

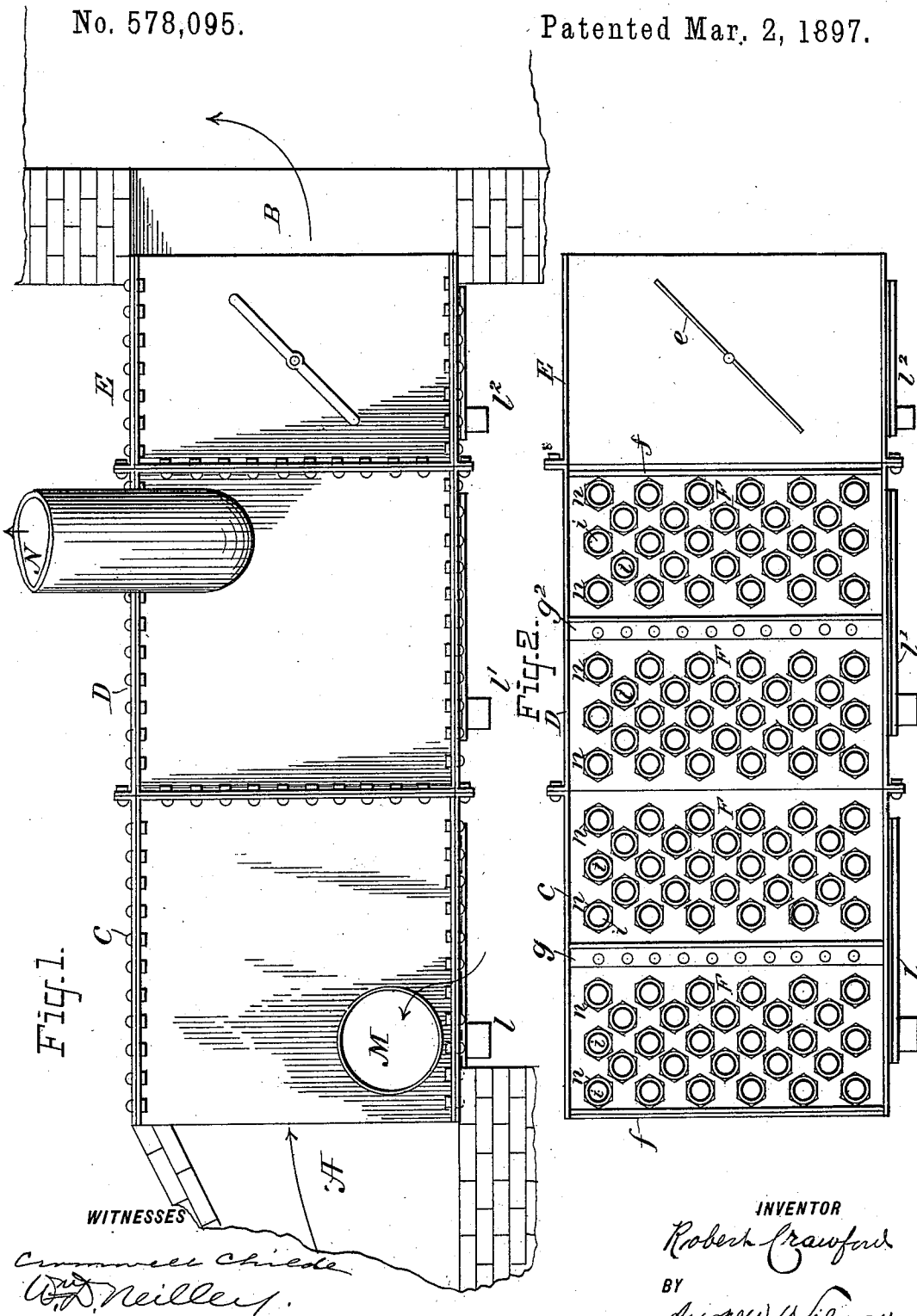
(No Model.)

2 Sheets—Sheet 1.

R. CRAWFORD.
AIR HEATER.

No. 578,095.

Patented Mar. 2, 1897.

