J. FISHER.

HOPPER FOR USE IN FEEDING FINELY DIVIDED FUEL.

APPLICATION FILED APR. 14, 1921.

1,414,870.

Patented May 2, 1922.

2 SHEETS—SHEET 1.

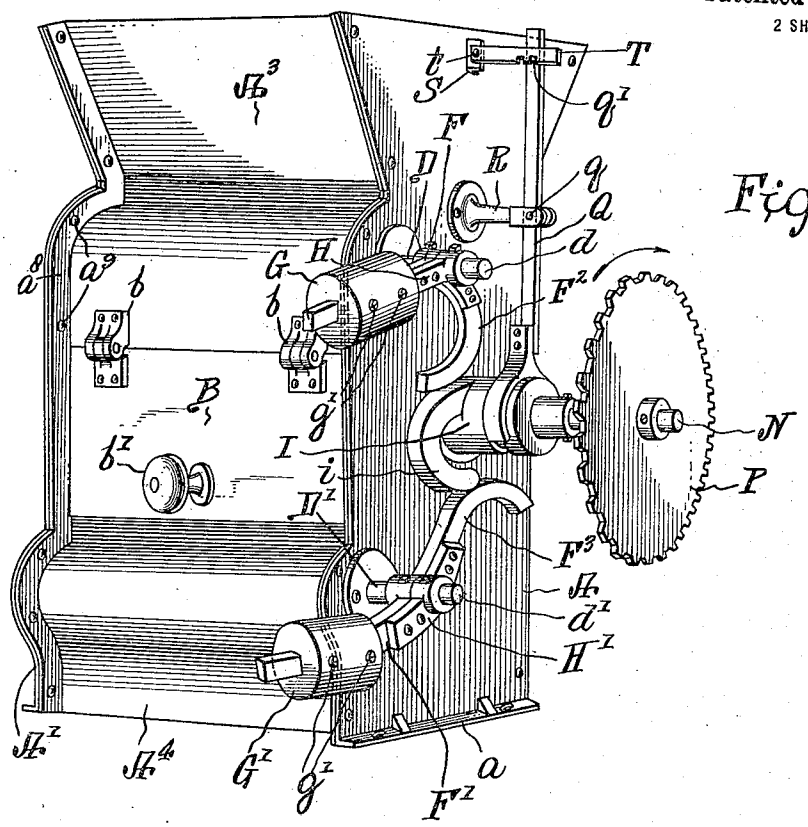


Fig. 1.

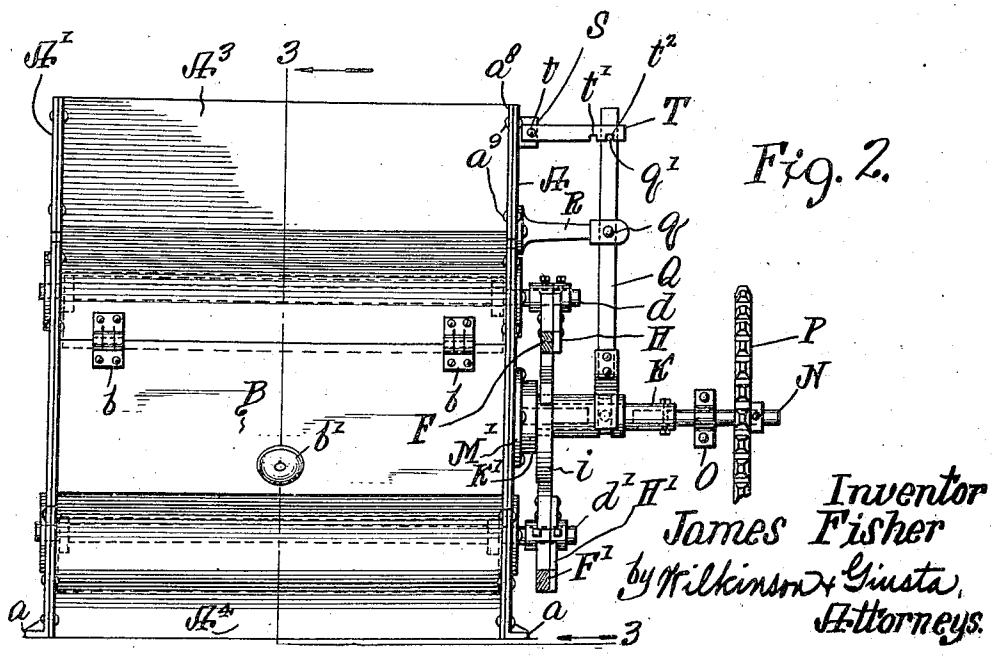


Fig. 2.

