

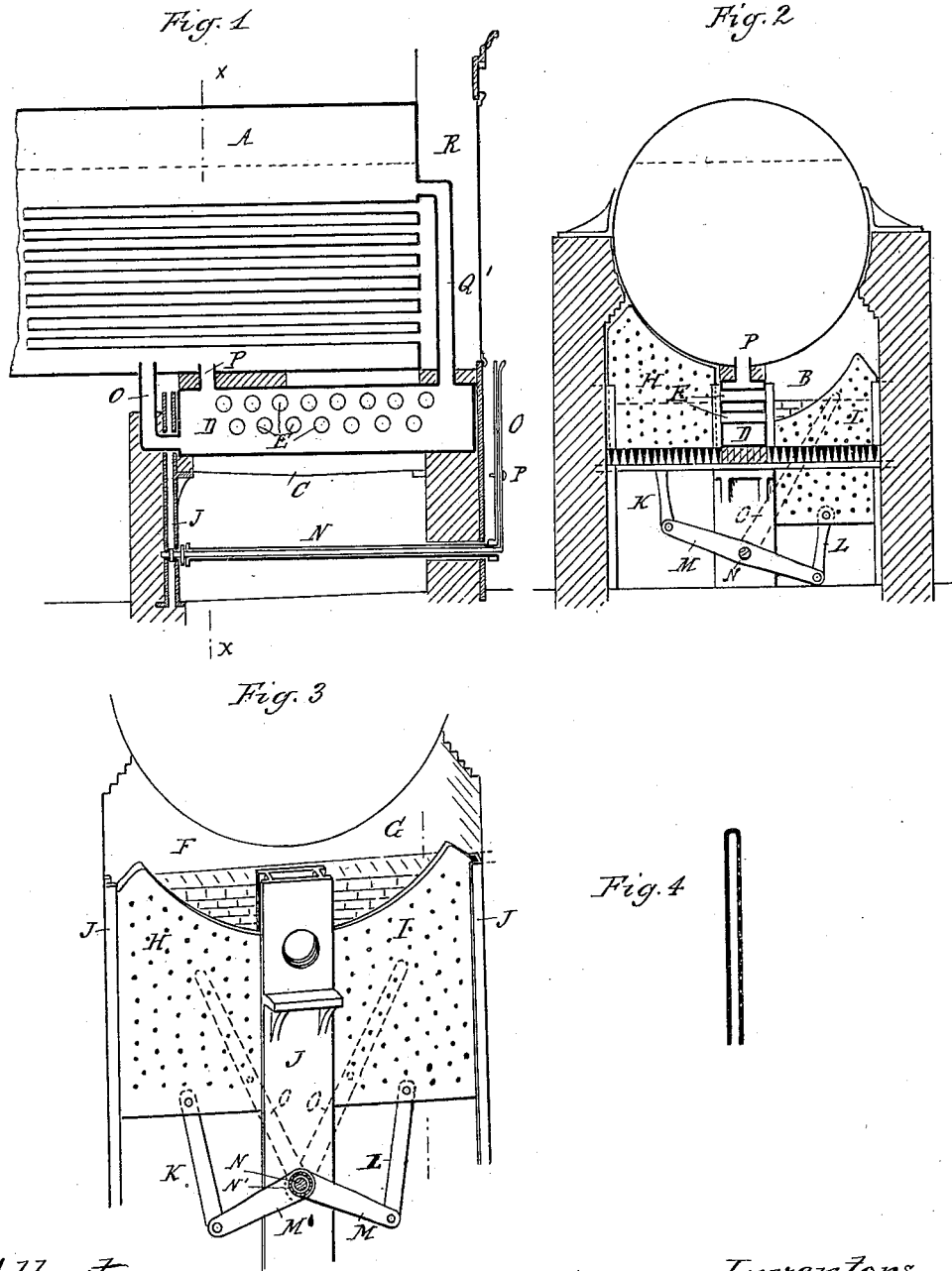
(No Model.)

C. H. CANDLER & J. WHITEHEAD.

STEAM GENERATOR AND FURNACE.

No. 263,478.

Patented Aug. 29, 1882.



Attest:  
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# UNITED STATES PATENT OFFICE.

