

M. K. Taylor,

2. Sheets, Sheet 1.

Boiler Furnace

No. 111,154.

Patented Jan. 24, 1871.

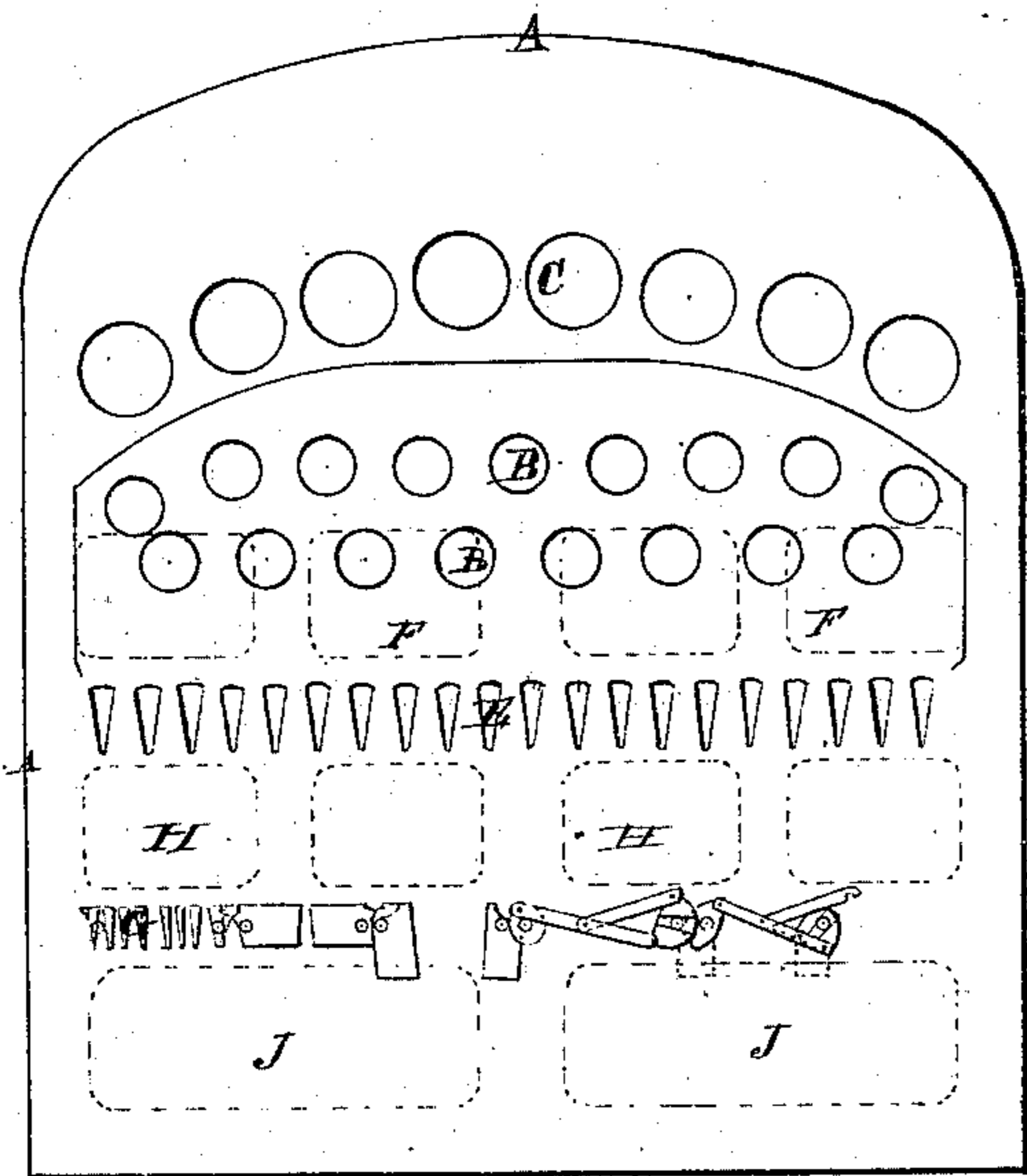


Fig. 1.

