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PATENTED MAY 30, 1905.

H. G. GINACA & A. W. KEECH.
BAGASSE BURNING FURNACE.

APPLICATION FILED OCT. 27, 1903. RENEWED JAN. 6, 1905.

2 SHEETS—SHEET 1.

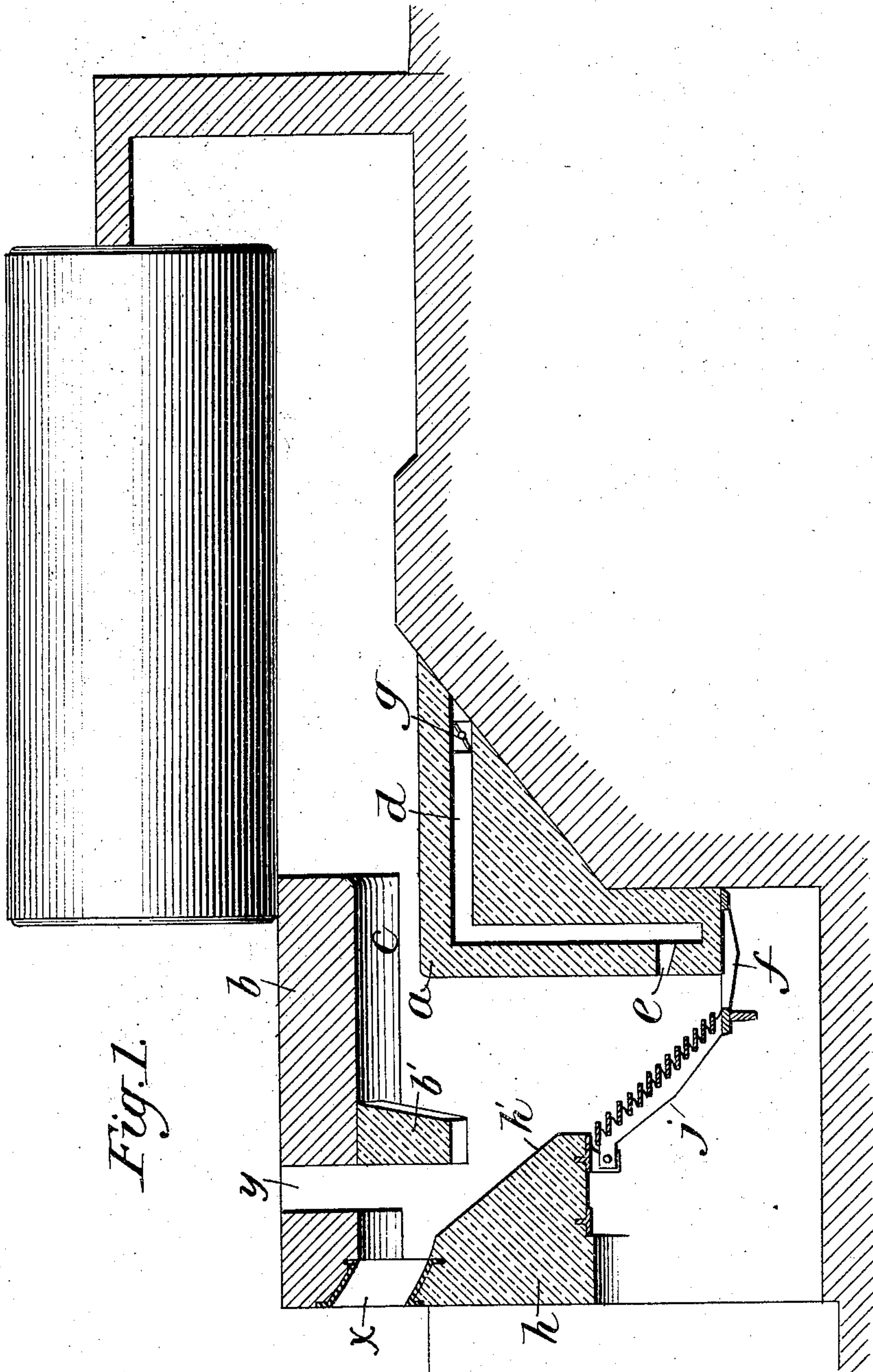


Fig. 1.

