(No Model.) 4 Sheets—Sheet 1.

F. COOK.

BAGASSE FURNACE.

No. 455,173. Patented June 30, 1891.

Fig. 1.

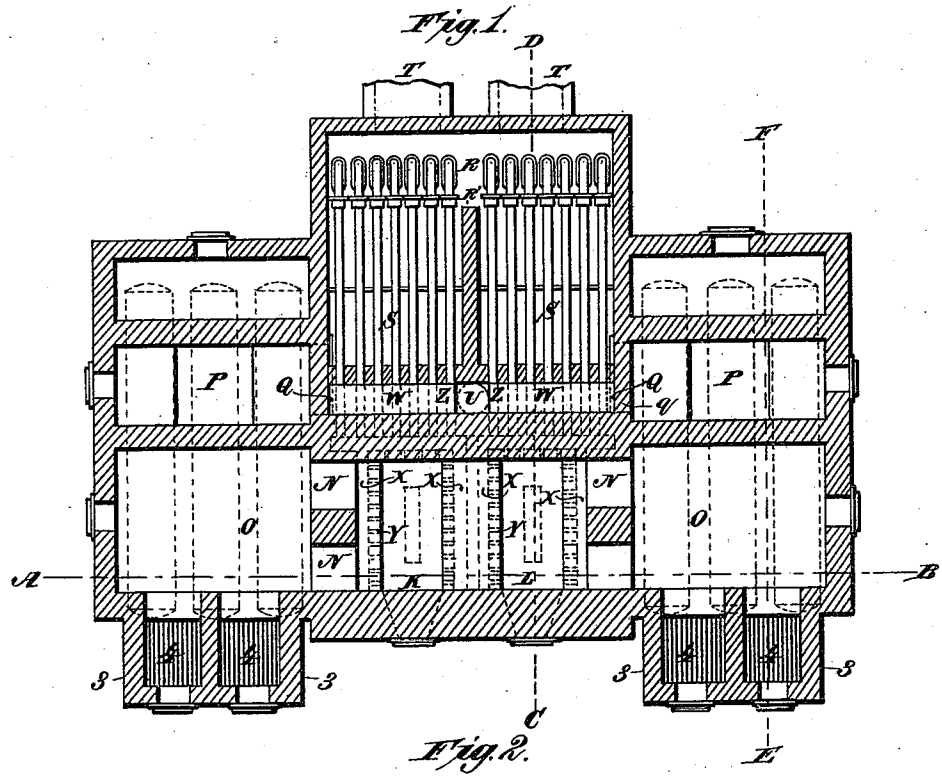
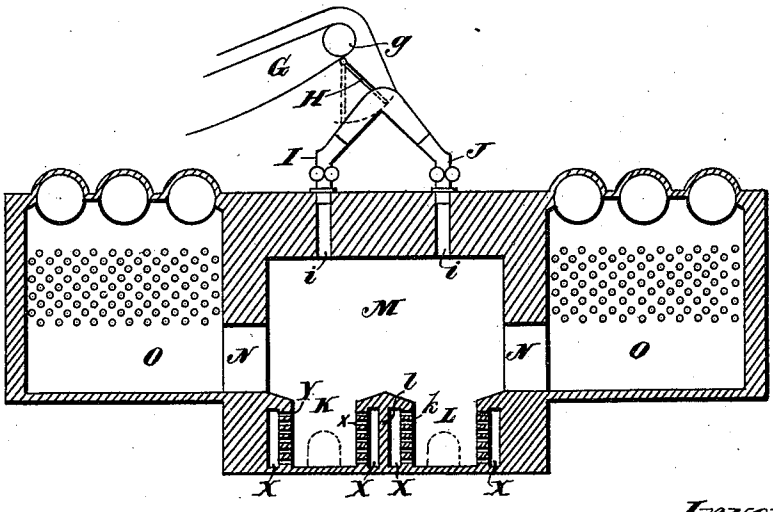


Fig. 2.



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Fig. 3.