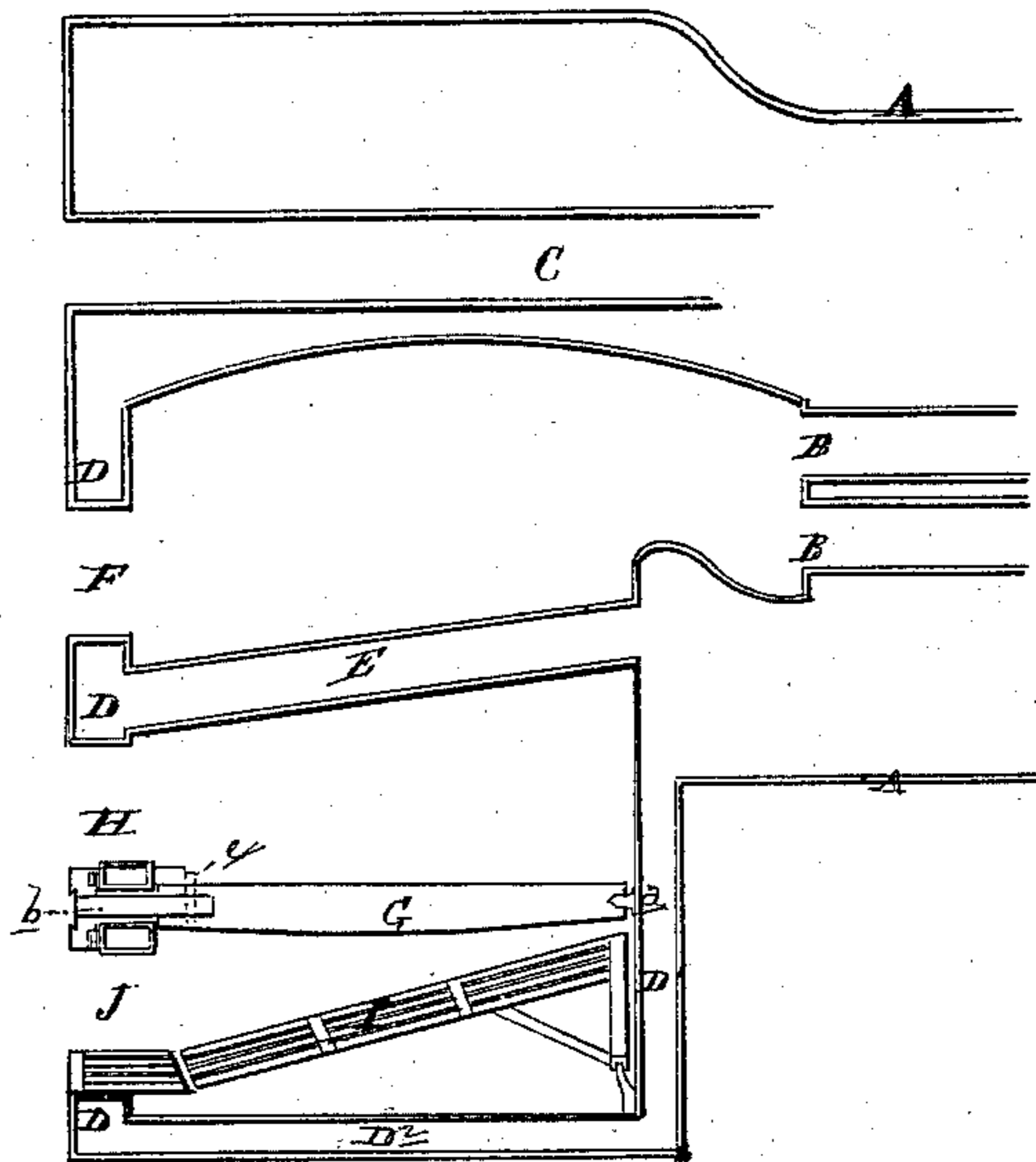


Fig. 2.

