K. REED.

Evaporating Pan.

No. 6,395. Patented April 24, 1849.

Fig. 1

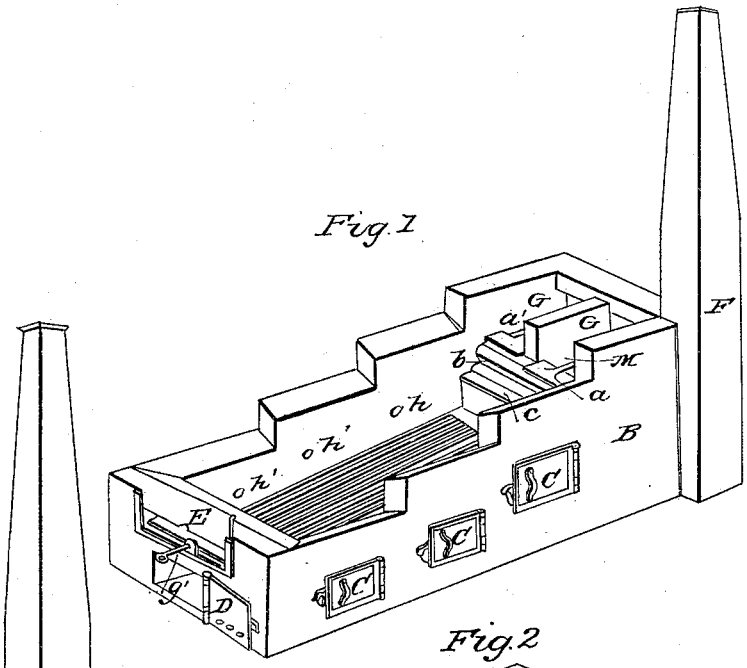


Fig. 2

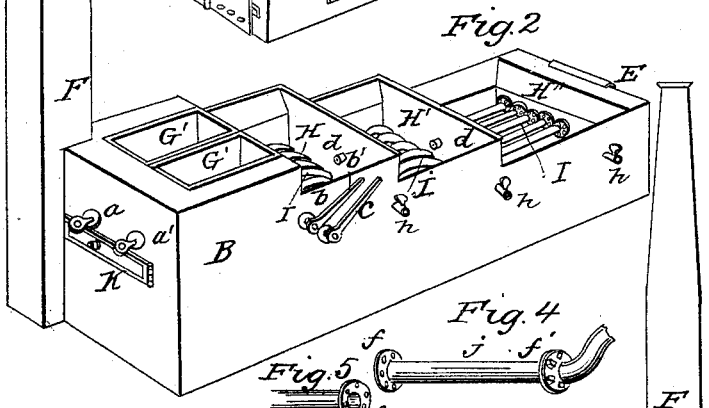
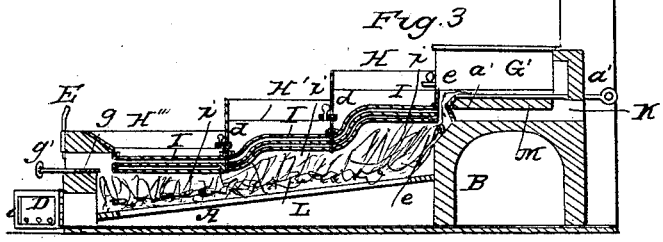


Fig. 4

Fig. 5

F

Fig. 3



UNITED STATES PATENT OFFICE.

KNIGHT REED, OF NEW HAVEN, CONNECTICUT.

IMPROVEMENT IN BOILING SUGAR.

Specification forming part of Letters Patent No. **6,395**, dated April 24, 1849.