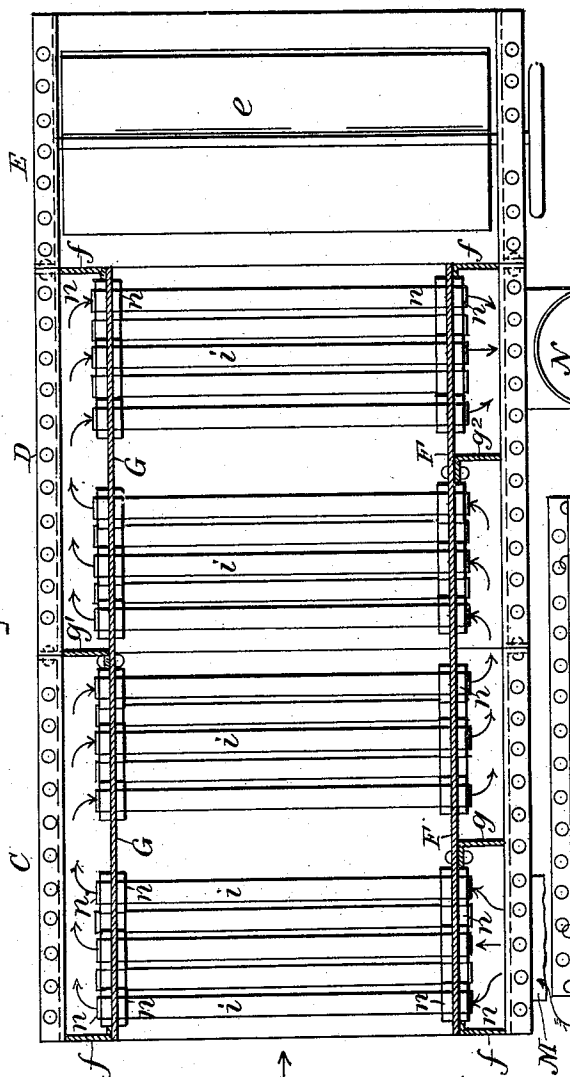


R. CRAWFORD.
AIR HEATER.

No. 578,095.

Patented Mar. 2, 1897.

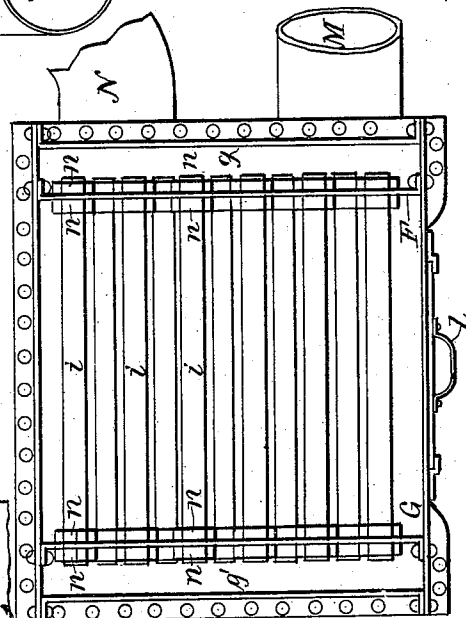
Fig. 3.



WITNESSES

Cornwall Childs
W. D. Neill.

Fig. 4.



INVENTOR

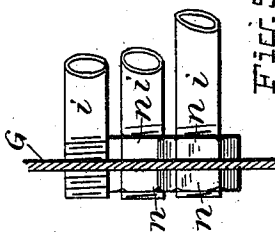
Robert Crawford

BY

Andrew Wilson

ATTORNEY

Fig. 5.



UNITED STATES PATENT OFFICE.

ROBERT CRAWFORD, OF NEW YORK, N. Y.

AIR-HEATER.

SPECIFICATION forming part of Letters Patent No. 578,095, dated March 2, 1897.

Application filed July 13, 1896. Serial No. 598,916. (No model.)

To all whom it may concern:

Be it known that I, ROBERT CRAWFORD, of the city, county, and State of New York, have invented certain new and useful Improvements in Air-Heaters, of which the following is a specification.

