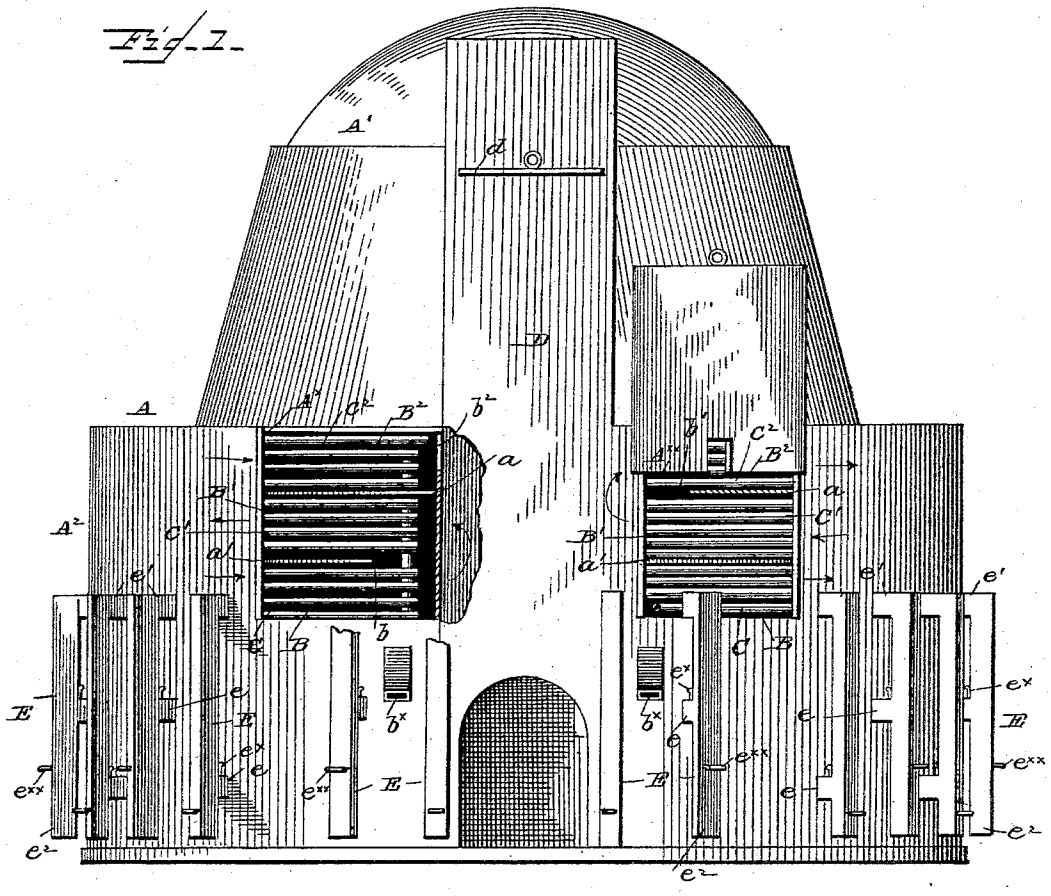
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# J. FRIEDRICH.

## CONDENSER FOR CHARCOAL KILNS.

No. 399,255. Patented Mar. 12, 1889.

Fig. 1.




WITNESSES.

