W. J. LYND.

Coking Fossil Coals or Lignites.

No. 150,873. Patented May 12, 1874.

Fig. 1.

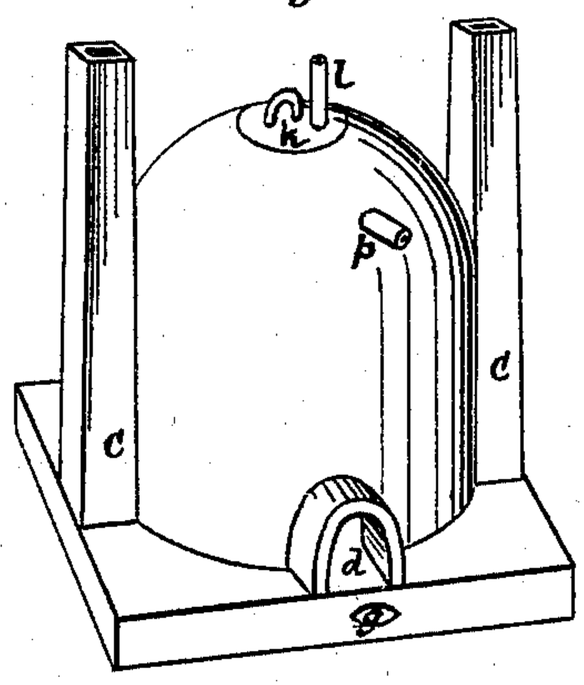


Fig. 2.

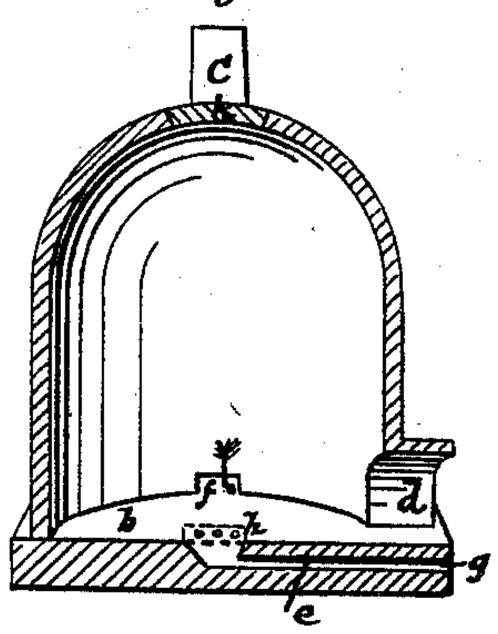


Fig. 3

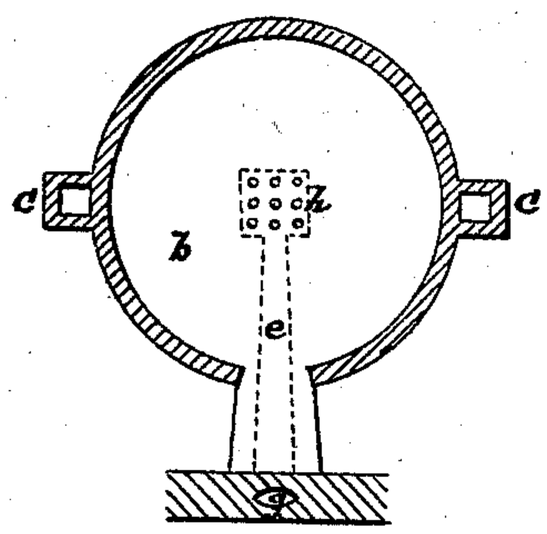


Fig. 4.

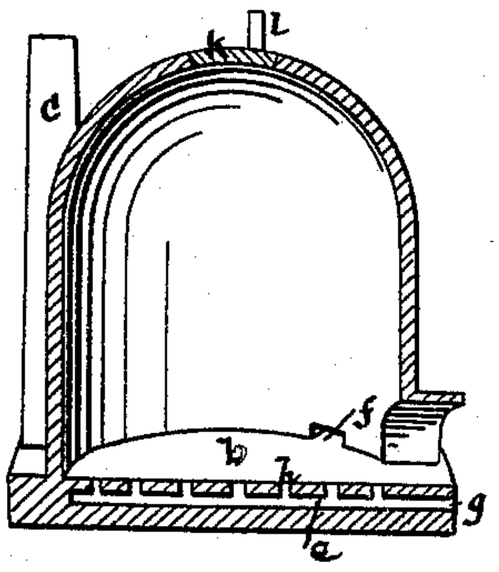


Fig. 5.