To all whom it may concern:

Be it known that I, KNIGHT REED, of the city and county of New Haven, in the State of Connecticut, have invented a new and useful Improvement in Apparatus for Sugar-Boiling; and I do hereby declare that the following is a full, clear, and exact description of the construction, character, and operation of the same, reference being had to the accompanying drawings, which make a part of this specification, in which—

Figure 1 is a perspective view of the whole body of the brick or stone work in which the boiling and clarifying pans are set for use, showing the door to the ash-box, the opening through which the pipes, tubes, or flues are to be cleaned out, the grate on which the fire is to be built, the doors opening to the grate, and the dampers which regulate the direction of the heat to the several appropriate parts. Fig. 2 is a perspective view of the opposite side of the same, showing the boiling and clarifying pans placed in their proper position for use, with the pipes, tubes, or flues passing through the boiling-pans, the rods and levers by which the dampers are worked, the door or opening through which the pipes, tubes, or flues are cleaned out from the back end, and the stop-cocks or faucets to draw off any liquid from the pans. Fig. 3 is a longitudinal section of the same, showing the situation of the fire, the form and position of the bottom of the boiling and clarifying pans, the pipes, tubes, or flues, the dampers, and the grate. Fig. 4 is a perspective view of a section of one of the pipes, tubes, or flues, showing the manner in which they are connected or joined where they pass from one boiling-pan to another. Fig. 5 is also a perspective view of a section of one of the pipes, tubes, or flues, showing the open end and flange.

My improvement consists in so constructing and setting the boiling and clarifying pans that the same fire may heat all at the same time, or the boiling or clarifying pans only, or but one or two of these pans, at pleasure, by properly adjusting the several dampers; and by so setting the boiling-pans that the fire may never come in contact with the sides of the pans above the surface of the sirup in them, thereby effectually preventing the burning of the sugar; and by passing pipes, tubes, or flues longitudinally through the boiling-pans, so that when the dampers are properly adjusted for that purpose the heated air, smoke, &c., may be sent through the whole length of all the boiling-pans, and therefore through the sirup in them, thereby saving much heat which otherwise would escape through the other flues into the chimney, and thus be lost; and by affixing stop-cocks or faucets in the front end of each of the clarifying-pans, by which the clarified juice may be drawn off into the upper or most elevated of the boiling-pans, and from that boiling-pan by other stop-cocks or faucets in the front end of that and the next boiling-pan, by which the sirup may be drawn from one boiler to the other, and from the last or lower boiling-pan by a stop-cock or faucet in the side be drawn off when the sirup is sufficiently boiled or evaporated for granulation or crystallization, and other stop-cocks or faucets in the side to draw off the washings from the other boiling-pans when necessary.

I make the arch or work in which the pans are set of brick, stone, or other suitable materials, substantially in the form represented in Figs. 1 and 2, B, with a grate, A, Figs. 1 and 3, on which the fire is to be built, with three or any other suitable number of doors, C C C, Fig. 1, above the grate, for the convenience of making the fire on any particular part of the grate A, Figs. 1 and 3, or spread over its whole extent, as may be most beneficial in any particular case; and with a door, D, Figs. 1 and 3, to the ash-hole below the grate, and an opening by a slide, C, Figs. 1, 2, and 3, in the end, and a door, K, Figs. 2 and 3, in the other end, for the purpose of cleaning out the ashes, &c., which may lodge in the pipes, tubes, or flues I I I, Figs. 2 and 3, which pass through the sirup in the boiling-pans H H′ H″, Figs. 2 and 3, which pipes, tubes, or flues are to be cleaned out by means of a chain or a spiral spring with sweepers attached, and drawn through the pipes, tubes, or flues, (the chain or spring being conducted by a small rod or wire;) or they may be cleaned out by any other convenient method; and with a damper, *g*, Fig. 3, moved by a rod, *g′*, Figs. 1 and 3, which shuts off the heat from the mouths of the pipes, tubes, or flues I I I, Figs. 2 and 3, and sends it all through the flues *c b* or *b′*, and thence into the chimney F, Figs. 1, 2, and 3; and with a damper,