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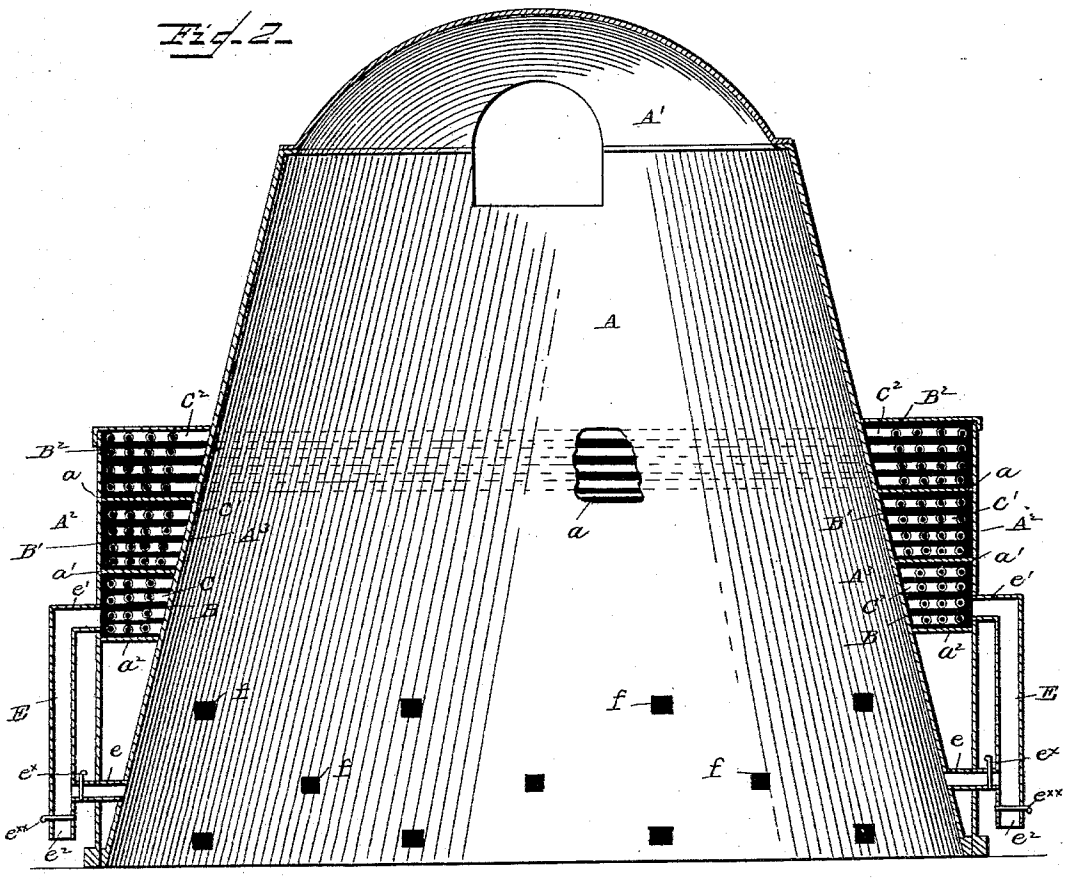
(No Model.) 2 Sheets—Sheet 2.

# J. FRIEDRICH.

## CONDENSER FOR CHARCOAL KILNS.

No. 399,255. Patented Mar. 12, 1889.

Fig. 2.




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# UNITED STATES PATENT OFFICE.

JOHN FRIEDRICH, OF IRON MOUNTAIN, MICHIGAN.

## CONDENSER FOR CHARCOAL-KILNS.

SPECIFICATION forming part of Letters Patent No. 399,255, dated March 12, 1889.

Application filed June 27, 1887. Serial No. 242,575. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN FRIEDRICH, a citizen of the United States, residing at Iron Mountain, in the county of Menominee and State of Michigan, have invented certain new and useful Improvements in Condensers for Charcoal-Kilns; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to condensers, and has particular reference to a device of this character, constructed for use upon and applied to an ordinary charcoal-kiln for the purpose of condensing the volatile products of combustion generated in such kiln; but I would not be understood as confining the application of my invention to such kilns alone, nor to any particular form of such kilns; but as it is especially designed for use upon such kilns I will describe it in connection therewith and as applied to the ordinary and well-known bee-hive kiln.

