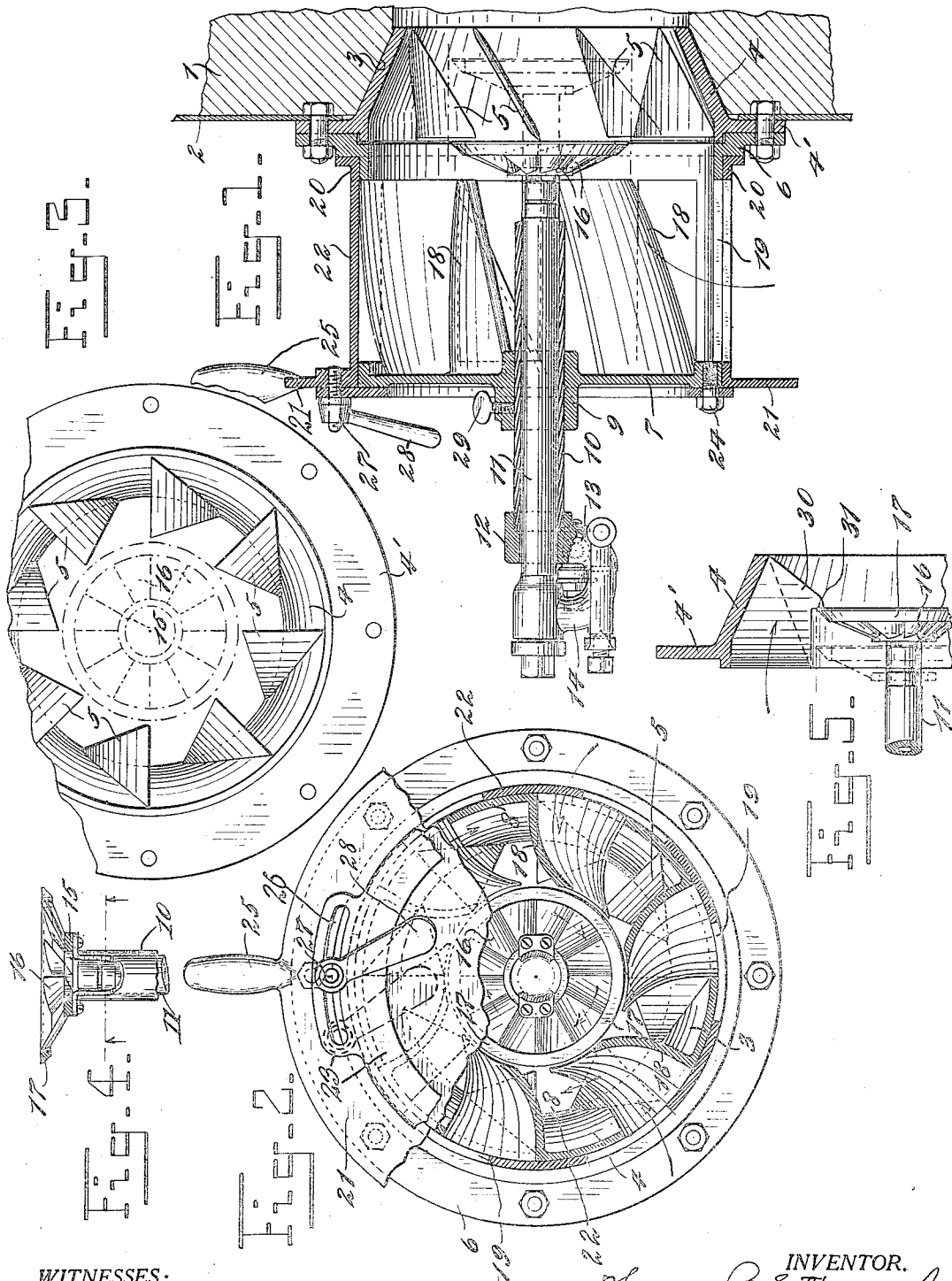


T. B. STILLMAN, JR.
OIL BURNING APPARATUS.
APPLICATION FILED JULY 19, 1915.

1,235,855.

Patented Aug. 7, 1917.



