

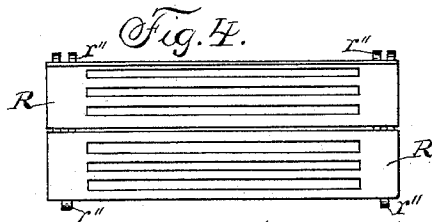
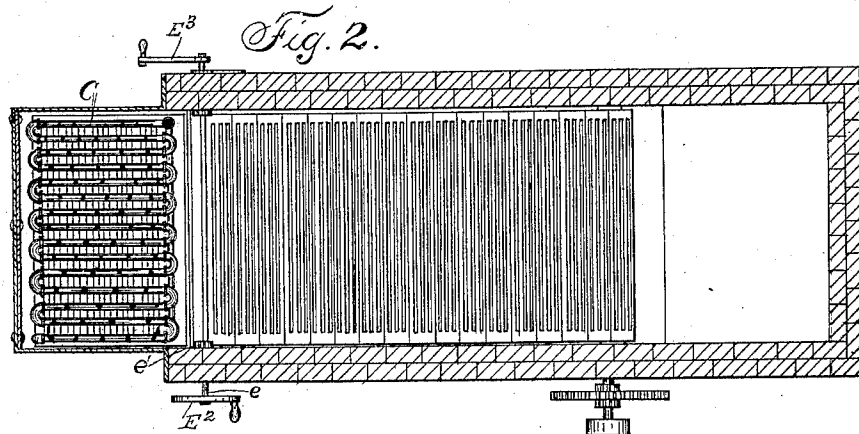
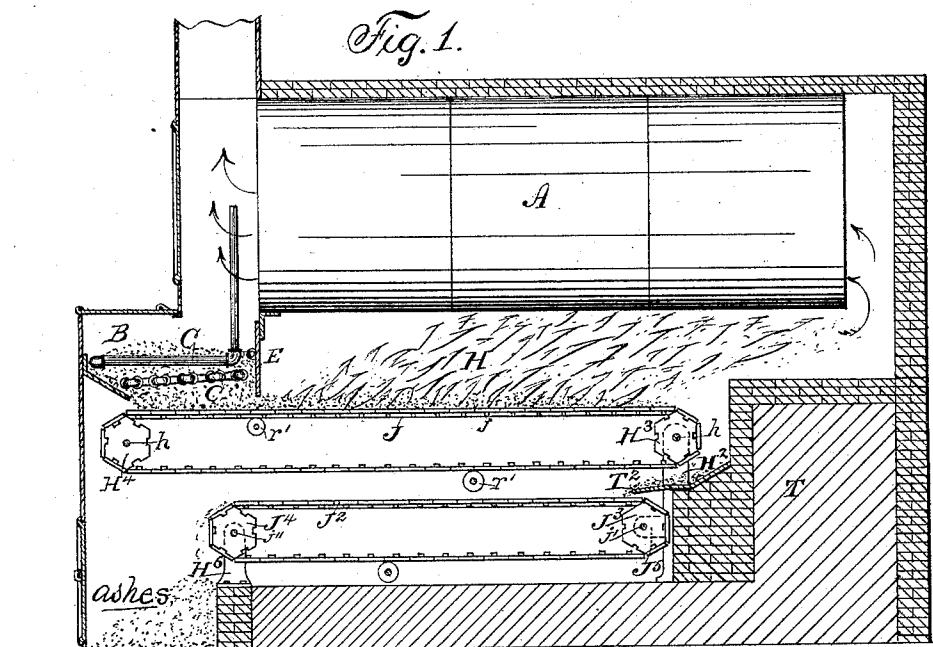
(No Model.)

2 Sheets—Sheet 1.

S. J. & J. B. LOUGHRAN.
FURNACE.

No. 468,482.

Patented Feb. 9, 1892.



Witnesses:

M. P. Smith.
Charles C. Bulky.

Inventors: Stephen J. Loughran,
John B. Loughran,
Thomas G. Orwig, Attorney.