Inventor
James Fisher
by Wilkinson & Giusta,
Attorneys.

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2 SHEETS—SHEET 2.

Fig. 3.

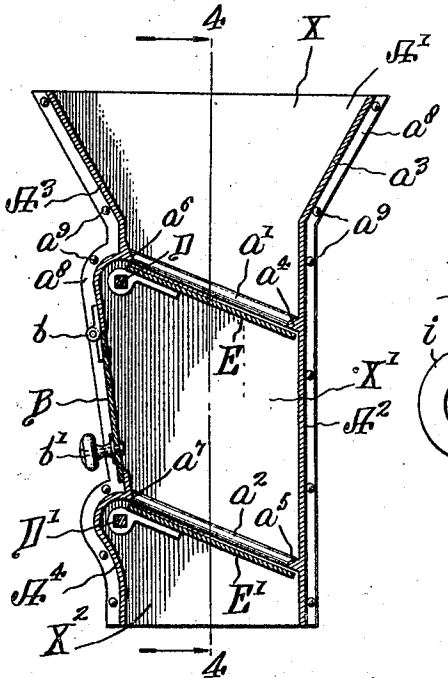


Fig. 5.

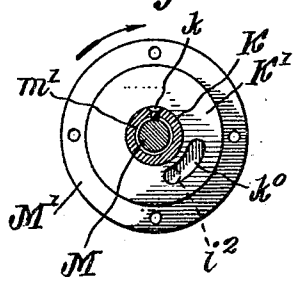


Fig. 6.

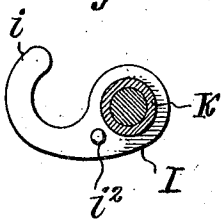
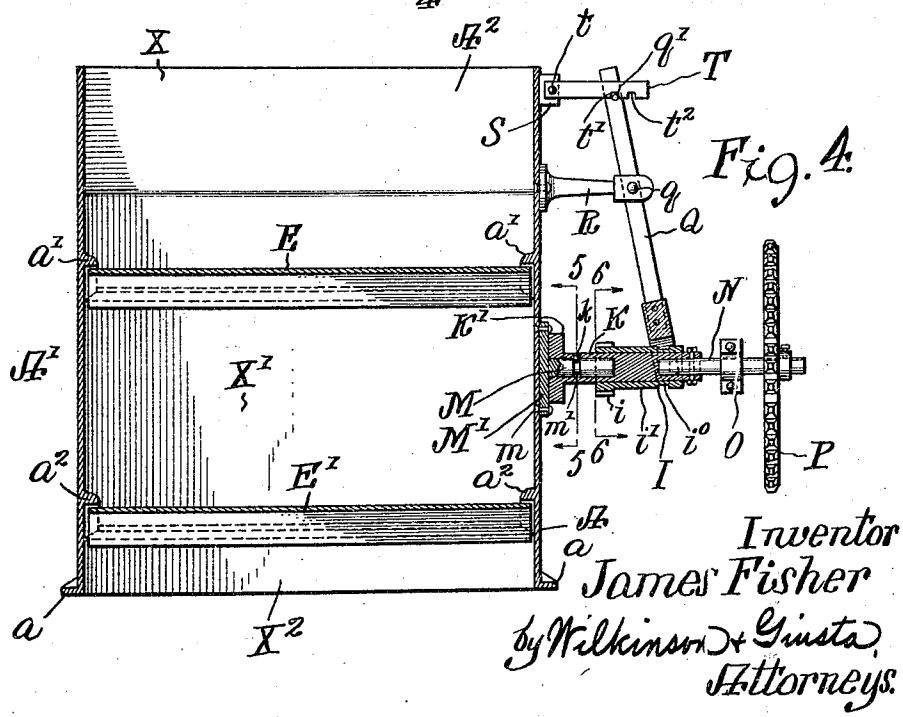


Fig. 4.