In carrying my invention into practice I construct an outer casing surrounding or encircling the lower portion of the kiln, the space between such casing and the kiln-wall forming a chamber for the location of my condensing apparatus. This chamber is preferably divided into three circumferential compartments having communication with each other only at alternating ends, and the highest compartment connects with the dome or chimney of the kiln, which is of sufficient height to insure a proper draft. In these chambers or apartments I place coils of pipe resembling the ordinary coils of pipe in steam water-heaters and force through them a stream of cold water. The pipes in the three or other number of chambers may all be connected together, so that the water delivered to them shall flow through all, or the coils or pipes in the several chambers or apartments may be separated and disconnected from each other and have separate supply and escape pipes. The pipes may be laid horizontally or in vertical convolutions. The lower apartment or chamber is connected with the combustion-chamber of the kiln by means of pipes or flues which lead from said combustion-chamber out through its walls and extend upward and enter the lower level of the first or bottom chamber. I prefer to employ a series of such flues or pipes extending all around the kiln, and by preference the connections with the combustion-chamber of the kiln are placed at different levels. These flues also have a downward extension which opens outside the kiln. They receive the volatile products from the combustion-chamber and air from outside atmosphere and deliver it to the lower chamber in the hollow walls. The opening to the outside air also permits any condensations which may take place in the flues to be carried to the outside of the kiln. The flues are provided with dampers or gates, which are arranged to close or partially close either the passage from the combustion-chamber or that from the outside atmosphere at will, so that a charge, tempered as may be desired, can be delivered to the condensing-chamber. Gates or doors are provided beside the stack or chimney to permit the coils to be inspected or any necessary work to be done. Escape-passages for the condensations are provided at suitable points in the lower chamber, and a damper or gate is employed in the chimney to regulate the draft.

The following detailed desciption will more fully disclose the nature, construction, and use of my improved condenser.

The accompanying drawings illustrate what I consider the best means for carrying my invention into practice.

Figure 1 is an exterior front elevation of a kiln with my device employed upon it, part of the wall of the casing being broken away to show the arrangement of the divisions and coils. Fig. 2 is a central vertical section thereof.

Similar letters of reference indicate corresponding parts in both the figures where they occur.

A is the body of the kiln.

A′ is the dome.

$A^3$ and $A^2$ represent, respectively, the kiln-wall and the casing surrounding a portion thereof. *a*, *a′*, and $a^2$ are the division-plates therein, which divide the same into three horizontal apartments, the lowest one of which is marked B, the middle one B′ and the top $B^2$. These apartments extend entirely around the body of the kiln and communicate with each

other only at the alternating ends, as shown by the openings *b* and *b'*, and the top one communicates with the chimney, as shown at $b^2$. Coils of pipe are arranged in these apartment or chambers, the coils in the lowest apartment being marked C, those in the middle C', and those in the top $C^2$. They may run horizontally, as shown in the drawings, or be run in vertical convolutions or bends, and the entire three sets may be connected together, so as to be in communication, or may be separate and non-communicating. Cold water is delivered to and forced through these coils by any suitable means, which I have not deemed it necessary to show, and any suitable discharge may be provided for them—as, for instance, through the same discharge-passage which carries off the condensations from the lower chamber.

Doors or gates $A^x$ $A^{xx}$ are provided on each side of the chimney, which latter is marked D. These doors or gates may be sliding or swinging, and they permit the inspection of the coils at this point, and also provide for any necessary work to be done at the ends of the chambers or apartments B B' $B^2$. The bottom of the chamber B is provided with one or more escape-passages, $b^x$, through which the collected condensations may escape, as well as the water, after traversing the coils, as above referred to.

The chimney D is provided with a horizontally-sliding gate or damper, *d*, at a suitable point in its height, by means of which the draft may be regulated.