c, Figs. 1 and 3, which closes the passage at the back end of the upper boiling-pan, H, Figs. 1 and 3, which throws all the heated air, smoke, &c., through the pipes, tubes, or flues I I I, Figs. 2 and 3, (the damper *g*, Fig. 3, being open,) and through the flue at *b* or *b'*, Figs. 1 and 3, to the chimney F; and with a double damper, *b* and *b'*, Figs. 1 and 3, which on being turned opens one flue while it closes the other. When it is in the position shown in Figs. 1 and 3, all the heat is thrown above the brick lining M, Figs. 1 and 3, and directly under the clarifying-pans G' G', Figs. 2 and 3, as seen in Fig. 3; but when it is turned the other way *b'*, Figs. 1 and 3, rests against the end of the upper boiling-pan, H, Figs. 2 and 3, while *b* rests under and against the bottom of the brick lining M, Figs. 1 and 3, and by that means all the heat is turned under this brick lining M, Figs. 1 and 3, and goes off to the chimney F, Figs. 1, 2, and 3, without heating the clarifying-pans in any degree. These dampers *c* and *b* and *b'* are worked by levers *b*, *b'*, and *c*, Fig. 2, the levers being so situated that their weight will steady the dampers in their proper positions; and with two dampers, *a* and *a'*, Fig. 1, and *a'*, Fig. 3, sliding on the upper side of the brick lining M, Figs. 1 and 3, one under each of the clarifying-pans G' G', Fig. 2, and G', Fig. 3. These two dampers are moved by rods *a* and *a'*, Fig. 2, and *a'*, Fig. 3, and may be used to shut off the heat from either of the clarifying-pans, when necessary, or both at the same time; and with a brick lining M, Figs. 1 and 3, which rests on iron bars placed across from one side to the other of the main or side walls; or it may be supported in any other convenient way. On this brick lining M, Figs. 1 and 3, in the center, I erect a brick partition to stand between and support the two clarifying-pans, as seen in Fig. 1, where the two spaces for the two clarifying-pans are represented by G G.

I make the two clarifying-pans of sheet-copper or any other suitable material, and of an oblong form, as seen at G' G', Fig. 2, with a stop-cock or faucet, *e*, Fig. 3, in the front end of each, to draw off the clarified juice into the boiling-pan H, Figs. 2 and 3, when needed.

I make the three boiling-pans H, H', and H'', Figs. 2 and 3, of sheet-copper, or any other suitable material, of a square form, as seen in Fig. 2, either in three separate parts, or two, or all joined together, as may be deemed most convenient, in such a manner that they may be set one elevated above the other, as seen in Figs. 2 and 3, with stop-cocks or faucets *d d*, Figs. 2 and 3, in the front ends of the two most elevated, H and H', Figs. 2 and 3, to draw off the sirup into the pan next below; and also with stop-cocks or faucets *h h*, Fig. 2, in the side to draw off the washings, &c., from the boiling-pans H and H' when necessary, and *h'*, Fig. 2, to draw off the sirup when ready for granulation or crystallization. Through the whole length of these three boiling-pans H, H', and H'', Figs. 2 and 3, I insert a suitable number of pipes, tubes, or flues, I I I, Figs. 2 and 3, in such a situation as to conduct the heated air, smoke, &c., through the sirup in the boiling-pans, to assist in boiling or evaporating the sirup, thereby saving much heat that would otherwise be lost by escaping through the other flues into the chimney. These pipes, tubes, or flues I I I, Figs. 2, 3, 4, and 5, should be situated throughout their whole length at a small distance from the bottom *i i i*, Fig. 3, of the boiling-pans, as seen in section in Fig. 3, and also from its sides, and from each other, so that they may not come in contact with anything but the sirup, except where they pass through the ends or partitions of the boiling-pans, where they are attached together by means of flanges on their ends, and screw-bolts, as seen at *f'*, Fig. 4, the ends or partitions of the boiling-pans being between the flanges and the screw-bolts passing through them, so that the pipes or tubes form continued flues for the heated air, smoke, &c., to pass off; or the pipes, tubes, or flues may be secured by any other substantial or convenient method. I set the boiling-pans H, H', and H'' in the arch or brick-work B, Figs. 1, 2, and 3, one below the other, as represented in full in Fig. 2 and in section in Fig. 3; and the clarifying-pans G', and G' still above the boiling-pan H, as represented in full in Fig. 2 and in section in Fig. 3, so that the liquid may be readily drawn off from one to the other by means of the stop-cocks or faucets *e* and *d* and *d*. Should it be found necessary, the boiling-pans may be supported by iron bars running across from side to side of the side walls of the arch B, Figs. 1, 2, and 3, directly over the fire.