Inventor

James Fisher

by Wilkinson & Giusta,

Attorneys.

UNITED STATES PATENT OFFICE.

JAMES FISHER, OF NEW ORLEANS, LOUISIANA.

HOPPER FOR USE IN FEEDING FINELY-DIVIDED FUEL.

1,414,870. Specification of Letters Patent. Patented May 2, 1922.

Application filed April 14, 1921. Serial No. 461,357.

To all whom it may concern:

Be it known that I, JAMES FISHER, a citizen of the United States, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Hoppers for Use in Feeding Finely-Divided Fuel; 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 present invention relates to improvements in feeding apparatus for use in feeding finely divided fuel to furnaces. While the apparatus is especially adapted for feeding bagasse from sugar mills to bagasse furnaces, it is also adapted to feed other finely divided fuel to furnaces, such, for instance, as sawdust, coal dust, finely divided charcoal, or the like.

The invention is primarily adapted for use in connection with bagasse furnaces, such, for instance, as the well known Fisher bagasse furnace largely used in apparatus for making sugar from sugar cane, and fully described in the U. S. Patent granted to me March 23, 1911, No. 739161, and entitled improvements in apparatus for feeding bagasse to furnaces.

In such furnaces it is especially important that there shall not be an influx of cold air through the throat of the hopper used in the feeding apparatus, and it is desirable to provide a hopper which will feed the fuel at intervals in predetermined quantities, and at the same time prohibit the continuous draft of air through the hopper. It is also important to provide an arrangement which will meet varying conditions, and the rough and continuous use required without getting out of order.

The finely divided particles of bagasse are more or less gummy and tend to choke up the hopper supplying the fuel to the furnace, and moreover this bagasse contains ingredients which are apt to exercise a chemical action upon the metal parts of the hopper, especially if these are made of iron or steel, causing the same to rust, and it is important to provide a hopper whose parts are not likely to get out of order from these or other causes. These and other objections well known in the art are believed to be in a large measure avoided by the airtight hopper which will be hereinafter more fully described and claimed, reference being had to the accompanying drawings in which like parts are indicated by similar reference symbols throughout the several views, and in which:

Figure 1 is a perspective view of the complete hopper detached from the furnace.

Figure 2 is a rear elevation of the hopper shown in Figure 1, parts being shown on a somewhat smaller scale.

Figure 3 shows a section along the line 3—3 of Figure 2, and looking in the direction of the arrows.

Figure 4 shows a section along the line 4—4 of Figure 3 and looking in the direction of the arrows.

Figure 5 is a detail partly in section along the line 5—5 of Figure 4, and looking in the direction of the arrows; and

Figure 6 is a detail partly in section along the line 6—6 of Figure 4 and looking in the direction of the arrows.

The hopper is shown as detached from the furnace which may be of any suitable or standard type as already described.

The hopper casing comprises two metal side plates or walls A and A′, preferably flanged at the bottom, as at a, and adapted to be attached to the top of the furnace, not shown. These side walls are provided with inwardly projecting, downwardly inclined ribs a' and a^2, see Figs. 3 and 4, to protect the cracks between the edges of the hopper doors and prevent the accumulation of small particles of fuel in said cracks, as will be hereinafter described, and also to form substantially an air seal with said hopper doors.

The front wall A^2 of the hopper casing is preferably straight, as shown in Fig. 3, through its lower portion, but tapers outward, as at a^3, to form the upper portion of the hopper.

The rear wall of the hopper casing is composed of two fixed portions A^3 and A^4 with an opening between the same, which opening is closed by the door B. The front wall A^2 is provided with inwardly projecting ribs a^4 and a^5 which project beyond the outer edge of the doors E and E′ to prevent any fuel from falling through or accumulating in the crack at the front edge of the door, and also to form a substantial air seal at that edge of the door. The upper and rear ends of the doors E and E′ project beyond and beneath the projection a^6 and a^7 in the rear wall of the hopper, and thus prevent

any bagasse from falling in behind the door. The front, rear and side walls of the hopper may be connected together in any convenient way, as by means of the flanges a^8 and bolts a^9.