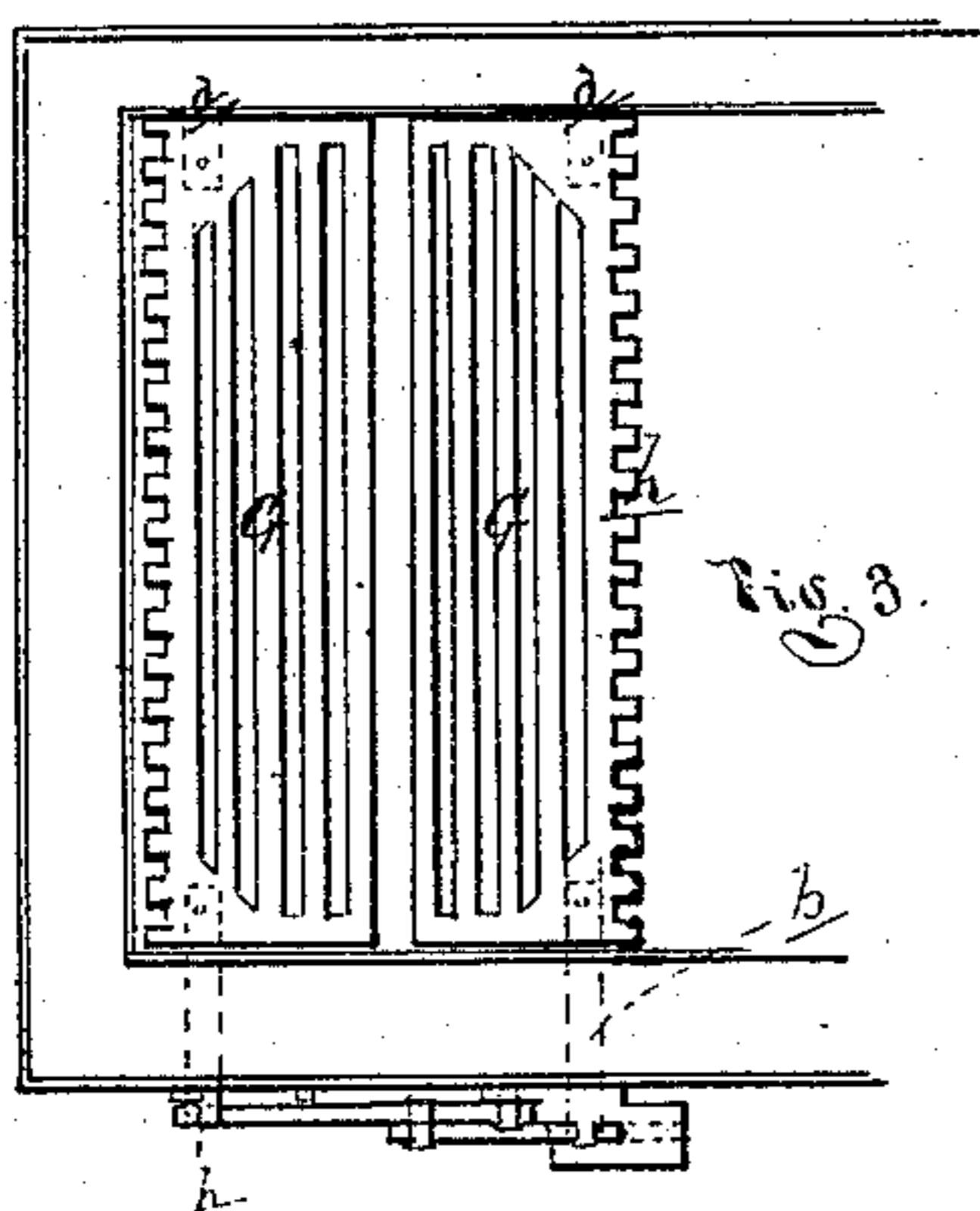


Fig. 3.

