

(No Model.)

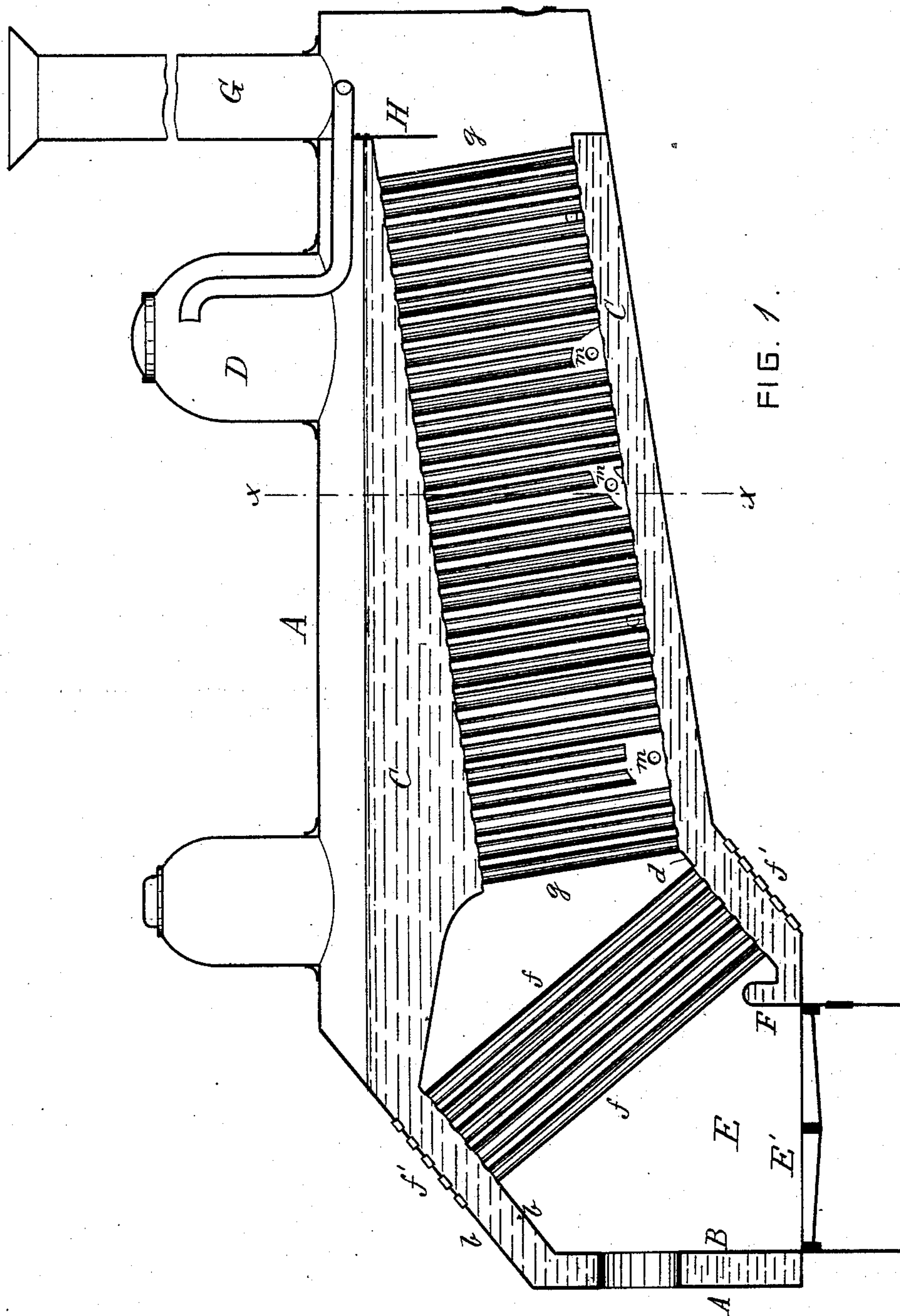
2 Sheets—Sheet 1.