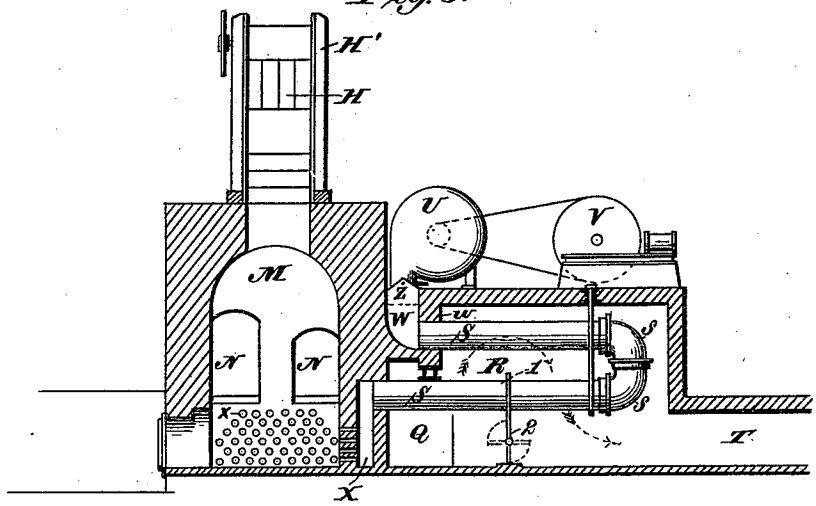
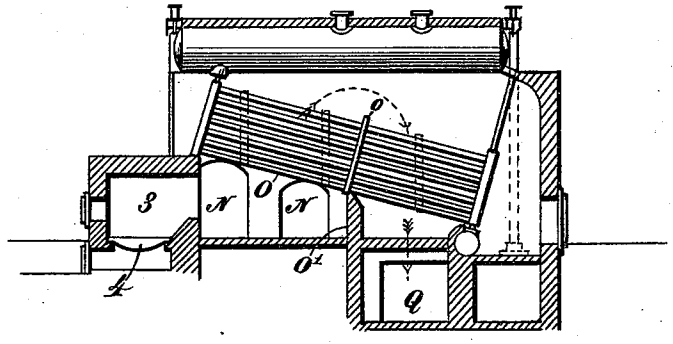


Fig. 4.



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BAGASSE FURNACE.

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Fig. 8.

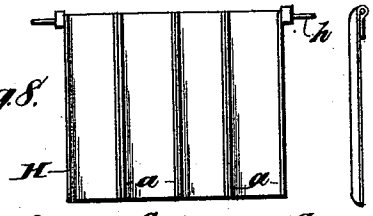


Fig. 10.

Fig. 9.



Fig. 5.

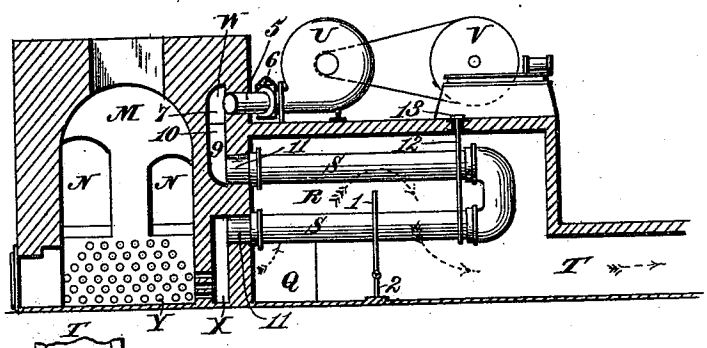


Fig. 6.