Upon the exterior of the kiln I provide a series of flues, E, which have connection by short pipes *e* with the combustion-chamber of the kiln, and by bends or pipes *e'* with the lower chamber or apartment in the condensing-chamber. They also have extensions $e^2$, which open to the outside atmosphere. The volatile products from the combustion-chamber of the kiln pass out through openings in the lower wall of the kiln, which openings register with the short branch pipes *e*, and the said products are carried by the flues E *e'* up into the chamber B in a heated state, which is modified or tempered by the intermixture with such products of an amount of cold air from the atmosphere which enters through the extensions $e^2$, and ascends through the flue into the chamber B along with the products of combustion from the kiln which ascend the flue. In the condensing-chambers B B' $B^2$ the volatile products are caused to travel the course indicated by the arrows through chamber B, around the kiln, thence back through chamber B' around the kiln, and back again in the direction first taken (through chamber B) through chamber $B^2$, around the kiln and out the chimney, and during all the travel through the circuitous path the said products are exposed to contact with the exterior of the numerous coils through which the increasing stream of cold water is being forced, so that a complete condensation takes place. The modified condition of temperature in the products, which is attained by the intermixture of cold air as they pass up the flues, also tends to aid in the condensation, and takes away a great deal of the intense heat of the gases, &c., delivered into the condensing-chamber.

The communicating passages which lead from the combustion-chamber out into the flues are preferably arranged at different heights, as shown by the letters *f f* in Fig. 2, in order to cause a more complete withdrawal of the said products from the combustion-chamber.

The openings to the outside air through the extensions $e^2$ of flues E not only permit the extrance of cold air, but also allow any condensations which may form in or be delivered to the flues to be discharged outside the kiln.

I provide a damper or gate, $e^x$, to cut off communication between the branch pipe *e* and the flue or to regulate the area of opening between the said parts, and a gate or damper, $e^{xx}$, in the extension $e^2$ to shut off the influx of air or regulate the area of the passage for the same to the flue. By this means I am enabled to modify and regulate both the quantity of products and the amount of air delivered through each flue, or to shut off one or the other, or both entirely. A right-angle bend on the inner ends of the dampers or gates prevents them from being removed from the pipes.

As already stated, any form of kiln can be equipped with my condensing devices, variations and modifications in the construction and arrangements of parts being made to correspond with the shape and construction of the kiln. I have shown the well-known beehive form of kiln as best illustrating the manner of applying and using my improvements.

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

1. The combination, with a kiln, of an outer casing surrounding its lower portion, a condensing apparatus located within the chamber between the kiln-wall and outer casing, and connections from the kiln-chamber to said condensing-chamber, as set forth.

2. The combination, with a kiln and an outer casing surrounding its lower portion, of division-plates dividing the chamber between the kiln-wall and casing into several communicating compartments, water-pipes traversing said compartments, and connections, as described, between the interior of the kiln and the chamber between the kiln-wall and casing, substantially as set forth.

3. The combination, with the kiln and the inclosing-casing, of the division-plates *a a'* $a^2$, having openings at alternating ends and water-pipes placed in the chambers or apartments formed by said division-plates, and the flues E, communicating with the condensing-

chamber at the top and with the combustion-chamber of the kiln at the lower end, as set forth.

4. The combination, with the kiln and the inclosing-casing forming a condensing-chamber, of the flues connecting with the condensing-chamber at their upper ends, with the atmosphere at their lower ends, and the kiln at intermediate points, whereby communication is established between the kiln-inclosing casing at one end and the combustion-chamber and outside air at the other, substantially as specified.

5. The combination, with the kiln and the casing forming the condensing-chamber, of the connecting-flues communicating with the condensing-chamber at their upper ends and having branch pipes $e'$, communicating with the combustion-chamber of the kiln, and the projection $e^2$, opening into the outside air, the branch pipes and projections being provided with dampers for controlling the area of the opening of the same, substantially as specified.

6. The combination, with the kiln and the casing forming the condensing-chamber formed by the walls of the kiln and the surrounding casing, and having separate apartments or chambers arranged horizontally around the kiln, and having communication at alternate ends to make a circuitous path through them, of connecting-flues provided with dampers and gates, substantially as and for the purposes specified.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN FRIEDRICH.

Witnesses:
H. McLAUGHLIN,
F. J. TRUDELL.