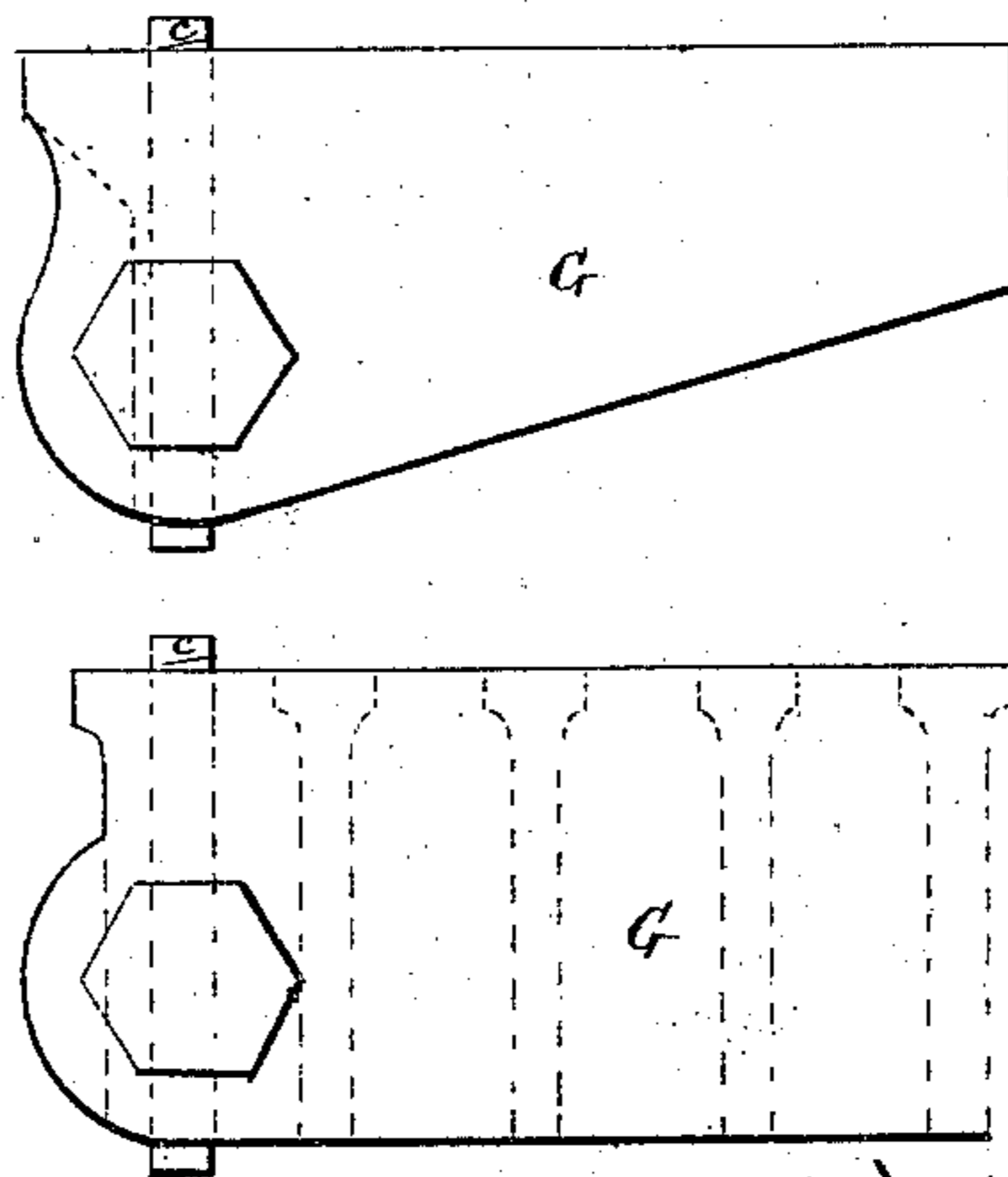


Fig. 4.