WITNESSES:
C. E. Keylman
W. A. Pauling

INVENTOR.
Thomas B. Stillman, Jr.
BY *L. B. Bell*
ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS B. STILLMAN, JR., OF HOBOKEN, NEW JERSEY, ASSIGNOR TO THE BABCOCK & WILCOX COMPANY, OF BAYONNE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

OIL-BURNING APPARATUS.

1,235,855.

Specification of Letters Patent.

Patented Aug. 7, 1917.

Application filed July 19, 1915. Serial No. 40,629.

To all whom it may concern:

Be it known that I, THOMAS B. STILLMAN, Jr., a citizen of the United States, residing at Hoboken, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Oil-Burning Apparatus, of which the following is a specification.

My invention relates to oil burning apparatus adapted for both natural and high forced draft, and will be understood by reference to the accompanying drawings in which Figure 1 is a central vertical section, certain parts being in elevation; Fig. 2 a front view partly in section with the burner removed; Fig. 3 an elevation of the inner cone of Fig. 1 with the air-deflecting plate in dotted lines; Fig. 4 a detail of Fig. 1 showing the method of attaching the air-deflecting plate to the burner; and Fig. 5 a modified form of the blade which may be used in the inner cone. Similar reference numerals indicate similar parts in the several views.

In the drawings the numeral 1 designates a portion of the brickwork of the furnace wall, and 2 the furnace front plate. The furnace wall is formed with a conical opening 3 in which is seated a cone-shaped casting 4 so placed that the smaller end is directed toward the furnace. The angle of the surface of the cone is preferably between 20° and 30°. This cone has on its inner surface a plurality of blades 5, normal to the surface of the cone and approximately at an angle of 60° to the plane of the front plate 2. In the form shown in Figs. 1, 2 and 3 the blades are substantially triangular in shape having two straight sides and a curved side corresponding to the curvature of the surface of the cone. As shown, the cone 4 has a flange 4' against which bears the flange of a cylindrical box or casing, the latter comprising a flanged ring 6, a front plate 7, and connecting ribs 8, all cast integral. The box and the cone 4 are secured to the furnace front plates by bolts, as shown. The front plate 7 of the box is formed with a hub 9 which gives a bearing surface for sleeve 10, through

which sleeve is passed a burner 11, the sleeve being substantially the same length as the burner barrel. Threaded on the outer end of sleeve 10 is a collar 12 having a chamber, not shown. To said chamber is connected the pipe 13, and from said chamber leads the gooseneck connection 14 to the burner. This is of standard construction.

At its inner end the sleeve 10 is cut away both on its upper and lower sides, as shown in Fig. 4, so that the burner tip is clearly visible at all times, and so that the oil spray issuing from the tip may be readily observed, thus also allowing a small supply of air around the burner tip. The extensions of the sleeve 10 are secured to a center ring 15 of an air-deflecting plate, said plate comprising a plurality of blades 16 secured to the center ring 15, and an outer ring 17. The air-deflecting plate may be either of the form shown and described in Patent No. 1,086,715, D. J. Irish, February 10, 1914, or that of Patent No. 1,126,654, E. H. Peabody, dated January 26, 1915. The blades 16, of the air-deflecting plate, are spaced apart to provide apertures for the admission of air and are inclined to the plane of the plate to give the air a whirling motion. The burner terminates in proximity to the opening provided by the central ring 15. When assembled, as shown in Fig. 1, the air-deflecting plate, the sleeve 10, burner 11 and collar 12, and parts carried thereby, are rigidly connected so that they move as a unit along the axis of the burner when desired.

Cast integral with the ribs 8 are blades 18 of the form shown in Fig. 2, that is, the blades are curved from one edge of the ribs 8, starting radially, and the curvature gradually increasing as the blades approach the center. The ribs 8 extend from the front to the rear of the box along diagonal lines, at approximately an angle of 60° to the front plate 7. The bases of the blades 18 have a corresponding angle to the front plate so that the air for combustion which enters the openings 19, between the ribs 8, is given an initial rotary motion.