The door B is provided for convenience of access to the interior of the hopper in case of choking with bagasse, or for repairs. The weight or knob b' shown on the door is heavy enough to keep the door closed, and keep it firmly closed, airtight without any latches. This door is very desirable, because it can be opened at once in case of choking, and one's hand can be put in and the bagasse shoved down in the furnace without any danger of being hurt by the operating machinery.

The hopper can be used on any type of furnace, and the hoppers may be made of any length or width desired, and they may be applied to the furnace in any convenient way.

Extending transversely across the hopper just below the upper ends of the ribs a' and a^2 are the shafts D and D' to which the doors E and E' are connected. On the outer ends d and d' of these shafts D and D' are secured arms F and F', on which are adjustably mounted counterpoise weights G and G', which weights tend to hold the doors E and E' normally in the closed position, as shown in Fig. 3. These weights may be moved in or out on the corresponding arms and held in place by the clamp screws g', or in any other convenient way. It will thus be seen that the hopper casing is divided into three chambers, the upper chamber X constituting the hopper proper, the middle chamber X' which is normally closed by the doors E and E', and the lower chamber or throat X^2, which delivers the fuel to the furnace. The fuel is fed in the upper chamber X and held there until it is desired to feed the same or a portion of it to the central chamber X', and that portion of the fuel held in the central chamber normally remains supported above the closed door E' until this latter door is opened. It will be seen that if either of these doors remains in the closed position it will be impossible for a draft of cold air to enter the furnace, but I provide tripping means for alternately opening the two doors while the other door is closed, as will be now described.

Opposite the arms F and F' carrying the counterweights G and G', and rigidly attached to the shafts D and D', are two curved cam arms F^2 and F^3, as shown in Figure 1. The arms F and F^2 and F' and F^3, which are preferably of light material, may be braced by yokes H and H', as shown in Figure 1. These cam arms F^2 and F^3 are alternately operated, and thus the doors E and E' are alternately opened and released, by a revolving cam or trip I, which has a curved engaging arm i, and a sleeve i' slidably and freely mounted on the bushing K, which is slidably mounted on the stub shaft M, preferably integral with the flange M' secured to the side wall of the hopper as by means of the rivets m. The bushing K may be held against longitudinal movement on the stub shaft M in any convenient way, as by means of the pin k, projecting into the annular groove m' on the stub shaft, as shown most clearly in Figure 5.

The bushing K is fast to the drive shaft N, journaled in suitable bearings O. This shaft carries a sprocket wheel P continuously driven by a sprocket chain, not shown.

The trip I is provided with an annular groove i^0 to engage the clutch lever Q, which is pivoted as at q to a bracket R, and this lever Q is provided with a pin q' adapted to engage a latch T which is pivoted as at t to the block S secured to the hopper casing, as shown most clearly in Figure 4. This latch T is shown as provided with two notches t' and t^2 to engage the pin q' and hold the clutch lever in either the operative or inoperative position. In Figure 4 I have shown the clutch lever in the position for disengaging the clutch, while in Figures 1 and 2 I have shown the lever in position for putting the clutch into engagement.

In order to lock the trip to the bushing and cause it to turn with the drive shaft, I provide a lug i^2, see Figure 6, which engages in a notch k^0 in the flanged base K' of the bushing K. For convenience in making the clutch connection this notch is preferably elongated, as shown in Figure 5.

The operation of the device is as follows:

The fuel is fed to the hopper X in the usual way, and may be continuously fed to the furnace by throwing the lever Q to the position shown in Figures 1 and 2, at which time the clutch will continuously operate. If it is desired to discontinue feeding that particular furnace, or to feed it intermittently, the clutch may be thrown into or out of engagement as often as may be desired. Whether the fuel is fed to the furnace continuously or intermittently, it will be seen that the two doors will never be open at the same time. The upper door will be opened and closed before the lower door is opened, and vice versa. It will also be seen that the doors will make a substantially airtight closure for the hopper so that drafts of cold air cannot enter the furnace through the hopper.