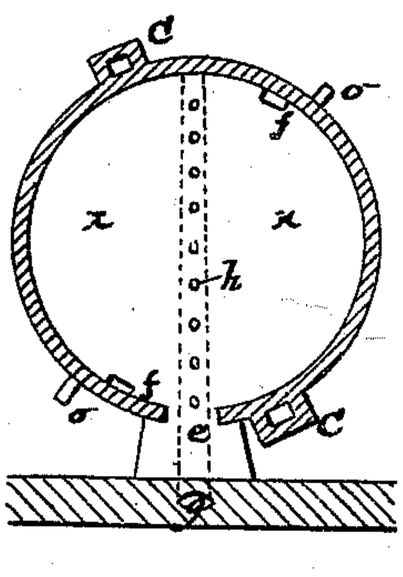


Fig. 6.

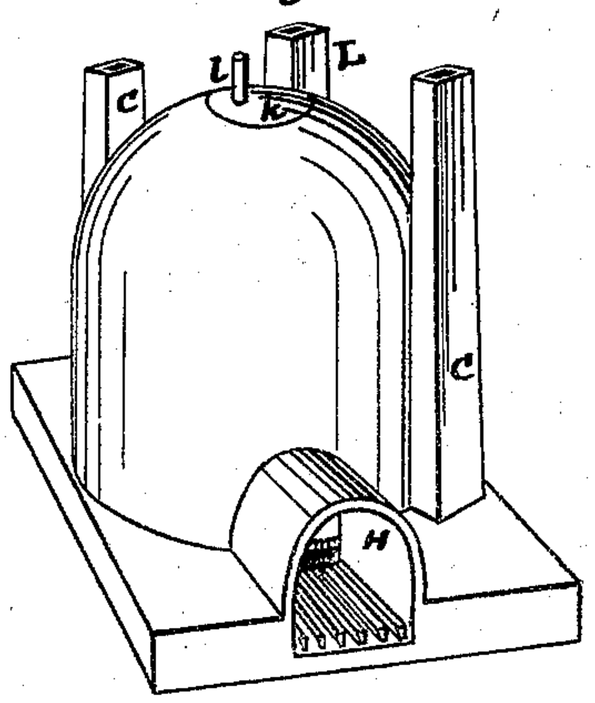


Fig. 7.