I build the fire L, Fig. 3, on the grate A, Figs. 1 and 3, opposite either or all of the doors C C C, Fig. 1, and adjust the dampers so as to allow the smoke, &c., to pass off to the chimney F, Figs. 1, 2, and 3, in any of the ways hereinbefore described, and as represented in section in Fig. 3.

For ordinary use I would recommend that the clarifying-pans be made of such size as to contain about one hundred and fifty gallons each, and the boiling-pans H about two hundred gallons, H' about one hundred and fifty gallons, and H'' about one hundred gallons, and in that proportion for larger or smaller works when deemed necessary. I also recommend that there be two clarifying-pans and three boiling-pans, as already described; but any other number of either may be used if found more convenient or useful. I would also recommend that the caliber of the pipes, tubes, or flues be about four inches in diameter for the ordinary size, and of similar proportion to the boiling-pans for larger or smaller works, when necessary. I would also recommend that the sirup should never be drawn off from the boiling-pans quite as low as the upper surface of the pipes, tubes, or flues, except for cleaning the boiling-pans when it is necessary.

The advantages of my improvement over al

other methods now known consist in setting the boiling-pans in such a manner that they be elevated, one above another, in a proper position to allow of the sirup being drawn from one to another by means of the stop-cocks or faucets in the most convenient and expeditious manner, and so that the fire can never come in contact with the sides of the boiling-pans so high as the surface of the sirup, and thereby prevent the sugar from being burned while boiling; and in the saving of fuel by causing the heated air, smoke, &c., to pass through the sirup by means of the pipes, tubes, or flues, which pass through the boiling-pans; and in so constructing and arranging the dampers that any particular part may be heated without affecting other parts; and so that the cane-juice or other liquid may be heated, for the purpose of clarifying it, by the same fire that heats the sirup in the boiling-pans, and which would otherwise pass off to the chimney and be wasted; and by so arranging the doors in the side through which the fire is kindled that the greater part of the heat may be applied to either one or to all of the boiling-pans, or thrown off almost wholly to the clarifying-pans, heating none but the highest boiling-pan, and that but very little.

I am aware that pipes or tubes have been passed through the sirup for the purpose of heating the sirup with steam, and that pipes or tubes are used in locomotive-boilers as flues to pass the heated air, smoke, &c., through the water in the boiler, for the purpose of economizing the heat, and that several boiling-pans have been heated by one and the same fire. I therefore claim none of these, as such, as my invention; but

What I claim as my invention, and desire to secure by Letters Patent, is—

The combination of the boiling-pans H, H′, and H″, of this construction, with the pipes or tubes I I I, passing through the whole length of the series of boiling-pans, and with the several dampers *g*, *c*, *b*, *b′*, *a*, and *a′*, to direct, vary, and change the direction of the heat, and with the clarifying-pans G′ and G′, so set as to be heated by the same fire which heats the boiling-pans, and yet so that the heat may be entirely shut from the clarifying-pans, or either of them, at pleasure, the whole constructed, arranged, combined, and for the purposes substantially as herein described.

KNIGHT REED.

Witnesses:
J. N. BRADLEY,
R. FITZGERALD.