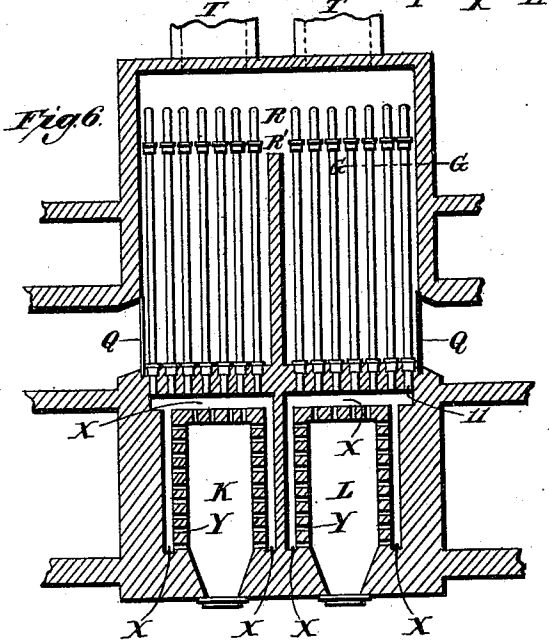
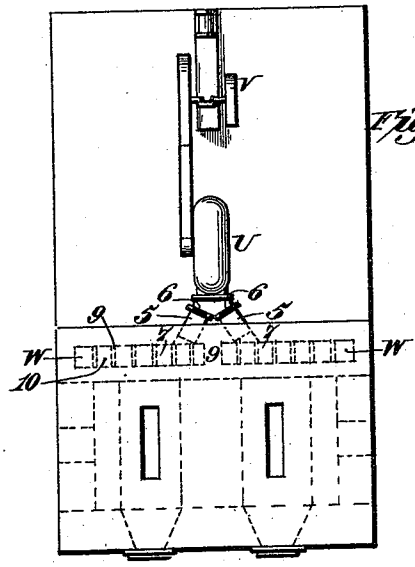


Fig. 7.



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F. COOK.

BAGASSE FURNACE.

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Fig. 11.

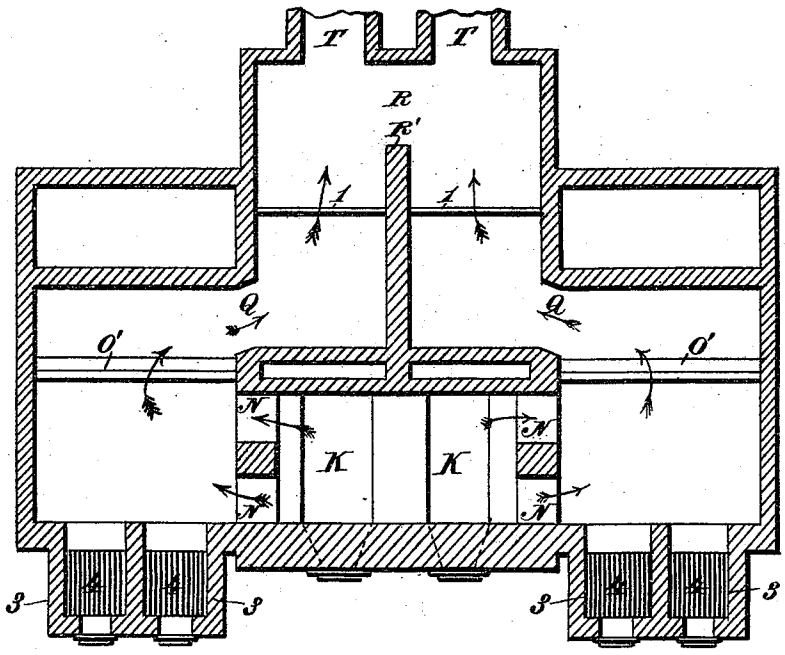
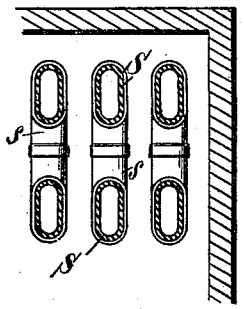


Fig. 12.



Witnesses.
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UNITED STATES PATENT OFFICE.

FREDERIC COOK, OF BAY ST. LOUIS, MISSISSIPPI.

BAGASSE-FURNACE.

SPECIFICATION forming part of Letters Patent No. 455,173, dated June 30, 1891.

Application filed December 4, 1890. Serial No. 373,621. (No model.)

To all whom it may concern:

Be it known that I, FREDERIC COOK, a citizen of the United States, and a resident of Bay St. Louis, in the county of Hancock and State of Mississippi, have invented certain new and useful Improvements in Bagasse-Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

My invention relates to certain novel improvements in the construction of bagasse-furnaces, and the purpose thereof is to provide a furnace of this class with a divided or duplex fire-chamber having a single combustion-chamber, into which the products of combustion of both the fire-chambers pass and are more or less perfectly consumed, whereby a divided battery of steam-boilers may be arranged upon opposite sides of the combustion-chamber, both parts being capable of being heated at the same time or either part separately.