Witnesses:

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J. E. Hutchinson Jr.

Inventors:

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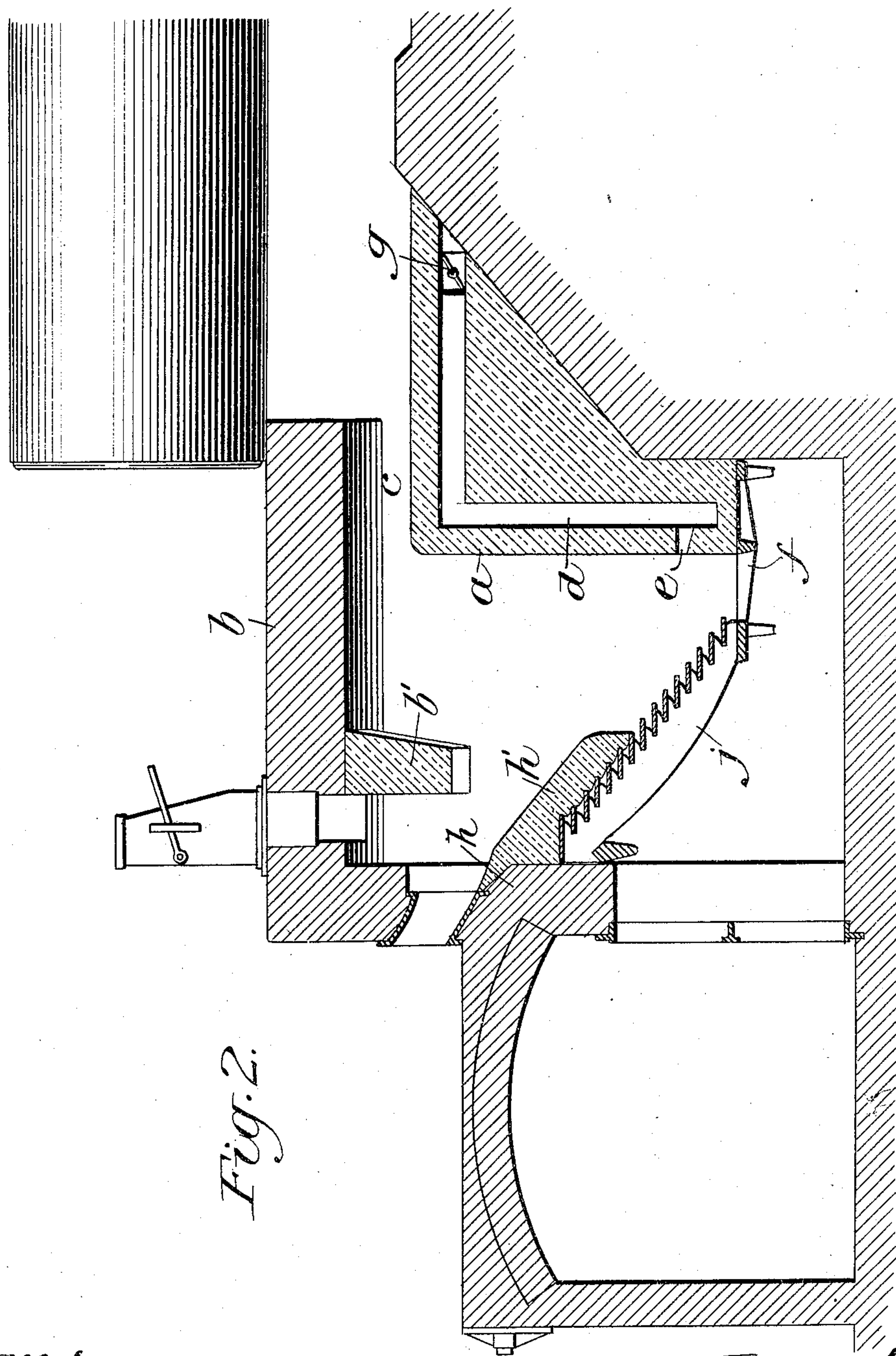


Fig. 2.