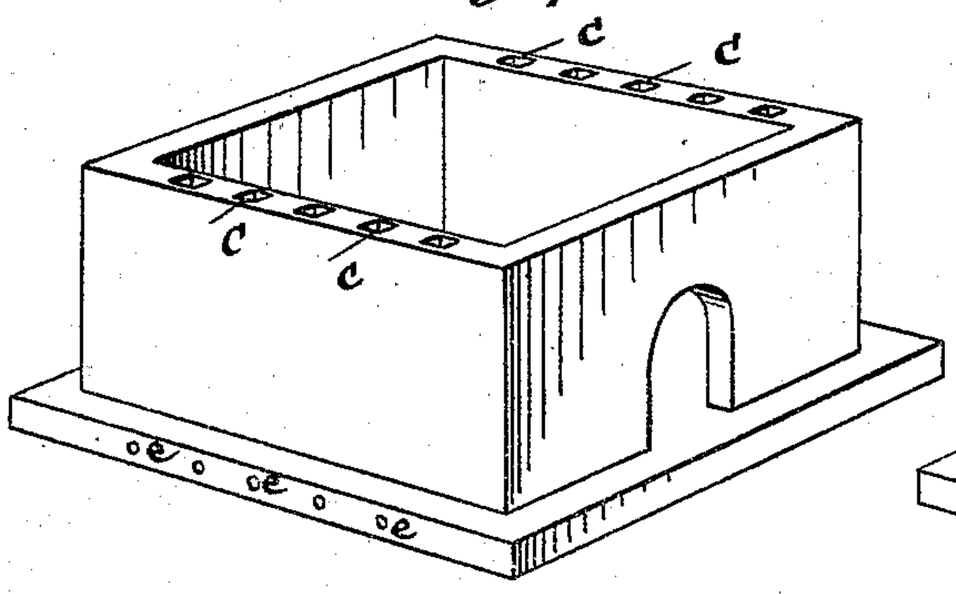
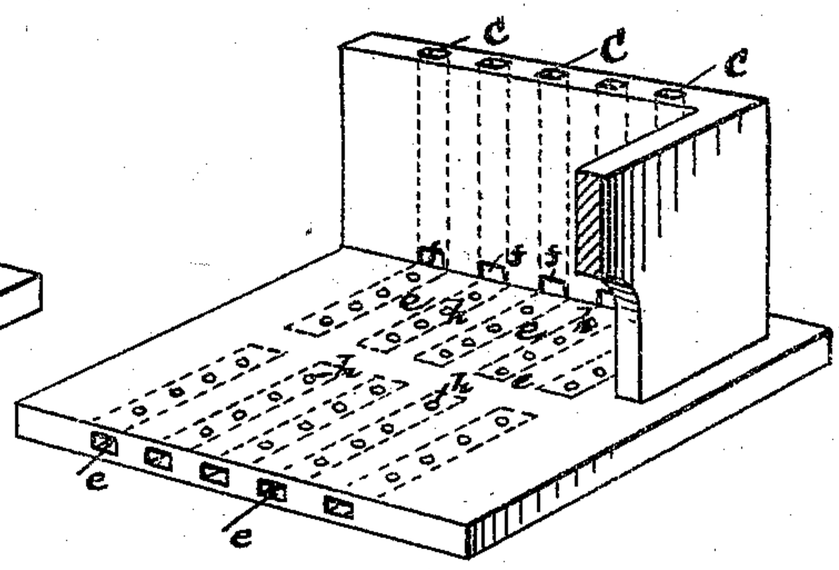


Fig. 8.



Witnesses

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WILLIAM J. LYND, OF DENVER, COLORADO TERRITORY.

IMPROVEMENT IN COKING FOSSIL COALS OR LIGNITES.

Specification forming part of Letters Patent No. **150,873**, dated May 12, 1874; application filed April 17, 1874.

To all whom it may concern:

Be it known that I, WILLIAM JOHN LYND, of Denver, in the Territory of Colorado, have invented certain new and useful Improvements in Coking Fossil Coals, of which the following is a specification:

This invention is particularly directed to the manufacture of good merchantable coke from the fossil coals, commonly known as lignites, of the far west, such as are found and mined near Trinidad, and elsewhere in Colorado Territory; at Rock Springs, and elsewhere in Wyoming Territory; at Monte Diablo, and elsewhere in California, &c.

I coke the mass from the bottom upward, and carry off the gases and volatile products evolved from the coal in a direction opposite to that in which the coking proceeds. The fire is started by draft-openings in the floor or hearth. When started, said openings are closed, and a small quantity of air is admitted from above the coal to get the mass well ignited. When thus ignited, the air is shut off, and the coking is continued and completed by the radiant heat of the mass. The ordinary methods of admitting air until the coking is complete I have found, by careful experiment, to be practically unavailable and inoperative in treating lignites, which, by such methods, are reduced mainly to ash and breeze; and I prefer to carry on my process in close kilns, having, in the top, a small damper-regulated air-admission opening, and a chamber or space above the coal for receiving the gases which first rise into that space, and then descend and pass down through the coal and escape from chimney-openings at the bottom of the oven or kiln. I provide two or more of such draft or escape openings, having corresponding chimneys located at different points in the surrounding walls of the oven or coking apparatus, so that, by opening one and closing the other alternately, or by opening one series and closing the other series alternately, the coking can be carried on with regularity, and evenly throughout all portions of the mass. As before stated, this process is mainly applicable to coals in the lump, and by it such coals can be thoroughly coked without disintegration or losing their original form. This is a feature of special importance with most of the varieties of the lignites, which, when in the condition of slack, or when once disintegrated, cannot, by the ordinary processes, be again caused to cohere and coke.

My invention may be carried into effect in many ways. In the accompanying drawing I have represented several forms of apparatus in which the process can be carried on.

Figure 1 represents a perspective view of one form of oven; Fig. 2, a vertical central section of the same; Fig. 3, a ground plan.

