

March 15, 1932.

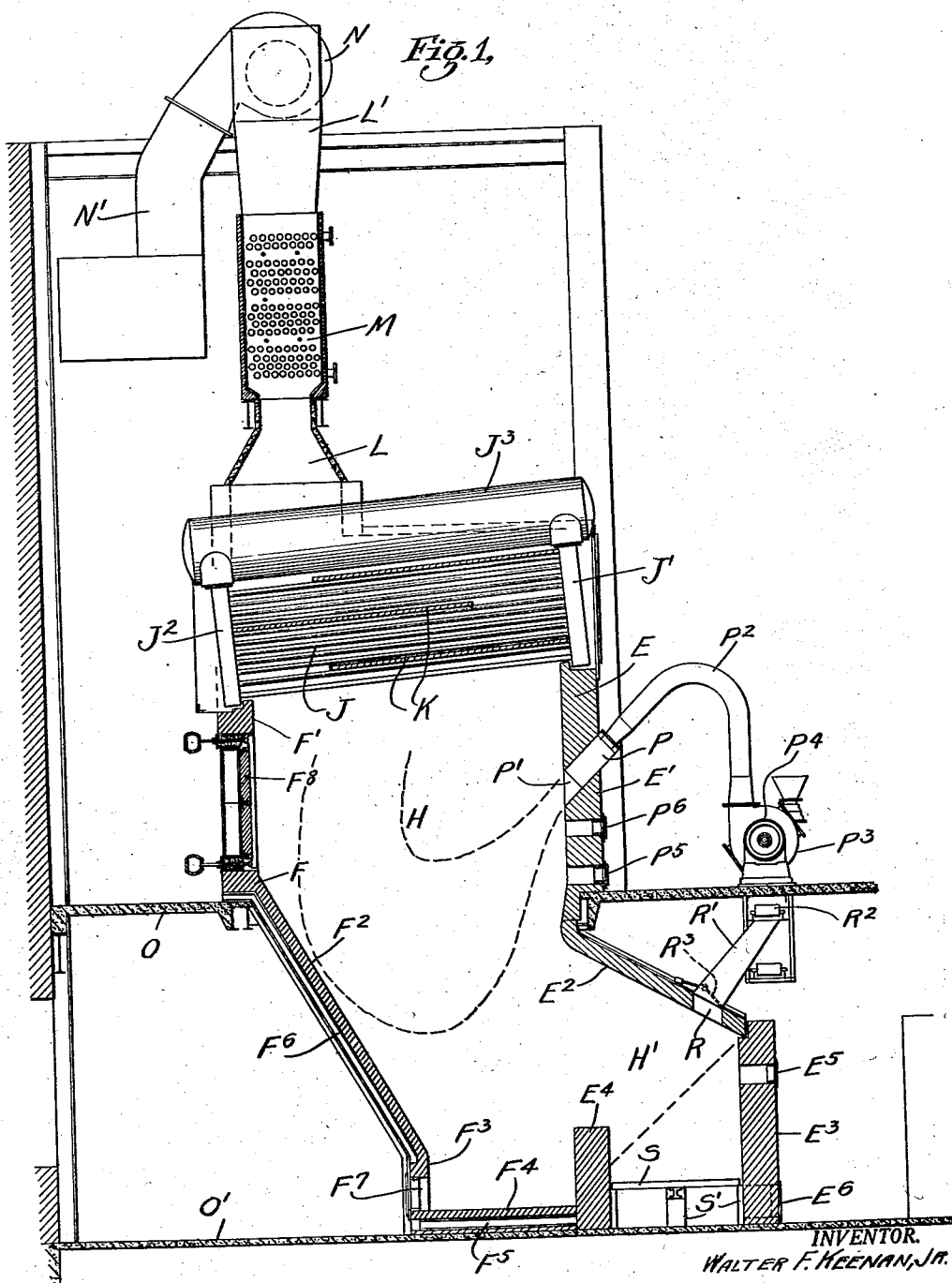
W. F. KEENAN, JR

1,849,095

COMBINATION FURNACE

Filed July 5, 1928

2 Sheets-Sheet 1



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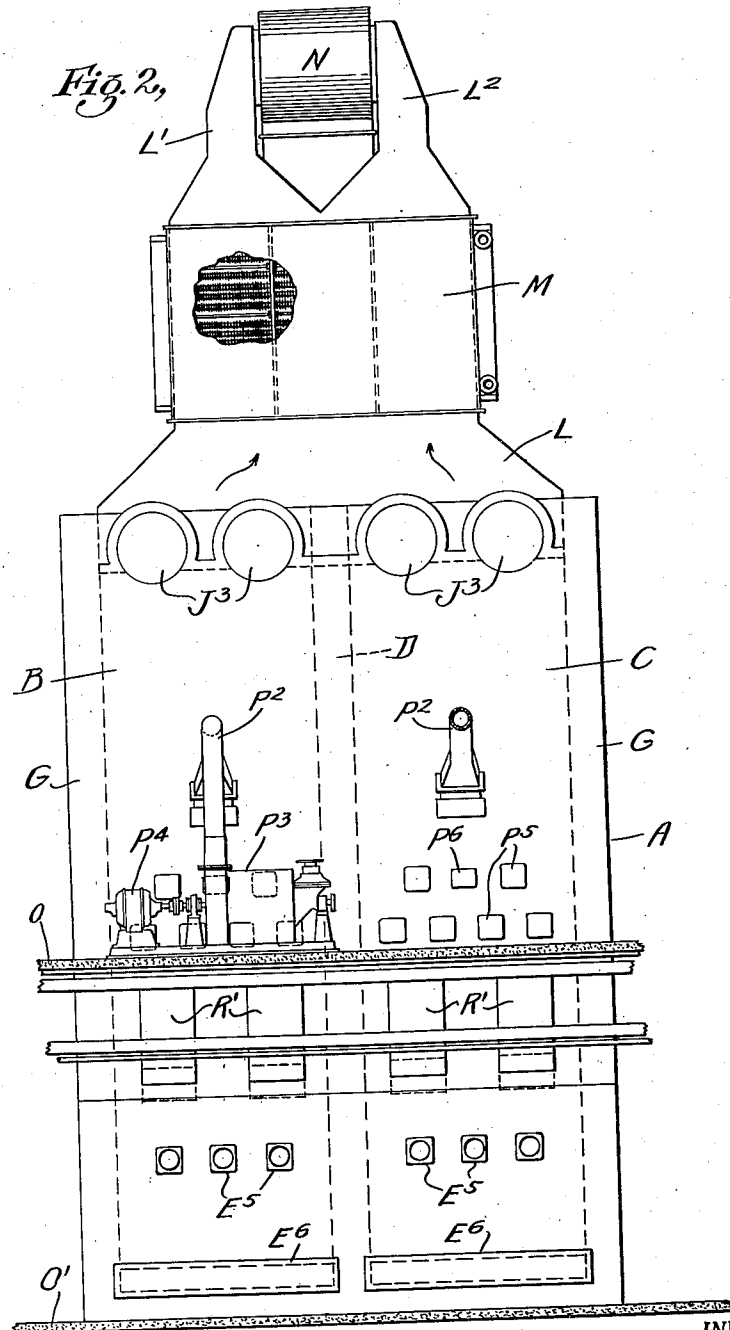
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COMBINATION FURNACE

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

PAUL VAN CLEEF, OF CHICAGO, ILLINOIS.

COLLAPSIBLE TUBE.

1,125,773.

Specification of Letters Patent.

Patented Jan. 19, 1915.

Application filed February 18, 1914. Serial No. 819,376.

To all whom it may concern:

Be it known that I, PAUL VAN CLEEF, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Collapsible Tubes, of which the following is a specification.

The present invention has reference to certain improvements in collapsible tubes.

10 The main object of the invention is to reinforce or stiffen or strengthen the lower end of the tube to enable the same to withstand the hydrostatic pressure resulting when the tube is squeezed to expel its contents, which may be paste, cement, or any other substance, or which may be due to expansion of the liquid caused by an elevation of temperature.

20 The features of the present invention are particularly useful in connection with that type or form of collapsible tube which is made from seamless tubing—that is, a tubing which is not seamed along its side, but those novel features are not limited to such a use, nor to a combination with only such a form of tube.

30 The collapsible tubes to which the disclosures of the present invention are particularly applicable have one end closed by bending the metal back on itself one or more times to produce a fold constituting what is hereinafter termed the closed end. When a hydrostatic pressure is developed in such a tube to expel the contents through its delivery end, a tendency also arises for this pressure to unfold the end portion, and therefore when subject to an excess of pressure such tubes are liable to open or unfold at their closed ends. The main object of the present invention is to reinforce or strengthen this closed end by crimping or corrugating the folds of the metal so as to impart thereto a greater stiffness in the direction in which the unfolding pressure is exerted. At the same time another object is to improve the appearance of this closed end of the tube by means of this crimping, thereby obtaining an additional beneficial result.