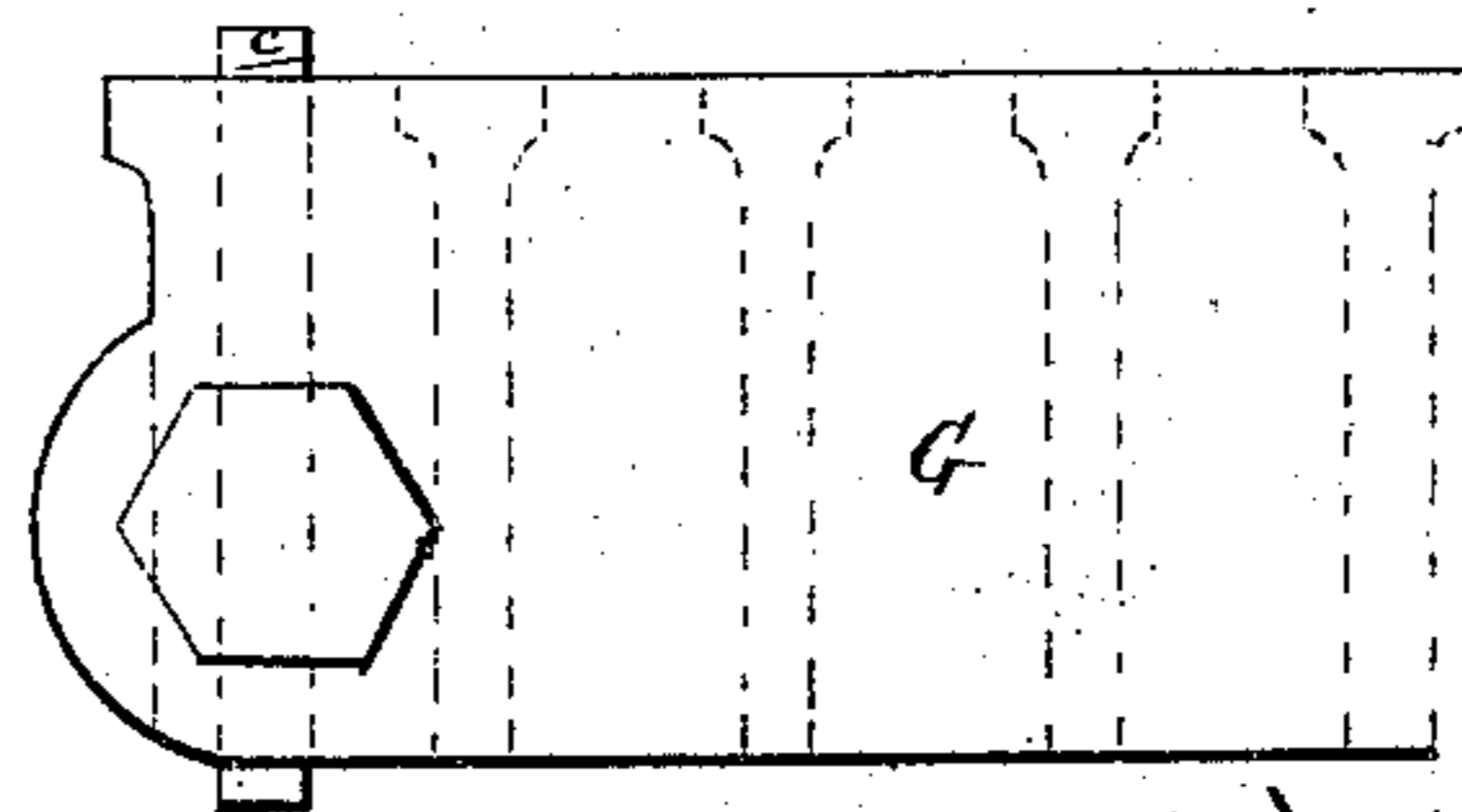


Fig. 5.