Furthermore it will be seen that the parts are so arranged that finely divided fuel cannot clog up the spaces around the edges of the doors, and the doors can always swing freely to the closed position without encountering any obstructions caused by the passage of the fuel through the hopper. It will be seen that the parts are so arranged as

to be durable and not likely to get out of order, or to have their operation affected by rust or corrosion.

By adjusting the position of the counterweights the force tending to close the doors may be varied to suit the requirements of the apparatus.

It will be obvious that various modifications might be made in the herein described apparatus, and in the construction, combination and arrangement of parts which could be used without departing from the spirit of my invention; and I do not means to limit the invention to such details except as particularly pointed out in the claims.

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

1. A hopper for use in feeding finely divided fuel to furnaces, comprising a casing open at the top and bottom, a pair of doors hinged transversely of said casing and mounted one above the other but spaced apart, seats for said doors provided on the interior of said casing above said doors, respectively, said seats holding said doors in a position slightly inclined from the horizontal, counterweights normally holding said doors in the closed position against said seats, and a cam arrangement, with means for operating same, for alternately tripping said doors against the action of said counterweight.

2. A hopper for use in feeding finely divided fuel to furnaces, comprising a casing open at the top and bottom, a pair of doors hinged transversely of said casing and mounted one above the other but spaced apart, downwardly inclined ribs forming seats for the sides of said doors, and transverse ribs forming seats for the free ends of said doors provided on the interior of said casing above said doors, respectively, counterweights normally holding said doors in the closed position against said seats, and a cam arrangement with means for operating same for alternately tripping said doors against the action of said counterweights.

3. A hopper for use in feeding finely divided fuel to furnaces, comprising a casing open at the top and bottom, a pair of shafts extending transversely through said casing and mounted one above the other but spaced apart, door plates secured to said shafts, seats for said door plates provided on the interior of said casing above said doors, respectively, arms carried by said shafts and provided with counterweights normally holding said doors in the closed position against said seats, cams also carried by said shafts, and a rotating cam alternately engaging said first mentioned cams, and tripping said doors, seriatim, against the action of said counterweights.

4. A hopper for use in feeding finely divided fuel to furnaces, comprising a casing open at the top and bottom, a pair of shafts extending transversely through said casing and mounted one above the other but spaced apart, door plates secured to said shaft, downwardly inclined ribs forming seats for the sides of said door plates, and transverse ribs forming seats for the free ends of said door plates, provided on the interior of said casing above said doors, respectively, arms carried by said shafts and provided with counterweights normally holding said doors in the closed position against said seats, cams also carried by said shafts, and a rotating cam alternately engaging said first mentioned cams, and tripping said doors, seriatim, against the action of said counterweights.

5. A hopper for use in feeding finely divided fuel to furnaces, comprising a casing open at the top and bottom, a pair of shafts extending transversely through said casing and mounted one above the other but spaced apart, doors secured to said shafts, seats for said doors provided on the interior of said casing above said doors, respectively, arms carried by said shafts and provided with counterweights normally holding said doors in the closed position against said seats, cams carried by said shafts, a rotating cam engaging said first mentioned cams for alternately tripping said doors against the action of said counterweights, and clutch mechanism for throwing said rotating cam into and out of operative relation with the other two cams.

6. A hopper for use in feeding finely divided fuel to furnaces, comprising a casing open at the top and bottom, a pair of shafts extending transversely through said casing and mounted one above the other but spaced apart, doors secured to said shafts, downwardly inclined ribs forming seats for the sides of said doors, and transverse ribs forming seats for the free ends of said doors, provided on the interior of said casing above said doors, respectively, arms carried by said shafts and provided with counterweights normally holding said doors in the closed position against said seats, cams carried by said shafts, a rotating cam engaging said first mentioned cams for alternately tripping said doors against the action of said counterweights, and clutch mechanism for throwing said rotating cam into and out of operative relation with the other two cams.

JAMES FISHER.