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UNITED STATES PATENT OFFICE.

HENRY GABRIEL GINACA AND ALVIN WELTY KEECH, OF HONOLULU,
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BAGASSE-BURNING FURNACE.

SPECIFICATION forming part of Letters Patent No. 791,023, dated May 30, 1905.

Application filed October 27, 1903. Renewed January 6, 1905. Serial No. 239,919.

To all whom it may concern:

Be it known that we, HENRY GABRIEL GINACA and ALVIN WELTY KEECH, citizens of the United States, residing at Honolulu, Island of Oahu, Territory of Hawaii, have invented new and useful Improvements in Bagasse-Burning Furnaces, of which the following is a specification.

Bagasse-burning furnaces differ greatly in construction from coal or other furnaces. Bagasse, the woody-fiber refuse of sugar-cane discharged from juice-extracting machinery, on account of its great bulk requires a larger volume above the grates and a different arrangement of the grates in order to burn it.

Our invention relates to improvements in the construction of such furnaces whereby greater efficiency is obtained. The bagasse entering the furnace is dried by radiation. Combustion is accomplished entirely within the furnace. A minimum passage rate of the heated currents over the heating-surface and a minimum temperature of the products of combustion at exit are obtained with a minimum admission of air.

Most bagasse-burning furnaces are of the Dutch-oven type. They are usually brought out clear of the boiler, have short horizontal grates placed low at the back of the furnace, and between the front end of these grates and the front wall of the furnace are grate-bars stepping up to the front wall, termed "step-ladder" grates. The width of these furnaces is usually from four to seven feet. A firing-door in the front wall and just above the upper step-ladder grate-bars admits the bagasse, or it is automatically fed through a feeder on top of the furnace and through its chute in the furnace-top near the front wall. In either case the bagasse falls on the step-ladder grates, which are placed at an angle such that the bagasse gradually creeps down as that on the lower grates becomes burned. On the upper step-ladder grates as at present constructed there exists a smoldering fire underneath the layer of green bagasse, the heat from which evaporates the moisture in the bagasse and liberates part of the volatile substance therein; but on account of the large amount of

cold air that passes through the upper grates the resulting gases are at a very low temperature and seldom become sufficiently heated by the hotter gases from the lower fire to complete their combustion. These upper grate-bars are detrimental to the efficiency of the furnace and are an unsuitable approach to the lower part of the furnace, where combustion should be the most active, the most intense heat being over the lower step-ladder grates and a lesser heat over the other grates, while only a smouldering fire exists over the upper grate-bars in the green bagasse lately entering the furnace. Combustion is rarely completed in the furnace, and the temperature of the products at exit from the stack is often very high.

In the accompanying drawings, Figure 1 represents a longitudinal sectional elevation of one form of bagasse-furnace embodying our improvements, and Fig. 2 is a similar view of a slightly-different form of furnace to which the improvements are also applied.

Similar letters of reference indicate similar parts throughout the drawings.

Referring to the drawings, it will be noted, Fig. 1, that the rear wall *a* of the furnace is carried up square, its top forming an abutment sufficiently below the arched top *b* of the furnace to permit of a suitable passage *c* to the space under the boiler. This rear wall *a* extends upward to a point hereinafter described and contains an air-flue *d*, supplying air to the furnace through twyers *e*, located above the grates *f*, the supply being regulated by the gate *g*. This wall *a* becoming hot heats the air passing through the flue *d* previous to its entering the furnace. It will next be noted that the step-ladder grates *j* are not carried up to the front wall *h*, as heretofore, but to an inclined floor *h'*, made of metal, brick, or other suitable material or of a combination of them, this floor *h'* being sufficiently higher than the step-ladder grates *j* for the purpose hereinafter explained. The horizontal grates *f* are also made shorter than heretofore. The arched top *b* of the furnace has a downward extension or projection near its front end and just back of the feeder-mouth, as shown at *b'*, and