It is my purpose, secondly, to provide an improved construction and combination of the parts composing a bagasse-furnace, whereby the air supplying a forced draft to the furnace may be heated before entering the latter by the partly-spent products of combustion which pass from the boiler chamber or chambers, the arrangement being such that the said products may be caused either to pass over, around, and between the air-heating tubes, or, on the other hand, be led directly to the passages or flues leading to the stack, the fire-chamber of the furnace and the space containing the air-pipes being centrally and longitudinally divided and the air-pipes contained in the compartments thus formed being caused to supply either or both of the duplex parts of the fire-chamber.

It is my purpose, thirdly, to provide a novel construction and arrangement of the parts composing the forced-draft or air-blast mechanism of a furnace having a double or duplex fire-chamber and to so combine the feeding devices therewith that either side of the furnace may be cleaned while the other side continues in operation.

It is my purpose, fourthly, to combine with a bagasse-furnace and with the steam-boilers heated thereby grate-bar furnaces adapted to the consumption of wood or coal or other fuel and so arranged with reference to the bagasse-furnace that said grate-bar furnaces may or may not be used in conjunction with the bagasse-furnace, and whereby also the heat of the latter shall not destroy the grate-bars when the furnaces heating the latter are not in use.

It is the object of my invention, fifthly, to provide a bagasse-furnace with a carrier for the fuel used therein and to combine with said carrier a series of separators whereby the bagasse may be discharged from the carrier into two feeders with substantial equality of supply to each or wholly supplied to either one of said feeders, whereby a furnace having divided or duplex fire-chambers may be supplied upon either or both sides of the dividing-wall.

To these ends my invention consists in the several novel features of construction and new combinations of parts hereinafter fully set forth, and then definitely pointed out in the claims which follow this specification, said invention being an improvement upon the invention shown and described in the United States Letters Patent granted me August 6, 1889, Nos. 408,587 and 408,588, and Letters Patent granted me May 3, 1887, No. 362,362, all for improvements in bagasse-furnaces.

To enable others skilled in the art to make, construct, and use my said invention, I will proceed to describe the same in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a ground plan of a complete bagasse-furnace, showing the air-heater, boiler, and supplemental furnaces. Fig. 2 is a vertical cross-section through the line A B of Fig. 1. Fig. 3 is a longitudinal section through the line C D of Fig. 1. Fig. 4 is a longitudinal section through the line E F of Fig. 1. Fig. 5 is a similar longitudinal section, but showing a modified arrangement of air-heater. Fig. 6 is a horizontal section through the bagasse-furnaces and air-heater shown in Fig. 5. Fig. 7 is a top plan view of the bagasse-furnaces and air-heater shown in

Fig. 5. Fig. 8 is a plan view of the bagasse-separator upon a larger scale. Fig. 9 is an end view of the same. Fig. 10 is a side view of the separator shown in Fig. 8. Fig. 11 is a view showing the course of the products of combustion from the boiler-chamber to the compartments containing the air-pipes. Fig. 12 is a vertical section upon the line G G, Fig. 6.

The bagasse is conveyed by a carrier G, Fig. 2, to a suitable point over the top of the furnace, said carrier being composed of any suitable flexible material or structure carried by pulleys or rolls *g*, only one of which is shown in the drawings, its shaft having support in bearings in uprights or standards H′, Fig. 3, which rise from the top of the furnace. Immediately beneath the pulley or roll *g* are arranged a series of separating-chutes H, consisting in this instance of four metallic plates independently pivoted at their upper ends upon a rod *h*, having its ends supported in the standards H′. Upon the longer parallel edges of each chute are formed or mounted sides or flanges *a*, Fig. 9, to prevent the bagasse from falling over the sides of the chute. When constructed in the manner described and shown, the chutes may be so arranged as to supply fuel to the inclining channels of a double feeder I J, the branches of which have communication with vertical openings *i* in the top of the furnace, which overhang the duplex fire-chambers. By arranging two of the chutes H in the position shown by full lines in Fig. 2, and the other two chutes in the position shown by dotted lines the bagasse will be fed to both the fire-chambers K and L, while if all four of said chutes are placed in either one of said positions the whole of the bagasse will be conducted into one of the fire-chambers only. I prefer to employ four of these chutes instead of two, and when feeding both fire-chambers to incline them alternately in opposite directions, as I obtain thereby a more nearly equal feed to the fire-chambers, since the bagasse may thereby be more uniformly spread in the feeders I J, because each alternate chute may be raised or lowered.