CLAUDE H. CANDLER AND JAMES WHITEHEAD, OF DETROIT, MICHIGAN,  
ASSIGNORS OF ONE-THIRD TO THOMAS CALVERT AND CHARLES B. CAL-  
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## STEAM-GENERATOR AND FURNACE.

SPECIFICATION forming part of Letters Patent No. 263,478, dated August 29, 1882.

Application filed June 14, 1882. (No model.)

*To all whom it may concern:*

Be it known that we, CLAUDE H. CANDLER and JAMES WHITEHEAD, of Detroit, in the county of Wayne and State of Michigan, have  
5 invented new and useful Improvements in Steam-Generators and Furnaces; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form  
10 a part of this specification.

The nature of this invention relates to certain new and useful improvements in steam-generators, by means of which a more perfect control of the fire in the furnace is obtained,  
15 a great saving in fuel is attained, and a better combustion of the gases or products of an imperfect combustion is secured.

The invention consists in the peculiar arrangement and operation of parts, and in their  
20 peculiar construction, as more fully hereinafter described. The invention is particularly designed to be an improvement upon the steam-generator furnace for which Letters Patent were issued to us on the 23d day of May, 1882,  
25 and numbered 258,371.

Figure 1 is a longitudinal vertical central section, showing the arrangement of the parts. Fig. 2 is a transverse vertical section on the line *x x* in Fig. 1. Fig. 3 is a diagram per-  
30 spective of the dampers provided with a modified arrangement for operating the same. Fig. 4 is a vertical cross-section of one of the dampers, both dampers being of the same construction.

35 In the accompanying drawings, which form a part of this specification, A represents a horizontal flue boiler, B the furnace, and C the grate-bars, all of the usual construction, except as hereinafter specified.

40 D is the heater, which is described in our aforesaid Letters Patent; but as it is somewhat differently connected we again describe it. It is a rectangular box, which sets upon the center of the grate or in the center of the  
45 furnace, so as to divide the latter into two equal and disconnected chambers above the grate, and with no communication between

the two, except through the flues E, which pass laterally through the box. The rear end of this division-box adjoins the usual bridge-wall  
50 with which the furnace is provided, while the front comes out to the furnace-front, such box being designed to extend the whole length of the grate-bars, and to fill the central space in the furnace from the grate to the bottom of  
55 the boiler, so as entirely to prevent any communication between the two chambers of the furnace except through the flues in the box, the ends of such flues opening into the chambers, as shown. The openings F G, between  
60 the top of the bridge-wall and the circumference of the boiler, are provided with dampers H and I. These dampers are of the proper shape and size to entirely close the openings; but they are so arranged that but one of said  
65 openings can be closed at the same time. These dampers are made with two walls connected together at sides and top, but unconnected at bottom, so that air may enter from the bottom. The rear wall is imperforated, while the front  
70 wall is perforated to allow the air entering at the bottom to pass out into the furnace-chambers, and by these means a circulation of air is kept up in the dampers, which prevents their being destroyed by the intense heat in  
75 the furnace, which would soon burn them out were no such provision made for an air circulation. These dampers have a vertically-reciprocating movement in slides J, suitably secured in the walls of the furnace, and at their lower ends  
80 these dampers are secured to the pitmen K L, one being secured to each pitman. The opposite ends of these pitmen are connected, one of each of the pitmen to the ends of the lever M, which is centrally secured to a rock-shaft,  
85 N, which is journaled at one end in the bridge-wall, or near the same, while the opposite end is journaled in the furnace-front near the bottom of the ash-pit. The end of this rock-shaft projects through said front, and has secured  
90 to it a lever or crank, O, by means of which the fireman may operate the rock-shaft, and thereby and through the intermediate connections alternately change the position of

the dampers, closing or disclosing alternately the openings F G at will.

The heater D is connected with the boiler by means of the pipe Q, which affords communication between the bottom of the boiler and the bottom of the heater, and by the pipe P, which leads from the top of the heater into the extreme bottom of the boiler, and the pipe Q', which leads from the top of the heater into the boiler just above the flues therein below the low-water line, passing through the smoke-jacket R, which lies between the front end of the boiler and the furnace-front. The pipe Q takes the water from the boiler in the rear of the bridge-wall, where such water is the coolest, and conducts it to the bottom of the heater, where it is exposed to the heat of the fire on each side of said heater and to the products of combustion passing through the flues therein and becomes highly heated, and escaping thence into the boiler through the pipes P and Q', which completes the necessary conditions requisite to produce a perfect and rapid circulation of the water.