45 Other objects and uses will appear from a detailed description of the invention, which consists in the features of construction and

combinations of parts hereinafter described and claimed.

In the drawing—Figure 1 shows a side view of a complete tube looking toward the front of the folded portion, this portion being provided with one form of crimp; Fig. 2 shows a section taken on the line 2—2 of Fig. 1 looking in the direction of the arrows; Fig. 3 is a view looking toward the front of the lower portion of the fold of the tube provided with a modified form of crimp; Fig. 4 is a section taken on the line 4—4 of Fig. 3 looking in the direction of the arrows; Fig. 5 is a side view of the folded portion of a tube provided with another modification of crimp; Fig. 6 is a bottom view of the tube shown in Fig. 5; and Fig. 7 is a section taken on the line 7—7 of Fig. 1 looking in the direction of the arrows.

70 The tube illustrated in the drawing is made up from a continuous seamless metallic body 8, which has its lower end 9 folded or bent over a desired number of times to provide an effective closure therefor. One form of this fold is shown in Fig. 7, wherein a complete double fold is illustrated. In providing this folded closure the metal of the tube body is tapered down from both sides as at 10, with the result that the bottom or closed end of the tube is comparatively flat, as best shown in Fig. 7.

85 When the material contained within the tube is to be expelled the cap 11 is removed from the delivery end, and the body portion is squeezed to create the desired hydrostatic pressure. This pressure is exerted uniformly on all equal areas of the containing vessel, including the bottom portion 10, being exerted at right angles to the surface at every point. Inasmuch as the bottom or closed end of the tube is not perfectly flat, it follows that there will be a tendency for the portions 12 and 13 of the bottom of the tube to push away from each other on account of the fact that they lie at an angle to each other. There will also be a tendency for the liquid or other plastic contents to work its way down and into the crack or seam 14 along the inner edge of the fold. This latter action will be augmented or enhanced by the tendency for the portions 12

main combustion chamber H and a long flaming fuel, such as wood refuse, in the auxiliary combustion chamber H'. With this purpose in mind, I have provided a fuel burner nozzle P arranged in an inclined passage P' in the front wall section E' for injecting a stream of finely divided fuel into the main combustion chamber. The nozzle P is connected at its outer end to a conduit P² conveying powdered coal from a fuel pulverizer P³ driven by an electric motor P⁴. The pulverizer and motor are mounted on the floor O, as shown. Air inlet ports P⁵ are arranged in the wall section E' below the nozzle inlet for introducing the combustion supporting air. An ignition door P⁶ is also provided directly below the nozzle P and through which a torch or other igniting means may be inserted for initially firing the combustible mixture.

The fuel jet expands in the manner illustrated by the broken lines in Fig. 1 and the heated gases pass upwardly into the tube bank. The solid products of combustion drop either directly to the ash receiving floor F⁴ or onto the inclined wall section F² from which they pass by gravity to the floor F⁴. The floor F⁴ and wall section F² are provided with air passages F⁵ and F⁶, respectively, for preventing the formation of slag. Doors F⁷ are provided in the lower wall section F³ through which the ashes can be removed. A radiant heat absorbing steam superheater F⁸ comprising a plurality of parallel tubular elements connected to external headers is arranged at the inner side of the wall section F'.

The provisions for introducing and burning wood refuse in each auxiliary combustion chamber H' comprise horizontally spaced fuel inlet openings R in the lower part of the inclined wall section E². Each wall opening R is connected by an inclined chute R' to the upper run of an endless conveyor R² extending transversely of the steam generator unit A. Suitable means are arranged for discharging the fuel from the conveyor buckets into each fuel chute R'. The lower end of each chute is closed by a counterweighted gate R³ adapted to be operated from the lower floor O'.

The fuel allowed to pass through the openings R falls onto a horizontal grate S mounted on suitable supports S' resting on the floor O'. The grate S extends from a point on the bridge wall E⁴, preferably less than half the height thereof, to the front wall section E³. Air inlet openings (not shown) are connected to the space below the grate. Air inlet ports E⁵ are also arranged in the upper part of the wall section E³ for the entrance of combustion supporting air. Doors E⁶ provide access to the space below the grate S for removing ashes accumulating therein. The refuse is preferably piled on the grate S to the

height indicated by the inclined broken line in Fig. 1.