H. C. GOULDING.

LOCOMOTIVE BOILER.

No. 353,303.

Patented Nov. 30, 1886.



WITNESSES

Wm. A. Lowe

P. B. Whippley

INVENTOR

Henry C. Goulding
by *J. Storer*
his ATTORNEY

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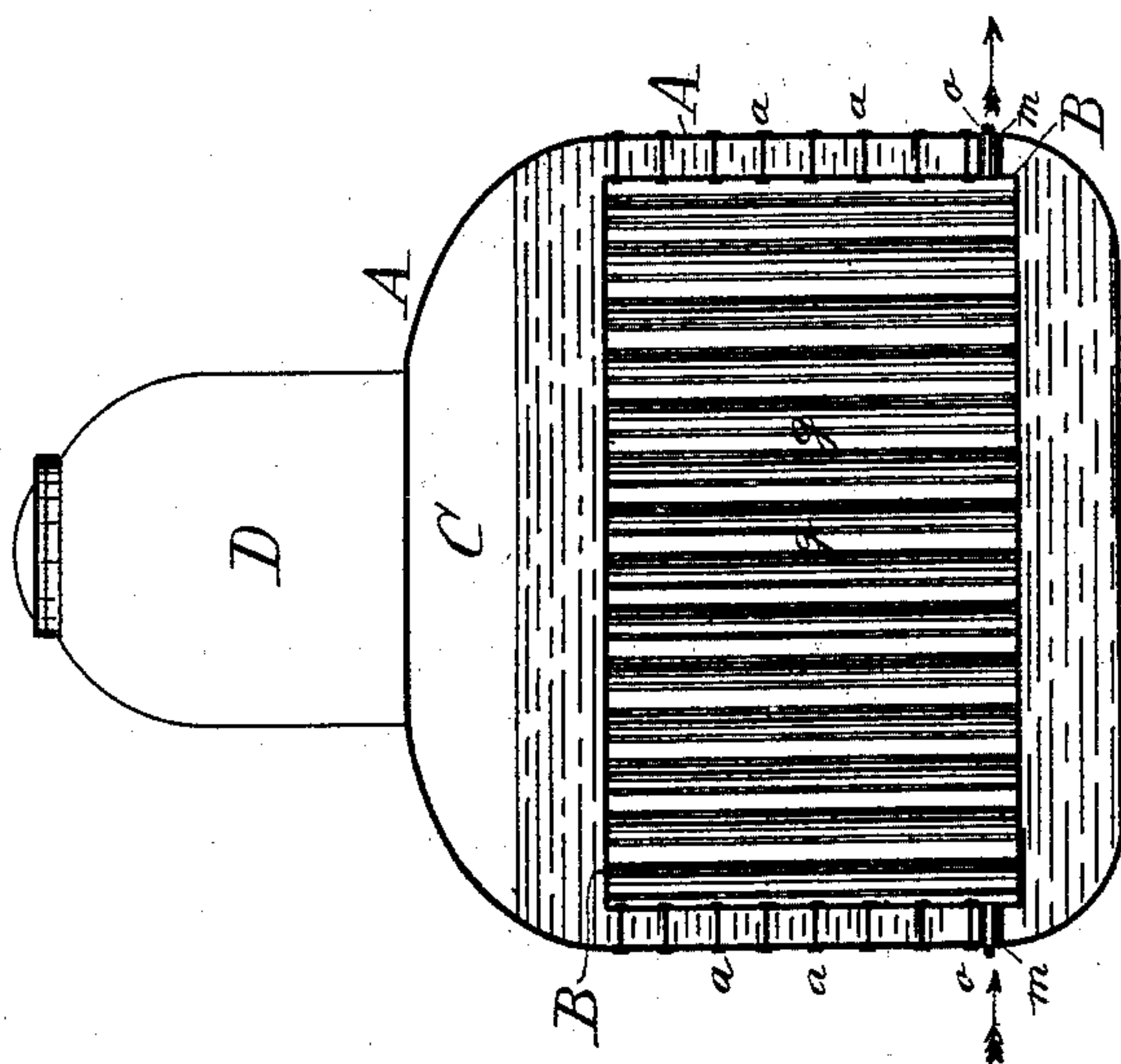


FIG. 2.