ATTEST

S. J. Spray  
Frederick E. Everts

INVENTOR

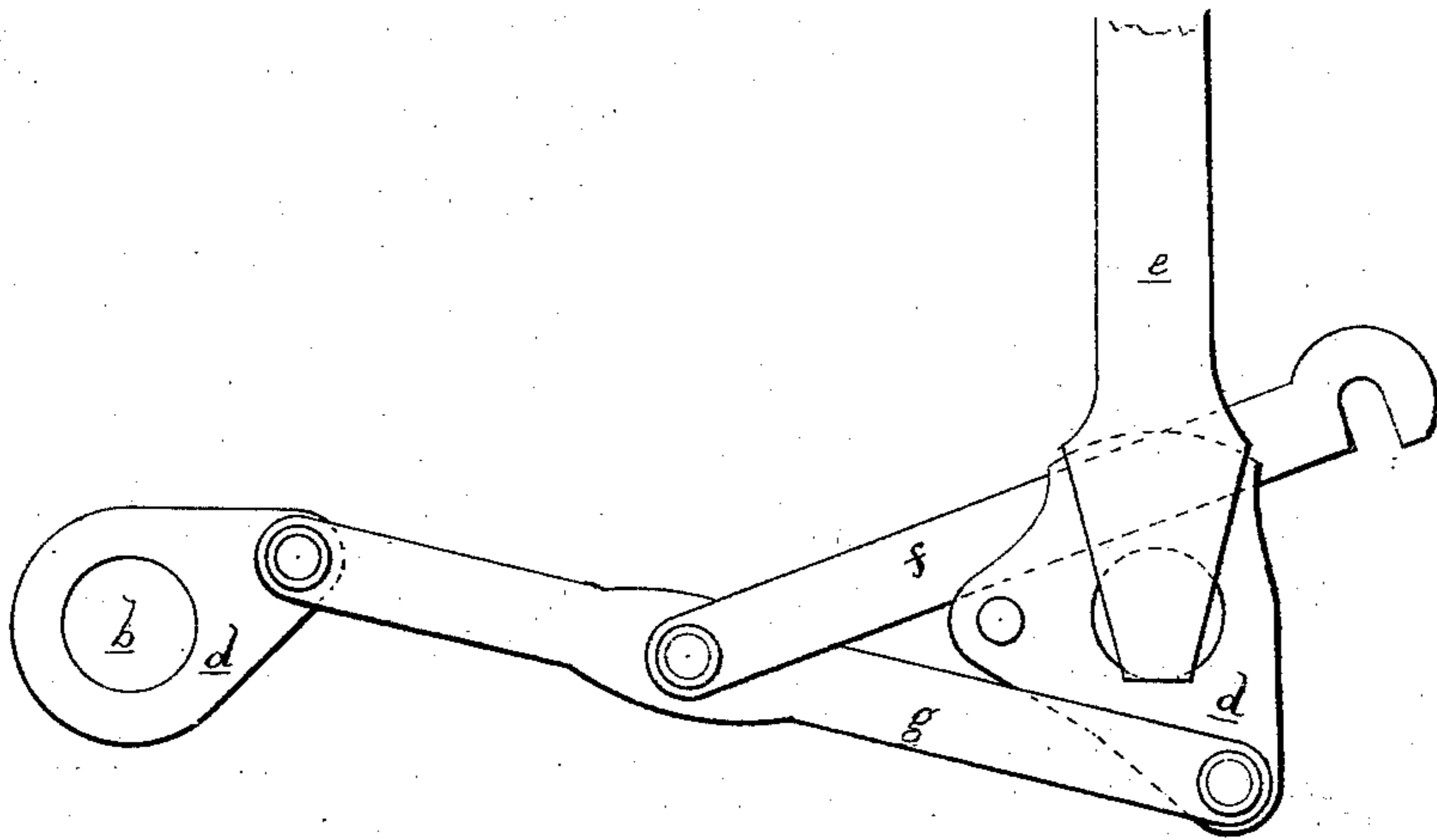
M. K. Taylor  
per Atty  
J. L. Sprague

*M. K. Taylor,*  
*Boiler Furnace.*

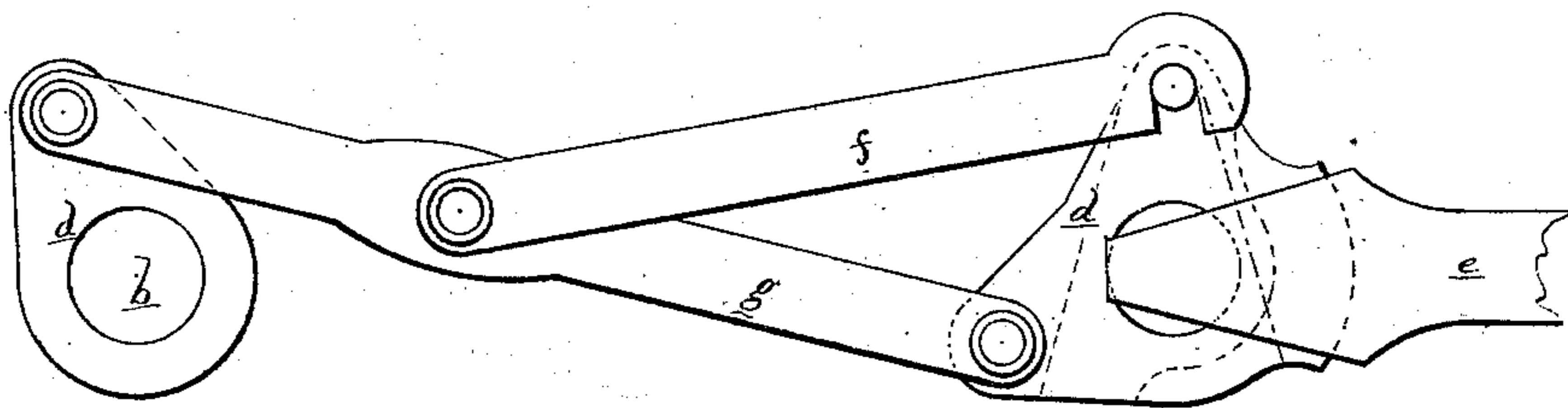
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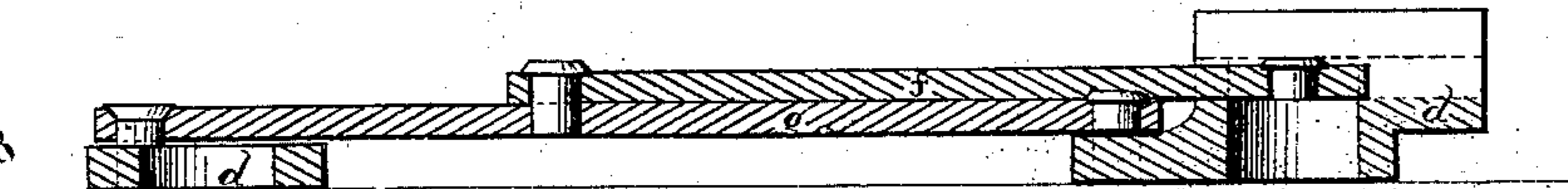
*Fig. 6.*



*Fig. 7.*



*Fig. 8.*



ATTEST

*S. J. Spray*  
*Frederick E. Everts*

INVENTOR

*M. K. Taylor*  
*per Atty*  
*Thos. S. Sprague*

# United States Patent Office.

MORSE K. TAYLOR, OF UNITED STATES ARMY.

Letters Patent No. 111,154, dated January 24, 1871.

## IMPROVEMENT IN FURNACES FOR STEAM-BOILERS.

The Schedule referred to in these Letters Patent and making part of the same.

### *To whom it may concern :*

Be it known that I, MORSE K. TAYLOR, Captain and Assistant Surgeon United States Army, have invented a new and useful Improvement in a Furnace for Steam-Boilers; and I do declare that the following is a true and accurate description thereof, reference being had to the accompanying drawing and to the letters of reference marked thereon and being a part of this specification, in which—

Figure 1 is a front elevation of my improved furnace, partially in section.

Figure 2 is a vertical longitudinal section of the same.

Figure 3 is a plan of a pair of my lower or dumping grates.

Figure 4 is an elevation of the front end of one section of a dumping-grate.

Figure 5 is a cross-section of the same.

Figure 6, sheet 2, is an elevation of the grate-dumping mechanism, as when the grates are opened.

Figure 7 is a similar view of the same when closed and locked.