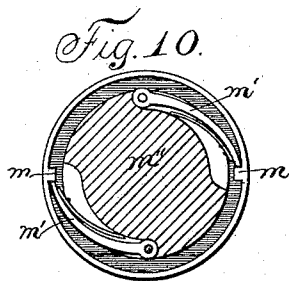
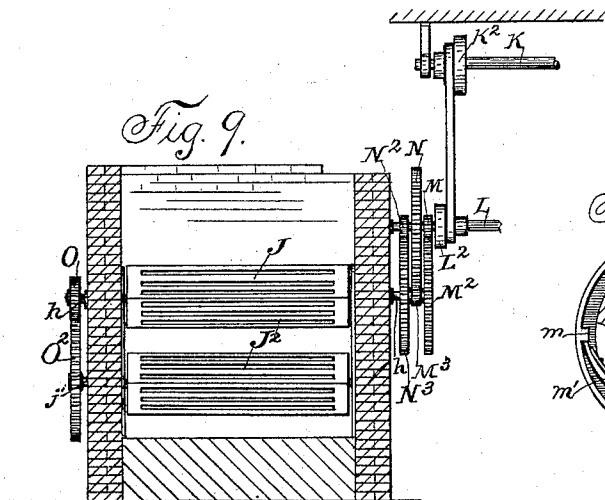
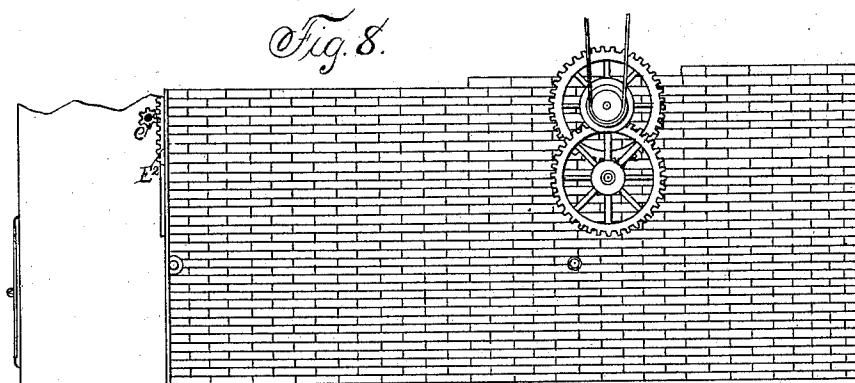
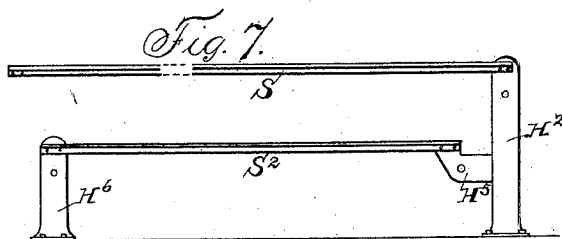
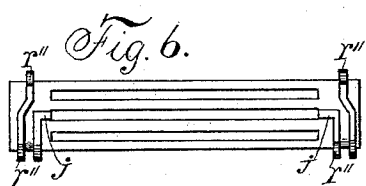
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2 Sheets—Sheet 2.

S. J. & J. B. LOUGHRAN.
FURNACE.

No. 468,482.

Patented Feb. 9, 1892.



Witnesses:

M. Smith.
Chas. C. Bulkeley.

Inventors: Stephen J. Loughran
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By Thomas G. Orwig, att'y.

UNITED STATES PATENT OFFICE.

STEPHEN J. LOUGHRAN AND JOHN B. LOUGHRAN, OF DES MOINES, IOWA.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 468,482, dated February 9, 1892.

Application filed October 23, 1890. Serial No. 369,143. (No model.)

To all whom it may concern:

Be it known that we, STEPHEN J. LOUGHRAN and JOHN B. LOUGHRAN, citizens of the United States, residing at Des Moines, in the county of Polk and State of Iowa, have invented a new and useful Furnace, of which the following is a specification.

Our object is to provide a furnace which will be especially adapted for burning fine bituminous coal or that waste product of the mine known as "slack," to prevent the generation of bituminous smoke, the waste of fuel by injudicious firing, and the formation of cinders in the furnace.

Our invention consists in a magazine into which the fuel to be consumed is first placed and in subjecting the fuel therein to the influence of heat and moisture of steam, hot water, or other heating and moistening agent before conducting the same into the combustion-chamber.

Our invention consists, further, in certain details of construction hereinafter more particularly described, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional side elevation of our improved furnace. Fig. 2 is a horizontal sectional view showing the tube in the magazine. Fig. 3 is a detail side view, and Fig. 4 a top view, of a section of the grate. Fig. 5 shows the end of a section of the grate supported on a bar fixed to the wall. Fig. 6 is a bottom view of one of the bars or sections of the endless grate. Fig. 7 is a detail view of standards and bars for supporting the endless grates or carriers. Fig. 8 is a side elevation of the exterior of the furnace, and Fig. 9 a vertical sectional view thereof, showing the position of the train of wheels for actuating the endless grate and carrier. Fig. 10 is a sectional view of a pulley containing a pawl-and-ratchet coupling.