My invention relates to that class of air-heaters which are intended to utilize the waste heat which is ordinarily discharged into the smoke-flue after the blast has done its work in a boiler; and the particulars of my improvements are hereinafter more fully set forth.

In the drawings, Figure 1 is a side view of my improved heater, the brick flues at either end being shown in section. Fig. 2 is a view of the heater in the same position as in Fig. 1 with the side plates removed. Fig. 3 is a top view with the top plates removed, the top flanges of the longitudinal and transverse partitions being removed for clearness in showing the other parts. Fig. 4 is an end view with the partitions *ff* removed, and Fig. 5 is a detail showing the way in which the transverse air-pipes are secured in position.

Similar letters of reference designate similar parts in all the figures.

A indicates the main flue above a return-flue tubular boiler, and B is the opening into the smoke-stack. Between these I place my improved heater, which I prefer to make in several sections, as C D E, formed from angle-plates of thin metal, detachably secured together by means of bolts, as shown. The last section E is intended to make the connection with the smoke-stack and is provided with a damper *e* to regulate the draft. In the following parts of this specification I shall refer to the sections C and D, unless I particularly specify the section E. Within the heater I place two longitudinal partitions F G, one near each side, whereby the interior is divided into three sections, of which the central one is much the wider. The ends of the smaller sections are closed by partitions *ffff*, and intermediate partitions or deflectors *g'g'* are placed at suitable distances. The partitions F G are provided with openings in staggered lines, and through these extend series of pipes *iiii*, which are threaded upon their ends and are held in place by lock-nuts *nnnn*, by which a tight joint is secured between the pipes and partitions. It will be seen that by

this construction it is practicable to secure a ready and true adjustment between the pipes and the partitions and to make effective and tight joints.

M is the fresh-air inlet, and N the outlet.

The waste heat traveling from the flue A to the smoke-stack B passes through the central division of the heater among the pipes *iiii*, which, in consequence, become heated.

The fresh air entering through the pipe M passes into the first division of the heater between the side and the partition F. The partition *f* and deflector *g* confine the current laterally, and, under the influence of natural or artificial draft, it is directed through the first series of pipes *iiii* to the other side of the heater. The partition *g'* causes the current to return through the next series of pipes *iiii*, when it is again deflected by the partition *g''* and finally reaches the discharge-pipe N, from whence it may be distributed in the usual manner.

The capacity of either of the lateral sections of the air-flues is greater than the combined capacity of the series of pipes emptying into it or out of it, so that an alternately rapid and divided and slower and united current is established, which is quicker where the heat is greater and slower where it is less. This passing and repassing of the air through the several series of pipes results in raising it to a high temperature, and the breaking up of the currents in the intermediate chamber at the ends of the pipes tends by mixing the air to produce uniformity of temperature in the whole volume and to prevent unequal expansion and contraction of the heater or scorching or burning in spots.

In the bottoms of the sections C D E, I place hand-holes covered by slides *l'l'*, by means of which the sections can be cleaned and kept free from ashes and soot.

In this manner I secure a heater which is simple, strong, and very effective. It can be transported in a knockdown condition and can be readily put together by unskilled labor. A greater or less number of sections may be used, according to the available space and other conditions. The number of transverse pipes may be varied by simply plugging the unused holes by running the lock-nuts upon short solid bolts instead of on the pipes. The

interior is readily accessible through the hand-holes *l l'* for cleaning. The parts being detachable, any portion of the heater can be removed for repairs, and the pipes can be
5 taken out and replaced.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

10 An air-heater formed of several sections built up of angle-plates detachably secured together by means of bolts, provided with intermediate longitudinal partitions forming between them a main flue and forming between them and the adjacent walls of the

heater air-flues, series of pipes in each section disposed across the same in staggered lines provided with threaded ends and detachably secured in said partitions by means of lock-nuts, said air-flues connecting through said pipes and provided with transverse partitions to deflect the air-current alternately from one flue to the other through the several series of air-pipes, substantially as described. 15 20

ROBERT CRAWFORD.

Witnesses:

WM. D. NEILLEY,
CROMWELL CHILDE.