the rear wall is carried up to and preferably slightly beyond its lower end. The bagasse entering the furnace either through the firing-door x or through the feeder-chute y is received upon the floor h' instead of upon the upper step-ladder grates, as heretofore. Cold air cannot pass from the ash-pit into the furnace through the floor h' , and the green bagasse consequently becomes dried by radiation before sliding or dropping off the floor h' onto the burning mass on the grates j , and the object of the floor being made higher than the grates is to facilitate the gravitating of the bagasse onto the top of the layer of burning bagasse on the grates j as the fuel upon the latter is consumed. A proper amount of air, regulated by the gate g , is admitted through the twyers e to effect complete combustion, this air being heated by its passage through the flue d in the hot wall a . The twyers e are placed at a suitable distance above the grates in order that this heated air may be supplied at the proper place to obtain complete combustion of the gases generated by the burning mass, and any air that enters through the feeder and furnace-mouths is prevented by the projection b' from passing along directly under the top b , as heretofore, and is caused to pass rearward and downward under the projection b' and to mingle with the gases rising from the smoldering bagasse on the floor h' as it passes into the volume of gases from the burning mass below. This projection of the arch b' owing to its location does not obstruct radiation of heat to the bagasse on the floor h' ; but it does prevent radiated heat from passing to the furnace-front and becoming heated aids in heating the air from the mouths and the gases distilled from the bagasse on the floor. These improvements may easily and cheaply be introduced in existing bagasse-burning furnaces, as shown in Fig. 2, having step-ladder grates extending upward clear to the front wall. This may be done by building the floor h' upon the upper part of the grate instead of putting in a new grate, thereby covering that part of the grate and making the construction and operation in all respects the same as though the grate actually extended near to the edge of the floor, and wherever the "grate" is referred to herein it is to be understood as meaning the fuel-burning surface, whether it be the whole of the actual grate-surface, as in Fig. 1, or that part of the grate structure which supports the fuel and on which it burns, as in Fig. 2. The back wall a is then built up, introducing the air-flue d and the twyers e . The upper step-ladder grates may be covered with fire-clay, iron plates, or other suitable material to form the floor h' , and the downward projection b' may be built under the top arch b of the furnace in any suitable way.

It is to be noted that the rear wall of the furnace extends to and preferably above the

lower edge of the depending arch b' , forming a combustion-chamber which lies wholly above the grate-surface, and that the throat-way or passage for the products of combustion is at the top of this chamber. It is also to be noted that the inclined floor onto which the bagasse is received extends beyond the front edge of the depending projection b' and is raised sufficiently above the level of the grate-surface to form a "drop-off," causing the bagasse to be automatically fed onto the grate-surface below; also, that the twyers e open into the fuel-chamber at the lower end of the rear wall just above the horizontal grate, so as to deliver air immediately over and above the burning fuel.

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

1. In a bagasse-burning furnace, the combination of the front wall, a step-ladder grate which supports the bagasse and on which it burns, an inclined floor elevated above the grate between its upper end and the front wall and upon which the bagasse is received as fed into the furnace, a downward projection from the arch of the furnace above the inclined floor, and a feed door or opening above the lower end of the projection, said projection extending downward sufficiently near the floor to form an apron to deflect the air downward from the feeding-opening along and above the floor into the center of the combustion-chamber.

2. In a bagasse-burning furnace, the combination of the front wall, an inclined grate which supports the bagasse and on which it burns, an inclined floor interposed between the grate and the front wall, upon which the bagasse is received as fed into the furnace and on which it is held preliminarily to burning on the grate, a projection extending from the arch of the furnace downward toward the inclined floor, and a rear wall extending upward to substantially the height of the downward projection from the arch.

3. In a bagasse-burning furnace, the combination of the front wall, a rear wall, an inclined grate which supports the bagasse and on which it burns, an inclined floor interposed between the grate and the front wall upon which the bagasse is received as fed into the furnace, and on which it is held preliminarily to burning on the grate, a projection extending from the arch of the furnace downward toward the inclined floor, and a flue in the rear wall for delivering air to the burning fuel on the grate, said rear wall extending upward to substantially the height of the downward projection from the arch.