The interior walls or lining of the oven should be composed of fire-brick, or other suitable material; and they may be oval, circular, or elliptical, or take any other form. The oven has doorway *d;* in this case arched, though the ceiling or top of d oorway may be horizontal. C C are chimneys, which are vertical, and built alongside of the inner wall of oven, leaving a space between the chimneys and the outer wall. It has not been deemed necessary here to represent more than the inner walls or lining of the oven. The outer walls, which are not shown, surround and stand at a distance of from two to two and a half feet from the oven proper, the space between the two being filled usually with sand. Two chimneys are here delineated, but three or more may be used, and should be placed equally distant from each other. The openings from the oven into the chimneys are about on a level with the floor, as seen at *f*, Fig. 2. The chimneys need not rise higher than the top of the oven, where they are supplied with covers to close them alternately while coking is going on, and to close them both and altogether when the coking is completed; but chimneys which rise several feet above the oven are preferable. The ground plan in Fig. 3 shows the position of the openings *f*, that lead to the chimneys, and also the direction and shape of passage *e* under the floor or hearth, for the admission to the oven of air entering through opening *g* in the outer wall of foundation. The ground floor or hearth *b* is composed, preferably, of fire-brick, and rests on a bed of concrete or small stones, or sand or other material. At the center of the floor are apertures *h*, lined with iron, and opening into passage *e* below the floor. A cover, *k*, closes the aperture at top of oven.

This cover has a pipe, *l*, which conveys air to the oven from above. A pipe, *p*, extending from the oven through the outer wall, may also be used for the same purpose, although this is not essential.

The coking operation with this oven is conducted as follows: The oven may be either cold or heated. The air-flues are opened and some burning coals, or other fire-kindlings, are placed at or near the apertures *h*. The oven is charged, and the doorway *d* is then tightly closed. The cover *k* is not put in its place for a short time. The air descends through the open top of the oven, and passes through the coal and mingles with gases in combustion, and passes with them into the chimneys, as shown by arrows. When the coal is enough ignited the cover *k* is put in place, and the air for supporting combustion passes through the pipe *l*. One of the two chimneys C C is open at a time. This alternate opening and closing takes place every hour, or every two hours. This is continued until smoke ceases to issue and carbonic-acid gas only is expelled. All the apertures of the oven are now closed and made air-tight. After the oven cools, the coke is removed, and the oven again charged and operated in the same way. The pipe *p* in this operation is not essential, though useful, as by it, when insufficient air is admitted through pipe *l*, the proper supply can be obtained without removing the cover. In case it is desired to have the oven heated when charged, the coke should be removed as soon as it can with safety, so that the oven may be already heated for the next charge. The pipe or aperture *l* in the top of the oven is an important adjunct in the operation. After a considerable body of the coal is ignited—say one-third of the mass—the quantity of air admitted by the pipe may be gradually diminished until two-thirds, or thereabout, of the coal is ignited, after which the pipe may be closed entirely. The ignition of the remaining one-third of the coal will be secured by radiation from the mass below. The gradual limitation of air admitted may be effected by means of a slide-valve at the mouth of the pipe or aperture *l*, or by means of a series of perforated stoppers formed to fit in nest, and with apertures gradually diminishing in size; or other devices for the purpose may be used.

In Figs. 4 and 5 I have represented a vertical section and ground plan of an oven, resembling the oven shown in the preceding figures, except in the construction and arrangement of the ground floor or hearth and the openings for escape of gases. The ground floor or hearth *b* has under it two arched spaces, *x x*, and an air-passage, *e*. This air-passage runs under the floor of the kiln from front to rear of the interior wall of the oven, and has openings into oven, lined with iron. This air-passage separates the two arched spaces *x x*. The openings *f* for the escape of gases are on a level with the floor, as seen in Fig. 4, and they communicate with the spaces *x*, which in turn communicate with the chimneys C. Into the spaces *x* extend passages or pipes *o*, through which air can pass to spaces *x* under the floor. The operation of this oven is like the other, except in the passage of the gases into spaces under floor, and burning there by the air admitted at *o o* to said spaces. The unconsumed gases pass from the spaces to the chimneys, which, together with the openings *o*, are opened and closed alternately and in succession, as before described.