The furnaces or fire-chambers K and L have a single overhead arched chamber M, which mixes the gases and products of combustion, which pass out through openings N under the steam-boilers O, which in this case are arranged to the right and left of the bagasse-furnace M or double fire-chambers K and L. After reaching the boiler-chambers these heated products of combustion pass in the direction shown by dotted lines and arrows in Fig. 4, flowing upward over the pipes of the boilers at their forward and higher ends, and thence downward over and around the other ends of the tubes, being compelled to follow this course by the dividing-wall O′ and plate *o*. After passing over the rearward ends of the boilers the partially-spent products of combustion are received in an opening Q, formed in each of the two walls *q*, inclosing compartments R, containing air-pipes, which lie in rear of the furnaces and partly between the rear ends of the boiler-chambers. After entering through the openings Q into these compartments the heated gases are caused to flow upward, passing between and around a series of air-pipes S, and thence downward over another portion of these same pipes, thereby heating said pipes and the air passing through the same, after which the gases and other products pass into the flues T, which lead to the stack, as shown in Figs. 3 and 5.

Within the space containing the air-pipes there is a central wall R′, by which it is partly divided into two equal compartments, each containing a suitable number of the air-pipes S, which constitute conveyers having a vertical oblong form in cross-section, similar to that of a cylinder which has been flattened upon two opposite sides until the latter are brought nearly together, leaving a comparatively narrow space of about five inches width, preferably, and twenty inches depth for the passage of air, the flattened faces of said pipes having thus a considerable vertical area. These pipes are each formed of two parallel horizontal branches, one above the other, connected by the curved elbows or ends *s*, Fig. 3. The upper member of each pipe is built into a transverse wall *w*, which, in conjunction with the rear transverse wall of the two fire-chambers K and L, forms duplex air-chambers W W, having communication with the open ends of the upper branches of said pipes in each series thereof. In the lower portion of the transverse rear wall of the furnace are formed chambers X, into which the ends of the lower branches of the air-pipes S open, being built into one of the walls inclosing the chamber X.

Upon the top of the compartments R, containing the air-pipes, is mounted a fan-blower U, driven by any suitable form of engine V. This blower is so arranged as to have a downward blast-delivery into the air-chamber W, and at each side of the mouth of said blower is arranged a blast-gate Z, by which the forced blast may be shut off or let on upon either side of the central point of the chamber W, or may be admitted to or shut off from both, thereby entering either or both of the fire-chambers K L or being shut off from either one or both of said chambers. The air-pipes S, which have communication with the chamber W and X, are supplied with air by this blower. This air, after entering the chambers X, passes into either or both fire-chambers K L through tuyeres *x* in the lower part of the rear wall of the furnace. The transverse chamber X communicates with and forms part of longitudinal channels (denoted by the same reference-letter) formed in the side walls of the furnace and having tuyeres *x* for the passage of air. The fire-chambers are separated by a central longitudinal wall having upon each side of a central impervious wall *l* an air-chamber X, communicating with the

transverse chamber X and inclosed by the inner central wall *l* and by an outer wall *k*, having tuyeres *x*. Each of the fire-chambers K L is thus surrounded upon three sides by air-chambers, from which forced blasts of heated air are delivered to the fire-chambers, either or both.