Figure 8 is a plan of the parts shown in fig. 7.

The nature of this invention relates to an improved furnace, more particularly designed for marine and stationary steam-boilers, to secure perfect combustion of bituminous coal therein, although other fuels may be used, and with great advantage.

The invention consists in the arrangement, within the fire-box of a boiler, of two sets of grates, the one above the other, to which access is had through suitable doors, and in the ash-pit an inclined sifting-grate. The lower grates are hung in pairs, and, by a peculiar system of coupling-levers, are arranged to dump the coals thereon down on the sifting-grate. In firing with soft coals, as soon as their volatile matters are thrown off and they become more or less coked, they are dumped on the sifting-grate, sliding down to the front, whence they are shoveled up onto the upper grates, the ash and clinkers being eliminated by the sifting-grates. Fresh fuel is then supplied to the lower grates, and as the smoke and gases of combustion are thrown off, they are compelled to pass through the incandescent fuel on the upper grates on their way to the flues, which causes them to ignite and be entirely consumed, thereby utilizing the entire volatile and combustible matter contained in the fuel, which, in furnaces of ordinary construction, is largely wasted and lost. The upper grates are hollow, inclined to the front, and connect the water-space of the boiler with the front leg of the fire-box, whereby the area of heating surface is largely increased, effecting still greater economy in the consumption of fuel.