4. In a bagasse-burning furnace, the combination of the front wall, a rear wall, a relatively short horizontal grate at the lower end of the rear wall, an inclined grate which supports the bagasse and on which it burns, said

inclined grate extending from the horizontal grate upward toward the front wall, an inclined floor interposed between the upper end of the inclined grate and the front wall, upon which the bagasse is received as fed into the furnace and on which it is held preliminarily to burning on the inclined grate, a projection from the arch of the furnace downward toward the inclined floor, and a flue in the rear wall for delivering air to the burning fuel just above the horizontal grate, said rear wall extending upward to substantially the height of the downward projection from the arch.

5. In a bagasse-burning furnace, the combination of the front wall, an inclined grate on which the bagasse is supported and on which it burns, an inclined floor interposed between the grate and the wall, and a projection depending from the arch of the furnace above the inclined floor, said inclined floor extending beyond the front edge of the projection and being raised above the level of the grate-surface, so as to receive the bagasse as fed into the furnace and hold it until the consumption of fuel previously deposited on the grate allows it to pass therefrom.

6. In a bagasse-burning furnace, the combination of the front wall, an inclined grate which supports the bagasse and on which it burns, an elevated, inclined floor interposed between the grate and the front wall upon which the bagasse is received as fed into the furnace and on which it is held preliminarily to burning on the grate, a projection extending from the arch of the furnace downward toward the floor, a rear wall extending upward to substantially the height of the downward projection, and a throatway or passage above the rear wall for the products of combustion.

7. In a bagasse-burning furnace, the combination of the front wall, a rear wall, an inclined grate which supports the bagasse and on which it burns, an elevated, inclined floor upon which the bagasse is received as fed into the furnace and on which it is held preliminarily to burning on the grate, a projection extending downward from the arch of the furnace toward the floor, and an air-flue in the rear wall at its lower end for delivering air just above the burning fuel on the grate, said rear wall extending upward to substantially the height of the downward projection.

8. In a bagasse-burning furnace, the combination of a front wall, a rear wall, a relatively

short horizontal grate at the lower end of the rear wall, an inclined grate which supports the bagasse and on which it burns, said inclined grate extending from the horizontal grate upward toward the front wall, an elevated, inclined floor interposed between the upper end of the inclined grate and the front wall and upon which the bagasse is received as fed into the furnace and on which it is held preliminarily to burning on the inclined grate, a projection depending from the arch of the furnace toward the inclined floor, and an air-flue in the rear wall at its lower end for delivering air to the burning fuel just above the horizontal grate, said rear wall extending upward to substantially the height of the downward projection and having a throatway or passage above it for the products of combustion.

9. In a bagasse-burning furnace, the combination of a front wall, a rear wall, a relatively short horizontal grate at the lower end of the rear wall, a stationary step-ladder grate which supports the bagasse and on which it burns, said step-ladder grate inclining from the horizontal grate upward toward the front wall, an elevated, inclined floor interposed between the upper end of the step-ladder grate and the front wall and upon which the bagasse is received as fed into the furnace and on which it is held preliminarily to burning on the step-ladder grate, a projection from the arch of the furnace downward toward the inclined floor, and forming with the rear wall a combustion-chamber above the step-ladder grate, an air-flue at the lower end of the rear wall for delivering air to the burning fuel just above the horizontal grate, and a throatway or passage in the top of the combustion-chamber above the rear wall for the products of combustion.

In testimony whereof we have each signed this specification in the presence of two subscribing witnesses.

HENRY GABRIEL GINACA.
ALVIN WELTY KEECH.

Witnesses as to the signature of Henry Gabriel Ginaca:

ROBT. J. PRATT,
D. A. FOX.

Witnesses as to the signature of Alvin Welty Keech:

ADAM LINDSAY,
THOS. C. RIDGWAY.