In the compartments R, containing the air-pipes, about midway of the longer branches of the pipes S, is arranged a vertical division-plate 1 to turn the products of combustion upward in order to compel them to flow over both end portions of the series of heating-pipes, as shown in Figs. 3 and 5. In this plate, beneath the lower branches of the air-pipes S, may be formed one or more dampers or gates 2, centrally pivoted and arranged to be opened, as shown in dotted lines in Fig. 3, or closed, as in Fig. 5. In the former instance the products of combustion entering the compartments R through the openings Q will pass directly to the flues T without affecting the air in the pipes S. This damper or these dampers are used when the blower is not in operation.

Referring now to Fig. 1, I arrange at the front ends of the boilers O independent furnaces 3, having grates 4, adapted to the consumption of wood or similar fuel other than bagasse. These furnaces are arranged in front of and entirely outside the boiler-chambers in order that their grates may not be burned by the heat of the bagasse-furnace when the latter is in operation. These grate-bar furnaces are used when the bagasse-furnaces are stopped and the blower is not in operation.

In Figs. 5, 6, and 7 I have shown a slight modification in the construction of the air-heating devices. The transverse air-passage being divided centrally, as shown in Fig. 6, the blower is arranged to discharge its blast horizontally into diverging pipes 5, communicating with the two parts of the divided transverse chamber. In each pipe is placed a blast-gate 6, and the open end of the pipe discharges into an air-duct 7, Fig. 5, built in the masonry of the rear transverse wall of the furnace and separated by a wall 8 from the similar duct upon the opposite side of said wall. Below each of these air-ducts is arranged a series of solid piers 9, of masonry, between which are formed air-passages 10, extending downward and having communication with the air-pipes S. In connecting these pipes with this modified construction I may build short pipes 11 into the walls of the bagasse-burner to connect the ends of the air-pipes S to the air-passages 10 and X, in order that the cold air may be forced by the blower continuously through the heater-pipes S and absorb waste heat from the partly-spent products of combustion and from the boilers and reach the fire-chambers as a hot blast through the tuyeres Y. In both constructions thus far shown and described the air-pipes S are suspended at one end only to iron beams 13 or other suitable supports in the roof or top of the compartments R, thereby allowing them to swing and expand in length without interference. The joints in the pipes are usually made in the ordinary spigot and faucet form, with cement or asbestus packing. The division-plate *i*, with its gates or dampers 2, is the same as in the principal form of construction shown in Figs. 2 and 3. By the use of the double or branch pipes 5 and the gates 6 either fire-chamber K or L can be used separately, or both may be used together.

The openings N N are of unequal height, the crowns of their arches being slightly below the bottom row of inclined tubes of the boilers. This construction causes the heat to pass at once beneath the tubes and effects a uniform distribution of the products of combustion.

By the arrangement of parts hereinbefore set forth I am able to divide the battery of steam-boilers, placing part on each side of the common combustion-chamber, and use both divisions simultaneously or either one separately, the lateral exit-openings upon each side of the combustion-chamber being of different height to discharge beneath the inclined boiler-tubes. I am thus able to use one part of the furnace and one division of the battery of boilers while the other part is being cleaned or is for any reason out of use. In this connection, also, the fuel-separators, which are independently pivoted immediately beneath the pulley supporting the endless carrier, may be readily adjusted to feed both fire-chambers at once or either one separately, and the entire adjustment whereby the forced draft and fuel-feed is thrown to one side or the other or divided equally between them is extremely simple and is easily and quickly effected.

By arranging the independent grate-furnaces in front of the boiler-chambers I am able to use them conjointly with the bagasse-consuming duplex furnace between said boiler-chambers, or, if desired, to employ either the bagasse-furnace or the grate-furnaces, either or both, as the case may be, while at the same time when the latter are not employed they are removed from the action of the heat generated in the intermediate furnace, and there is no danger of the grate-bars burning or being injured thereby.

What I claim is—

1. In a bagasse-furnace, duplex fire-chambers separated from each other by a vertical longitudinal imperforate wall having a parallel perforated wall on each side to form chambers closed at the top and communicating with separate air-chambers in the rear wall of the furnace, a single overhead chamber common to both fire-chambers and having lateral exits, air-pipes arranged in rear of the furnace in a space divided into two compartments, the air-pipes in each compartment having communication, respectively, with the

separate air-chambers in the rear wall of the furnace, an air-forcing chamber communicating with said air-pipes, an air-forcing apparatus, and blast-gates, whereby the draft may be thrown into or cut off from either or both of the duplex fire-chambers, substantially as described.