In Fig. 6 is represented an oven resembling that shown in Figs. 1, 2, and 3, with the exception that there is no flue *e* or apertures *h*; but in lieu thereof there is an open space or chamber beneath the hearth, and a fire-box, H, of suitable construction communicating with said space, so that the flames from the coal in the fire-box will pass under the hearth and heat it. At the end of the space opposite to the fire-box is a chimney, L, for carrying off the smoke from the fire-box. The main oven is charged, and the charge ignited, and then the heat at the bottom (caused by the products of combustion from the fire-box passing under the floor or hearth) is maintained and kept up until the coking is complete. Under this arrangement no air need be admitted through pipe *l*, but at the same time a little air admitted through the pipe will aid the operation.

To the spaces below the floors or hearths of the ovens represented in Figs. 4, 5, and 6, superheated steam may be supplied to burn the gases with more intensity.

In Figs. 7 and 8 is represented another form of oven or kiln.

Fig. 7 is a perspective view, and Fig. 8 is a like view with a portion of the walls broken away.

This oven is in form a parallelogram. It may be of any length, and from four feet to fourteen feet wide. As the coal is carried into the kiln and there piled up, the doorways are high and wide enough for men to pass in and out with cars on a movable railroad. These doorways are to be closed (after the charging of the kiln) with movable brick plastered over with mud. The air-flues *e* in the floor of the kiln may run all the way across, or to a partition under the center of oven, so that the air from either side will not go beyond the partition. This last method is exhibited in the drawing. The dotted lines show the position of air-passages under the floor. Each air-flue is in line with a chimney, and admits air through apertures *h*, lined with iron. Grates may be used. The chimneys C are vertical and about two feet apart. In a furnace twenty-four feet long there would be about nine chimneys on each side. The walls of oven may be six to eight feet high, and three to three and one-half feet thick, but well abutted at base. The chimneys open into oven at about the level of the floor, as seen at *f*.

This oven is operated as follows: Proper

kindling material is distributed over the floor. The first layer of coal is placed so that a draft can occur from the air-flues and insure ignition of kindling material. The oven is filled to within two feet of the top, when small coal is used for a covering, and slack is placed over the small coal. The slack need not be put on until the coal is ignited, as it otherwise would hinder the descent of air to assist the combustion of kindling material. The chimneys on one side of the kiln are now closed by tiles or iron covers. The chimneys on the other side are left open. The escaping gases will ascend these chimneys. When the process has gone on in this way for two hours, then open the chimneys which have been closed and close the chimneys which have been open. This alternation is repeated as often as desired, until the whole mass is coked. This becomes known when smoke ceases to be given out. The chimneys should then be closed and the mass covered with a heavy coat of slack or coke-dust, to prevent the burning of coke while the mass is cooling. It is evident that this kiln may be arched and apertures be provided in the arch for supplying the air. When the kiln is thus constructed the trouble and expense of covering the charge with coke-dust when the coking operation is completed will be saved, since the air can be effectually excluded by closing tightly the apertures of the arch. For some coals this form of kiln is preferable.

As in making gas the defects of one kind of coal are counterbalanced by the properties of another kind of coal, so in coking a mixture of coals is attended at times with decided advantage. I may, therefore, mix different coals in whatever condition they may be, whether in lump, slack, or powdered state. I coke the coals either without mixture or with it, and in the proportions found to be most economical and effective.

I do not broadly claim coking coals from the bottom upward and carrying off the air and gases in the opposite direction; but

What I do claim is—

1. The mode herein described of coking coals commonly known as lignites by coking the mass from the bottom upward and carrying off the gases in the opposite direction, the same being effected by the admission of air from above in small quantity at first, and the gradual diminution and final cutting off of said air-supply as the coking proceeds and before it is terminated, the coking of the upper part of the mass being effected by radiation from the lower ignited portion, as set forth.

2. The combination, with the charge-chamber and the chimneys communicating therewith at or near the level of the floor or hearth, of one or more air-supply pipes or apertures, located in the top or arch of the oven, and communicating with said chamber, substantially as and for the purposes shown and set forth.

3. The air-flues beneath the oven floor or hearth for conveying air to the interior of the charge-chamber, as and for the purposes set forth.

In testimony whereof I have hereunto signed my name this 17th day of April, A. D. 1874.

WM. J. LYND.

Witnesses:
EWELL DICK,
HENRY R. ELLIOTT.