WITNESSES

W. M. Lowe
P. B. Whelpley,

INVENTOR

Henry C. Goulding,
by Isaac L. Storer,
ATTORNEY

UNITED STATES PATENT OFFICE.

HENRY C. GOULDING, OF NEW YORK, N. Y.

LOCOMOTIVE-BOILER.

SPECIFICATION forming part of Letters Patent No. 353,303, dated November 30, 1886.

Application filed March 22, 1886. Serial No. 196,136. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. GOULDING, a citizen of the United States of North America, and a resident of the city, county, and State of New York, have invented a new and useful Improvement in Locomotive-Boilers, of which the following is a specification.

The object of this invention is to provide an improved locomotive-boiler, constructed especially with a view to secure extensive fire-surface, quick generation of steam, and economy of fuel, all of which will be hereinafter fully set forth.

Reference is to be had to the accompanying drawings, forming part of the specification, in which similar letters of reference indicate corresponding parts in both the figures.

Figure 1 is a sectional side elevation of my improved boiler. Fig. 2 is a vertical section thereof on line *x x*, Fig. 1.

The outer boiler-shell, A, has flat sides and rounded top and bottom, and the inner shell, B, has flat sides and top and bottom, and they inclose a water-space, C, extending all about the boiler, as shown. At the sides the water-space is comparatively narrow, and there the shells A B are stayed by bolts *a a*. At the top the space C also serves as a steam-chamber, the normal water-line being designated by dotted lines, and a steam-dome, D, communicating with the steam-chamber, is fixed on the top of the boiler.

The water-space in the bottom of the boiler is made sufficiently deep to permit the deposit of all sediment from the water, whence it may be blown off through suitable blow-off cocks. (Not shown.)

In the bottom of the fire-box E is a grate, E', of ordinary construction.

The peculiar points of my improved construction are as follows: Instead of making the upper front angle or corner of the fire-box rectangular or rounded on the inside, as is usual, I bend the shells A B at that point, so that they form an angle of forty-five degrees, or thereabout, to the crown-sheet and boiler-front, as shown at *b b*, Fig. 1, and in the lower and diagonally-opposite corner of the fire-box the inner shell, B, is fixed at a like angle to the perpendicular, as shown at *d*. Then I extend several series of tubes, *f*, from the inner shell at *b* to the inner shell at *d* di-

agonally from the upper front corner to the lower rear corner of the fire-box, expanding the ends of said tubes into the shell in the ordinary manner, and making provisions for so doing by openings and plugs in the outer shell, as indicated at *f'*, so that said tubes shall form a free water-communication between the upper and lower water-spaces of the boiler. These tubes *f* are designed to be fixed about eight or ten inches apart, and to be in four or more rows, each row extending from side to side of the fire-box, and preferably they will be so arranged that the tubes of one row will be opposite the spaces between the tubes of the next row. In order to protect the lower ends of these tubes from too intense heat, and to provide more heating-surface, a hollow bridge-wall, F, communicating with the boiler water-space at each end, is extended across the fire-box from side to side in front of the lower ends of said tubes *f*.

That part of the inner shell of the boiler which extends from the fire box to the stack G is inclined upward from front to rear at a slight angle, of, say, an inch to a foot of length, or thereabout. In short boilers the degree of inclination of this part of the boiler may be two or more inches to the foot; but in long boilers an inch of inclination to a foot is more practicable. This part of the boiler from the fire-box to the stack is filled with tubes *g g*, extending from the upper to the lower water-space, set several inches apart at right angles to the top and bottom sheets of the inner shell, so as to be inclined somewhat from the perpendicular, for the purpose of facilitating the water-circulation, which is always found to be better in inclined than in vertical tubes. These tubes *g g* are also preferably "staggered," each one being set opposite the space between the next two from the front rearward.