It is not an absolute necessity that the heater should entirely cut off communication between the two chambers of the furnace, except that obtained through the flues in the heater, as there may be a small space left between the top of the heater and the bottom of the boiler; but it is necessary for the perfect working of our device that the communication should be entirely cut off from the grates to a point very near the bottom of the boiler.

After the fires are started and need replenishing with fuel, this should be supplied to the furnaces alternately. The damper in the chamber being fed should be closed, so that the smoke and other products of combustion thrown off freely when the fuel is first fed can only find an exit through the flues in the heater into the other chamber, where, being heated in such passage and brought into contact with the ignited gases in that chamber, such products of combustion are consumed, or, mingling with the gases, are carried with them into the chamber in rear of the bridge-wall and are there consumed. By this construction, arrangement, and operation of parts the fuel is utilized to its fullest extent, for a greater quantity of water can be evaporated with a less amount of fuel than can possibly be done with any of the known constructions for generating steam.

We are aware that there are very many constructions of steam-generators and furnaces designed to consume the smoke, save fuel, and evaporate water at the least possible expense, and we do not broadly claim a device for that purpose; nor do we claim any of the devices heretofore patented or known, such being imperfect in some particulars to perform the service required of them, while we, by a long series of experiments, have succeeded in producing the most satisfactory results.

In some constructions it will be found neces-

sary to have the heater fill the space centrally between the bottom of the boiler and the top of the grates, while in other constructions it will be found beneficial to leave a small space between the two parts named. Hence the heater may be used in either position and come within the true meaning of our application.

It will be noticed that we rely entirely on mechanical appliances to produce the required result, while most of the so-called "smoke-consumers" rely on the use of steam-jets to decompose the smoke before it is consumed.

Above we have described the lever M as being centrally secured to the end of rock-shaft N, the latter being operated by a crank, O. This construction does not permit of one damper being operated independent of the other, and, as the crank-lever O blocks up that furnace-door to which the fireman has to gain access (see Fig. 2) in the alternate firing of the two furnace-compartments, the fireman is obliged to attend at all times and without confusion to the proper working of the device. When fire is first started the crank O is put in a vertical position; but in this position both dampers are only partially opened, and in cases where sawdust or shavings are burned would not give sufficient draft. We obviate this defect by making the lever in two parts, M M', as shown in Figs. 1 and 3, and attach each to an independent rock-shaft, N N', and crank-lever O. One of the rock-shafts, N', we make hollow to allow the other one to pass through it. This construction will allow of opening both dampers the full height of the openings F G, and by connecting the two crank-levers by a pin, P', the dampers can be operated afterward, as specified.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In a steam-generator furnace, and in combination with such generator-furnace and with the boiler, the heater D, provided with flues through the same and connected with said boiler by the pipes Q, P, and Q', the former communicating with the boiler in rear of the bridge-wall, while the latter communicates with the boiler above the flues and passes through the smoke-jacket, substantially as and for the purposes specified.

2. In a steam-generator furnace, the dampers H I, constructed as described, hollow, open on one side only, and with a front perforated wall, and adapted to close the openings between the boiler and the bridge-wall, substantially as and for the purposes specified.

3. In a steam-generator furnace, and in combination with a locking device, P, two crank-levers, O, adapted to operate the dampers H I reversibly or independently of each other, substantially in the manner described.

4. In a steam-generator furnace, the combination, with the heater D thereof, of the vertically-sliding dampers H I, the shaft N, lever M, and rod L, connected with the damper I,

the hollow shaft N', lever M', and the rod L, connected to the damper H, and the operating-handles O O, substantially as described.

5 In a steam-generator furnace, the combination, with the alternately opening and closing dampers H I, of the crank-lever O for operating said dampers, said lever being arranged in front of the furnace-doors, whereby it will block one of the doors and prevent the  
10 same from being opened when either of the

dampers is entirely opened or closed, substantially as described.

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JAMES <sup>his</sup> X WHITEHEAD.  
mark.

Witnesses:

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