We have shown our invention in combination with a tubular boiler A of ordinary construction.

B is a magazine for the preliminary reception of the fuel, in which are arranged congeries of serpentine or other desired form of piping C, one end of which may be connected to the boiler or to the exhaust-pipe of an engine and its other end leading and opening into the smoke-box or elsewhere. It will be observed that the congeries of serpentine pipes are ar-

ranged transversely relatively to one another, thus presenting a greater heating-surface. The upper set of pipes are perforated at their inner elbows, and the inner length of the lower set is also perforated to permit the escape of the steam and hot water into the heated fuel, thus moistening said fuel after heating and before passing through the throat into the combustion-chamber, a feed door or gate E, having a horizontal rod or shaft e, passing through eyes on said gate, the rod or shaft extending through the furnace-walls on each side and held in elevation by racks E², Fig. 8, engaging pinions e' on said shaft on the outer side of the furnace-walls, the gate being raised or lowered by rotating the shaft by hand-levers or wheels E³, and being held in place by pawls, a throat being at this point formed between the magazine and the combustion-chamber.

H is a combustion-chamber, within which on each side and at the rear thereof are standard plates H², having journal-boxes within which the shaft h of wheels H³, having the form of a polygon, have their bearing, each of the sides of said polygonal wheels having a notch. The shaft h' of the wheels H⁴ at the forward end of the chamber has its bearing in the metal plates extending down from the magazine. The wheels H⁴ are also of the form of a polygon and provided with notches.

J is an endless fuel-carrier made of sections of grate having teeth j on their under outer extremities adapted to engage the notches in the wheels H³ H⁴, said sections being pivotally connected, as hereinafter described, and passing about the wheels H³ H⁴.

Beneath the endless fuel-carrier J is an endless ash and unconsumed-fuel carrier J², which passes about polygonal wheels J³ J⁴, each side of which is provided with a notch, said carrier being formed of sections of plate pivotally connected together and also having the projections j adapted for engagement with the notches of the wheels. The shaft j' of the wheels J³ are supported within journal-boxes on arms J⁵, extending at right angles from the standards H². The shaft j'' of the wheels J⁴ are within journal-boxes secured to each side of the standards H² at the forward end.

Referring now to the mechanism for oper-

ating the shaft of the carriers, (shown clearly in Figs. 8, 9, and 10,) K is a line-shaft having the cone of pulleys K², and L is a counter-shaft on which is loosely mounted a cone of pulleys L², the latter having a recess formed on its larger inner face forming a ratchet-plate, as shown in Fig. 10, the periphery of said recess having lugs *m m*, adapted to be engaged by pawls *m' m'* on a boss *m''*, formed with the pinion M, which latter is fixed to the counter-shaft L, and its teeth meshing with those of a gear-wheel M², mounted loosely on the outer end of the shaft *h* of the carrier J, said wheel M² having formed with it the pinion M³, with the teeth of which the teeth of gear-wheel N, mounted loosely on the counter-shaft L, mesh, said gear-wheel N also having formed with it the pinion N², which meshes with the gear-wheel N³, fixed to the shaft *h* of the said carrier J. When power from the line-shaft by a belt is applied to the cone of pulleys L², the latter, being loosely on the shaft L, is rotated until the lugs *m m* come into engagement with the pawls *m' m'*, when its motion of rotation is transmitted to the pinion M, fixed to the counter-shaft, the motion of the latter in turn being communicated by the train of gear M², M³, N, and N², loose on their respective shafts, to the gear-wheel N³, fixed to the shaft of the upper carrier. By this means, it will be seen, the necessary slow movement of the upper carrier is obtained. On the opposite end of the carrier-shaft *h* is fixed a pinion O, meshing with a gear O² on the shaft *j'* of carrier J². By this means a slow movement of the carrier J² is obtained relatively to carrier J. The carriers may be operated by hand by placing a hand-lever on the end of the shaft L when found necessary to accelerate the movement of the carriers in advance of the movement communicated to them from the line-shaft or in a case where the said line-shaft is not in motion. If desired, the train of mechanism may be dispensed with and a worm or bevel gear used.