By arranging the tubes *f* and the water bridge-wall F in the fire-box and the inclined tubes *g g* in the body of the boiler, as shown, I not only greatly increase the heating-surface over that of other locomotive-boilers, so that steam may be made more quickly and with less consumption of fuel, but also insure a more rapid and free circulation of the water in the boiler, all of which are matters of industrial and commercial importance.

It will be evident that in this form of boiler

there will be a tendency for ashes and cinders to deposit on the bottom sheet of the inner shell, B, about the lower ends of the tubes *g g*. In order that such deposits may readily be removed, I fix short tubes *m m* through both shells A B and through the intermediate water-space, just above the bottom of the shell B. The outer ends of these tubes *m m* are kept normally closed with plugs or caps *o o*, and when it is desirable to remove the deposit of ashes and cinders, as aforesaid, the caps or plugs are removed and the ashes *c* ejected by jets of steam or blasts of air, or by suction through the said tubes *m m*, and, if desired, one or more of the caps or plugs *o o* may be removed at any time to admit air to aid in combustion of the gases about the tubes *g g*.

On the smoke-stack end of the boiler I secure a deflector, H, Fig. 1, which is designed to be extended about one-third of the distance down over and the full width of the exit-opening of the combustion-chamber, in which are the tubes *g g*, in order to cause the products of combustion, as they flow from the fire-box to the stack, to be distributed more evenly about the said tubes, to oppose the tendency of the hot air and gases to keep about the upper parts only of the tubes, as they naturally would in the absence of the deflector. By thus causing the products of combustion to be more evenly distributed about the tubes the deflector H effects a more rapid generation of steam and a greater evaporation of water for the fuel used. It also performs, to a considerable degree, the functions of a deflector for ashes and cinders, that would otherwise escape up the stack, directing them downward as they escape from the combustion-chamber into the base of the uptake, where there may be a vessel of water to receive them.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A locomotive-boiler constructed substantially as herein shown and described, with front upper corner and lower rear corner of the fire-box formed parallel to each other and at angles of forty-five degrees, or thereabout, to the crown-sheet, with series of water-tubes extending diagonally from the upper front to the lower rear corner of the fire-box, and com-

municating at both ends with the boiler water-chamber, with water bridge-wall communicating with the boiler water-chamber, with the top and bottom of the inner shell placed parallel with each other and at an upward inclination from fire-box to smoke-stack, with inclined tubes extending between the top and bottom inner shells and communicating at both ends with the water-chamber, and with tubes for ejecting ashes and cinders entered through both shells of the boiler at the sides thereof, all arranged as herein set forth.

2. In a locomotive-boiler constructed with the upper front and lower rear corners of the fire-box formed parallel with each other and at angles of forty-five degrees, or thereabout, to the crown-sheet, substantially as herein shown and described, the series of water-tubes *f*, extending diagonally between said corners, and communicating at both ends with the boiler water-chamber, as set forth.

3. In a locomotive-boiler constructed substantially as herein specified, with the inner shell inclined upward from fire-box to smoke-stack, the inclined water-tubes *g g*, fixed in the top and bottom of the inner shell and at right angles thereto, as set forth.

4. In a locomotive-boiler constructed with water-tubes fixed diagonally in the fire-box, from the upper front corner to the lower rear corner thereof, a water bridge-wall extending across the fire-box in front of the lower ends of the diagonal tubes, and communicating at both ends with the boiler water-chamber, substantially as and for the purposes described.

5. In a locomotive-boiler constructed substantially as herein shown and described, the combination, with the boiler-shells, of a deflecting-plate fixed thereon and extending down over the upper portion of the exit-opening of the combustion-chamber, as and for the purposes set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 26th day of February, 1886.

HENRY C. GOULDING.

Witnesses:

JACOB J. STORER,
WM. A. LOWE.