2. In a bagasse-furnace, a single overhead chamber arranged above duplex fire-chambers, which are separated from each other by a central longitudinal imperforate wall having parallel perforated walls to form air-chambers, which are closed at the top and communicate, respectively, with separate air-chambers in the rear wall of the furnace, boiler-chambers arranged upon opposite sides of the single overhead chamber and communicating therewith by exit-openings of different heights to correspond with the inclination of the boiler-tubes, air-pipes arranged in rear of the furnace in a space divided by a longitudinal wall into separate compartments, the air-pipes in each compartment communicating with one of the air-chambers in the rear wall of the furnace, an air-forcing chamber communicating with the said air-pipes, an air-forcing apparatus, and blast-gates, whereby the draft may be thrown into or cut off from either or both of the duplex fire-chambers, substantially as described.

3. A bagasse-furnace having a plain hearth and provided with lateral discharge-openings for the products of combustion, boilers arranged upon each side of the bagasse-furnace, beneath the forward ends of which the products of combustion are discharged, and grate-bar furnaces placed in front of the forward ends of the boiler-chambers, the grate-bars being arranged substantially upon a level with the lateral discharge-openings from the bagasse-furnace, whereby said grate-bars are withdrawn from the path of the heated products of combustion from the bagasse-furnace, substantially as described.

4. In a bagasse-furnace, duplex fire-chambers divided by a central longitudinal imperforate wall forming, with parallel perforated walls, air-chambers, which are closed at the top and communicate with air-chambers in the rear walls of the furnace, air-pipes arranged in a space centrally and longitudinally divided into compartments in rear of the furnace, the series of air-pipes in each compartment having communication with the separate air-chambers in the rear wall and with an air-forcing chamber, an air-forcing apparatus, and blast-gates arranged in the air-forcing chamber, whereby the draft may be thrown into or cut off from either or both the duplex fire-chambers, substantially as described.

5. In a bagasse-furnace, the combination, with a common or single chamber having a central wall dividing its lower portion into fire-chambers having a single space or chamber above, of diverging feeders supplying said fire-chambers, an endless carrier for the fuel running over a pulley above said feeders, and a separator consisting of a series of plates independently and pivotally mounted upon an axis just beneath the pulley and conducting the bagasse to either chamber separately or into both simultaneously, substantially as described.

6. A bagasse-furnace having double or divided fire-chambers, in combination with a separator consisting of several metallic plates having flanges upon their sides and independently pivoted at one end above a duplex feeder conducting the bagasse to the furnace, and an endless carrier running over a pulley above the feeder and immediately above the pivotal axis of the separator-plates, whereby each alternate plate may be inclined in substantial parallelism to supply one of the fire-chambers, substantially as described.

7. A bagasse-furnace having a double or two-part fire-chamber, a common combustion-chamber, boiler-chambers arranged upon both sides of the combustion-chamber, the side walls of the combustion-chamber being provided with exit-openings for the passage of the heated products of combustion, said openings diminishing in height as they approach the rear, their tops being substantially in line with the inclined tubes of the boilers, and air-forcing devices supplying tuyeres in the walls of both fire-chambers, substantially as described.

8. A bagasse-furnace having a double or two-part fire-chamber, a common combustion-chamber which is provided with exit-openings in the lateral walls, air-pipes arranged in compartments in rear of said furnace, said pipes communicating at one end with air-chambers in the walls of the fire-chambers, a blower supplying air to the other end of said air-pipes, a division-plate arranged transversely to said pipes in each compartment and provided with a gate or damper to drive the products of combustion which enter through the said walls from the boiler-furnaces over the air-pipes or to permit them to pass directly to the chimney or stack, and blast-gates, whereby the forced draft may be directed into or cut off from either one or both of the fire-chambers, substantially as described.

In testimony whereof I have hereunto subscribed my name in presence of two witnesses.

FREDERIC COOK.

Witnesses:
WALTER H. COOK,
ROBERT RIES.