With the apparatus arranged as described the wood refuse is effectively burned with a large percentage of excess air around the point where the refuse flames enter the main combustion chamber. This is particularly advantageous as a large quantity of air is required for ignition and combustion of the powdered fuel at this point.

The combination furnace of my invention is characterized by the high combustion efficiency occurring when the powdered fuel and wood refuse are burned simultaneously and when either is burned alone. The location of the wood burning furnace gives a long length of flame travel for the high volatile long flaming wood refuse. This is especially effective when both fuels are burned as the two flames meet in the main combustion chamber and assist each other in maintaining a high combustion efficiency. The arrangement is further characterized by the fact that the ash resulting from the combustion in the main chamber deposits in a separate ash receiving space and not into the auxiliary chamber to interfere with the combustion of the wood therein. The combustion chambers are so arranged that either the powdered fuel or wood refuse may be burned alone with a high combustion efficiency. When powdered fuel is burned alone, the transverse bridge wall protects the grate from destruction by the radiant heat of the fuel burning in suspension.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of my invention as set forth in the appended claims and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

Having now described my invention what I claim as new and desire to secure by Letters Patent, is:

1. A combination furnace comprising in combination a vertically elongated main combustion chamber of substantial volume having vertical front and rear wall sections, means in one of said walls for injecting fuel into said main combustion chamber to be burned in suspension therein, an auxiliary combustion chamber having an inclined top wall, the upper end of which extends towards said main combustion chamber into contact with said vertical front wall section, and opening at one side to the lower portion of said main combustion chamber, a grate located in the lower part of said auxiliary chamber, and a bridge wall extending vertically between said

grate and said main combustion chamber, arranged to protect said grate from the radiant heat of the fuel burning in suspension in said main chamber.

2. A combination furnace comprising a main combustion chamber having front and rear vertical walls, means mounted in one of said walls for injecting fuel into said main chamber, an ash pit at the bottom of said main chamber, an auxiliary combustion chamber below and at one side of said main chamber, a grate in the lower part of said auxiliary chamber, means for passing a second fuel onto said grate, an ash pit below said grate and a vertically extending bridge wall partially separating said combustion chambers and in approximate alignment with said front wall.

3. A combination furnace comprising in combination a main combustion chamber having vertical front and rear wall sections, a downwardly inclined powdered fuel nozzle mounted in said front wall section, an inclined rear wall in the lower part of said chamber, an ash receiving space at the bottom of said inclined wall, an auxiliary combustion chamber in front of and connected to the lower portion of said main chamber, a grate mounted in said auxiliary chamber, means for introducing fuel into the upper part of said auxiliary chamber, an ash receiving space below said grate, and a transverse bridge wall mounted between said ash receiving spaces and in approximate vertical alignment with the front wall of said main combustion chamber.

4. A combination furnace comprising a main combustion chamber having front and rear vertical wall sections, means for burning finely divided fuel in suspension in said main chamber, an ash receiving space at the bottom of said main chamber, an auxiliary combustion chamber below and in front of said main chamber, a bridge wall partially separating said chambers, means for burning a long flaming fuel in said auxiliary chamber, and means for introducing a high percentage of excess air into the upper part of said auxiliary chamber, whereby sufficient air for complete combustion of said finely divided fuel is present where the burning gases from said auxiliary chamber meet the fuel burning in suspension in said main chamber.

5. In a steam generating installation comprising a main combustion chamber having vertically arranged enclosing walls and a comminuted fuel supply nozzle located in one of said walls, and an auxiliary combustion chamber arranged below and at one side of said main chamber and having walls defining the same and means for receiving and burning a long flaming fuel in said auxiliary chamber, the improvement which consists in supporting the main chamber vertical walls

at the normal boiler room floor level and said auxiliary chamber walls at a lower floor level, and connecting the walls of said chambers into a continuous wall structure.

6. In a steam generating installation comprising a main combustion chamber having vertically arranged enclosing walls and a comminuted fuel supply nozzle located in one of said walls, and an auxiliary combustion chamber arranged below and at one side of said main chamber and having walls defining the same and means for receiving and burning a long flaming fuel in said auxiliary chamber, the improvement which consists in supporting the main chamber vertical walls at the normal boiler room floor level and said auxiliary chamber walls at a lower floor level, connecting the walls of said chambers into a continuous wall structure, and arranging means for conveying fuel to said auxiliary chamber on the underside of said boiler room floor.

Signed at New York city, in the county of New York and State of New York, this 28th day of June, A. D. 1928.

WALTER F. KEENAN, Jr.