Surrounding the box is a cylindrical shut-

55

60

65

70

75

80

85

90

95

100

ter comprising a flanged ring 20 which rests upon the flanged ring 6, and front flange 21 and connecting ribs 22, the width of the latter being substantially the width of the openings 19 between the ribs 8. A thin ring plate 23 is secured to the front plate 7 of the box by stud bolts 24, the ring bearing against the flange 21 of the rotating shutter thereby holding the latter in place. The shutter may be rotated by a handle 25 secured thereto to open more or less the openings 19 between the ribs 8. On the ring 23 is an extension having a slot 26 through which passes a bolt carrying a lock nut 27 with an operating handle 28. When the shutter is to be rotated, the lock nut is loosened and after the shutter has been rotated to the desired position the lock nut is tightened so as to hold the shutter in its adjusted position.

When operating under natural draft, the parts will be in the position shown in the full lines in Fig. 1, that is, the air-deflecting plate, having blades 16, is set substantially in the plane of the larger end of the cone 3. The shutter is so adjusted that the openings 19 are opened their full width. With the parts in the position shown, the air passing through the deflecting plate has a whirling motion imparted thereto and this motion is in turn imparted to the main air supply passing around the outer ring 17, so as to assist the main air supply in intermingling with the atomized oil. An initial rotation of the entering air is produced by the curved blades 18, this rotation of the air being maintained until after it passes the smaller end of the cone 4. The rotation produced by the center deflecting plate, having blades 16, and curved blades 18, is in the same direction. The intermingling of the air and atomized oil is also materially assisted by so placing the cone 4 with its smaller end toward the furnace, that is, the inclination of the wall of the cone toward the furnace directs the air toward the center of the stream of atomized oil.

When used with high forced draft the rotary shutter may be left wide open as when used with natural draft, and the air-deflecting plate moved toward the furnace, as, for example, to the position shown in dotted lines in Fig. 1. This adjustment of the air-deflecting plate is readily accomplished by loosening the set screw 29 passing through the hub 9, and bearing upon the sleeve 10. As before stated, the air-deflecting plate, burner 11 and sleeve 10 move forward as a unit. When the desired position is reached these parts are held in their adjusted position by tightening the screw 29. Due to the tapering shape of the cone 4 this action of pushing the air-deflecting plate in toward the furnace cuts down the effective air open-

ing around the ring 17, thus reducing the proportion of air entering around the ring 17 compared with that entering between the blades 16. It is necessary to bring about this adjustable reduction of the effective area around the outside of the ring 17 due to the fact that at high draft air rushing in around 17, when in the position to be used for natural draft, blows the flame from the tip of the burner back into the furnace, setting up violent pulsations. By cutting off this excess air as described, these pulsations are brought under perfect control and are completely eliminated, if desired.

The principle, however, of forcing the main supply of air several inches beyond the burner tip and into the flame, well after the oil is burning, is still maintained, regardless of the position of the air-deflecting plate. The method of operation would be, therefore, in running natural draft, to have the air-deflecting plate pulled out as far toward the boiler room as possible, and in running forced draft to move the air-deflecting plate and burner in toward the furnace as far as necessary, in order to reduce the pulsations which otherwise would occur. One or two inches of adjustment is usually sufficient to obtain the desired result over the widest range from very low to very high draft when in full operation and when the mixing chamber is heated to a degree sufficient to vaporize any oil which may be deposited therein. The air openings at 19 will be left wide open at all times under these circumstances, if desired, the control being worked entirely by sliding the air-deflecting plate back and forth.

In Fig. 5 I have shown the form of blade preferred by me in use in cone 4. This blade 30 differs from that shown in Figs. 1 and 2 in that it is larger and approaches more nearly a rectangular form. The greater area of the surface of the blade, the excess area over the blade 5, being indicated by the portion outside of the broken lines, makes the blade 30 more effective in controlling the air supply and pulsations. An additional feature is the formation of the blade 30 with shoulders 31 which serve as stops to limit the forward position of the air-deflecting plate and burner.

In an apparatus actually constructed and used by me the outer diameter of the ring 17 of the air-deflecting plate was about nine inches, and the inside diameter of the inner ring 15 was about two inches. The diameter of the larger end of the cone-shaped mixing chamber was about fifteen inches, and the diameter of the smaller end of said chamber about eleven and one-half inches. The depth of the mixing chamber was about five and one-half inches, and that of the air-deflecting plate about one and one-half

inches. The burner tip was about three-eighths of an inch from the plane of the inner ring 15 and the air-deflecting plate. These dimensions are given by me simply as a guide in the construction of an apparatus which I have found successful in practice. It is, of course, not intended to limit the parts to these exact dimensions.