Referring now to the construction of the endless grate of the carrier J, (shown in detail in Figs. 1, 2, 4, 5, and 6,) it will be seen that the grate is a pitched chain, the sections R of which correspond in pitch to the side of the polygonal wheels. On the upper face of the said sections R are formed flanges *r*, projecting upward, which extend transversely of the grate, sufficient space, however, on each side of the grate being allowed to permit the passage of the anti-friction roller *r'*, which aids in sustaining the carrier J. These flanges *r* (shown in Fig. 3) are designed to be on the rear edges of the sections and to scrape the lower strata of the fuel in the magazine B and retain and advance the fuel that is carried on the flat top surfaces of the sections to break any mass of fuel that may become fused together on top of the grate, and to aid in removing matter that may lodge on the deflecting-plate T². The sections of grate are

joined together closely, so that the ashes will not fall through, by means of perforated ears *r''*, formed in pairs on one edge of each section and singly on the other, the single ears being inserted between the double ears and pivotally connected by means of pins *r'''*.

In Fig. 7 is shown the form of traveler-bars S, which are connected at one of their ends to the side of the furnace-chamber and at their other ends to the standards H², the end edges of the sections of the carrier J being supported in their travel by said bars S. S² are like traveler-bars connected at one of their ends to the standards H², and at their other to the sides of the supporting-standards H⁵, said bars supporting in their travel the sections of the carrier J², formed of sections of plate. The traveler-bars S and S² are on each side of the furnace-chamber, are of angular form, and so disposed as that the outer ends of the pins *r'''* bear against their outer edges, thus preventing lateral play of the carriers.

T is the bridge-wall, and T² a deflecting-plate secured thereto.

The operation of our invention is as follows: The fuel is first placed within the fuel-magazine and deposited upon the fuel-carrier J and subjected to the influence of the heat from the pipes therein, and as the fuel passes upon the fuel-carrier J the heated fuel is brought into position adjacent to the perforated portions of the pipes and moistened by the steam or hot water escaping therefrom, thus softening the bitumen of the coal and generating inflammable gas, which on entering the combustion-chamber hastens the coking process. The passage of the fuel from the magazine is regulated by the feed-door in front of the breast. The carrier J, moving slowly in a horizontal plane, receives the fuel from the magazine and conveys it in a state of combustion toward the rear of the combustion-chamber, depositing the residue either in the form of ashes or of unconsumed parts upon the lower carrier J², which, moving in a direction toward the forward end of the furnace-chamber and at a slower rate of speed than the carrier J, gives time for thorough combustion of the unconsumed parts, if any, before depositing the waste matter in the forward end of the ash-pit. It will now be seen that the coking process is constant, because of the constant heating, moistening, and feeding, that the gas-burning and coking process is never arrested or checked, and that since the flame from the burning gas is as constant and steady as the feed there are no smoking intervals.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A fuel-magazine for a furnace, having within its interior a congerie of pipes containing steam, hot water, or other heating and moistening agent, said pipes being arranged

as described and so perforated as to subject the fuel after heating to the influence of steam or hot water, as and for the purposes described.

2. The combination, with a combustion-chamber, of a fuel-magazine the floor or bottom of which is a carrier traveling in the direction of the combustion-chamber and a series or congerie of pipes, the parts of which at the inner end of the fuel-magazine near the throat are perforated and adapted to be filled with steam, hot water, or other heating and moistening agent, said pipes being so arranged as that the fuel in the magazine is heated first with dry heat and then with moisture before being led into the combustion-chamber, as set forth.

3. In a furnace, an endless grate composed of sections R, having perforated ears pivotally connected, flanges or scrapers *r* on their top surfaces, and projections *j* on their bottoms and end portions, in combination with polygonal wheels having notches in the sides of the wheels to engage the projections *j*, substantially as shown and described, for the purposes stated.

4. The method of treating and feeding bituminous coal or the waste of bituminous coal in a furnace, which mode or method consists in first placing a mass of the said combustible material in a magazine and heating and moistening it with steam and then scraping off and carrying from the bottom of the prepared mass a continuous supply of the prepared fuel to maintain a fire on a grate in a combustion-chamber.

5. In a furnace, the combination of a fuel-magazine having an open bottom and perforated tubes extended across the open bottom to heat a mass of comminuted fuel and to convey steam to the fuel, an endless grate adapted to convey fuel from the open bottom of the magazine, and means for actuating the endless grate to carry the prepared fuel from the magazine into the combustion-chamber.

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