In the drawing—

A represents the body or shell of a marine boiler, of which B are the direct and C the return-flues.

D are the front water legs, D<sup>1</sup> the rear ones, and D<sup>2</sup> the water bottom under the ash-pit, forming a furnace or fire-box of the kind generally constructed for such boilers, except that the ash-pit is a little deeper.

E are hollow or water-grates, each one being constructed of boiler-plates of the form shown in section in fig. 1, and in a boiler of eight feet front should be about two and a quarter inches wide at the top, and one inch at the bottom, and six inches deep. These grates connect the back sheet with the front leg of the fire-box, being set in at an inclination toward the front, as shown in fig. 2. The grates are set about one and one-half inch apart, and access is had to them through proper doors F.

G are other grates, in sections of several bars cast in one frame section, the bars being arranged at the usual distance apart, about one inch, and the grate-sections being arranged and operated in pairs, as will be presently explained.

The rear outer corner of each section of a pair is pivoted to a stud, *a*, riveted to the back sheet.

Through an annular opening in the front leg, opposite each pivot, a rock-shaft, *b*, projects, having a polygonal end, which is inserted in a corresponding socket in the front end of the section, where it is secured by a key, *c*.

H are doors through which fuel is supplied to these lower grates.

The outer projecting end of each of the rock-shafts is provided with a crank-head, *d*, those of each pair of sections being so arranged and connected that, by means of a hand-lever, *e*, inserted in a socket of one of them, they may be made to open downwardly and dump their fuel, and by the same means brought up again to a horizontal plane, and locked together in that position by means of a hook-latch, *f*, pivoted in the coupling-bar, *g*, engaging with a stud in the head which is operated upon.

The sides of the grate-sections are provided with serrations *h*, which interlock with those of the adjoining ones so that, when closing, any lumps of coal lodging there may be cut up and drop out of the way of their closing.

I is an inclined sifting-grate, supported at the rear end of the ash-pit. The grate may be made in sections of any convenient width, and hinged either at the rear end or at convenient point in its length, so that it may be lifted up to remove the ashes and clinkers accumulating underneath it. Or, if preferred, suitable openings made in the sides of the ash-pit will answer the purpose.

J are doors in the ash-pit front, which give access to the sifting-grate.

The operation of this improvement may be explained as follows:

The fire is started on both or on the lower grate

only. As soon as the coals on the lower grates have thrown off their volatile matter and become more or less coked, the firemen commence at one side of the furnace and dump the contents of each pair of grates onto the sifting-grates below, and then close the sections again. As the coals slide to the front of the grate the ashes and clinkers will sift through. The coals thus cleansed are then shoveled up into the upper part of the furnace, on the grates E, and fresh fuel supplied to the lower sections. As the gases of combustion are thrown off from the fresh coals they are compelled to pass up through the incandescent fuel on the upper grate, which insures their ignition and total combustion. The process of dumping and refilling the lower grates and shoveling up the coked coals to the upper grate is continued until all the sections are thus treated.

The grate surface of the boiler-furnace is, by the employment of the water-grate described, trebled, and a greater amount of heat utilized, while it promotes rapid circulation of the water; taking its water, as it does, from near the bridge wall, the high temperature of the water tends to prevent deposits of scale and earthy matters therein.

Nor is this construction of boiler-furnace an advantage to the use of soft coal alone, as it may be used as a double-banked furnace in firing with wood, with the additional gain to be derived from the additional heating surface in the water-grate. The same advantages will obtain in the use of anthracite coal as fuel.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with the boiler A, of the water-grate E, the dumping-grate G, and the sifting-grate I, when the same are constructed and arranged substantially as described and shown, for the purposes set forth.

2. The dumping-grates G, in combination with the studs *a*, rock-shafts *b*, heads *f*, levers *d*, coupling-rods *g*, and latches *j*, all constructed and arranged substantially as described and shown, for the purposes set forth.

MORSE K. TAYLOR.

Witnesses:

FREDERICK EBERTS,  
GEO. SPENCE.