranged to operate in the manner and for the purpose substantially as shown.

In testimony that we claim the foregoing we have hereunto set our hands this 31st day of July, 1873.

J. R. WORSWICK.
EDWARD LEWIS.

Witnesses:
JOHN A. PRINDLE,
JAMES QUAYLE.