In installations where more than one burner is installed the rotating shutter will be operated to close the openings 19 should that particular burner be shut off, to prevent an excess of air entering the furnace.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In an oil burning apparatus the combination of a burner, an air deflecting plate secured to the burner and in proximity to the tip thereof, said plate having a central opening, a mixing chamber and means for admitting air thereto through said opening, and means for adjusting said burner and plate within said mixing chamber.

2. In an oil-burning apparatus, the combination of a burner, a cone-shaped mixing chamber having its smaller end directed toward the furnace, an air-deflecting plate secured to the burner, means for adjusting said burner and plate along the axis of the burner within said mixing chamber, and means for admitting air to said mixing chamber.

3. In an oil-burning apparatus, the combination of a burner, a cone-shaped mixing chamber having its smaller end directed toward the furnace, an air-deflecting plate placed at the larger end of the mixing chamber and in proximity to the tip of said burner, means for adjusting said burner and plate along the axis of the burner and within the mixing chamber, and means for admitting air to said mixing chamber.

4. In an oil-burning apparatus, the combination of a burner, a cone-shaped mixing chamber having its smaller end directed toward the furnace, and having blades on its inner wall, an air-deflecting plate at the larger end of the mixing chamber and in proximity to the tip of said burner, means for adjusting said burner and plate longitudinally along the axis of the burner within the mixing chamber, and means for admitting air to the mixing chamber.

5. In an oil-burning apparatus, the combination of a burner, a cone-shaped mixing chamber having its smaller end directed toward the furnace, an air-deflecting plate at the larger end of said chamber and in proximity to the tip of said burner, said air-deflecting plate being of less diameter than the diameter of the larger end of the base of the mixing chamber, means for adjusting said plate and burner along the axis of the burner and within the mixing chamber, and

means for admitting air to said mixing chamber.

6. In an oil-burning apparatus, the combination of a burner, an air-deflecting plate in proximity to the tip of said burner, a cone-shaped mixing chamber having its smaller end directed toward the furnace, an air-deflecting plate at the larger end of the mixing chamber and between the burner tip and said chamber, a casing surrounding the burner and air-deflecting plate, said casing having openings for the admission of air for combustion, means for controlling the volume of entering air, and means for adjusting said deflecting plate and burner longitudinally of the axis of the latter and within said mixing chamber.

7. In an oil-burning apparatus, the combination of a burner, an air-deflecting plate having a central opening and comprising a plurality of blades spaced apart to provide apertures for the admission of air, said blades being inclined to give the air a whirling motion, a cone-shaped mixing chamber having its smaller end directed toward the furnace, means for adjusting said plate and burner along the axis of the latter and within said mixing chamber, a casing surrounding said burner and plate, and means for admitting air for combustion to said casing.

8. In an oil-burning apparatus, the combination of a burner, an air-deflecting plate having means to impart a whirling motion to the air and secured to said burner, a mixing chamber between said plate and the furnace, and means for adjusting said plate and burner along the axis of the latter within said chamber toward and away from the furnace.

9. In an oil-burning apparatus, the combination of a burner, an air-deflecting plate having means to impart a whirling motion to the air and secured to said burner, a cone-shaped mixing chamber having its smaller end directed toward the furnace, and means for adjusting said plate and burner along the axis of the latter within said chamber toward and away from the furnace.

10. In an oil-burning apparatus, the combination of a burner, an air-deflecting plate secured to said burner, a mixing chamber between said plate and the furnace, said chamber having blades on its inner walls to direct the main supply of air into the atomized oil, and means for adjusting said plate and burner along the axis of the latter within said chamber toward and away from the furnace.

11. In an oil-burning apparatus, the combination of a burner, an air-deflecting plate having means to impart a whirling motion to the air and secured to said burner, a mixing chamber between said plate and the furnace, said air-deflecting plate being at the

larger end of said mixing chamber and of
less diameter than the diameter of the
smaller end of the mixing chamber, and
means for adjusting said plate and burner
5 along the axis of the latter within said cham-
ber toward and away from the furnace.

In testimony whereof I have hereunto

signed my name in the presence of two
subscribing witnesses.

THOMAS B. STILLMAN, JR.

Witnesses:

M. E. McNinch,
CHARLES A. JONES.