

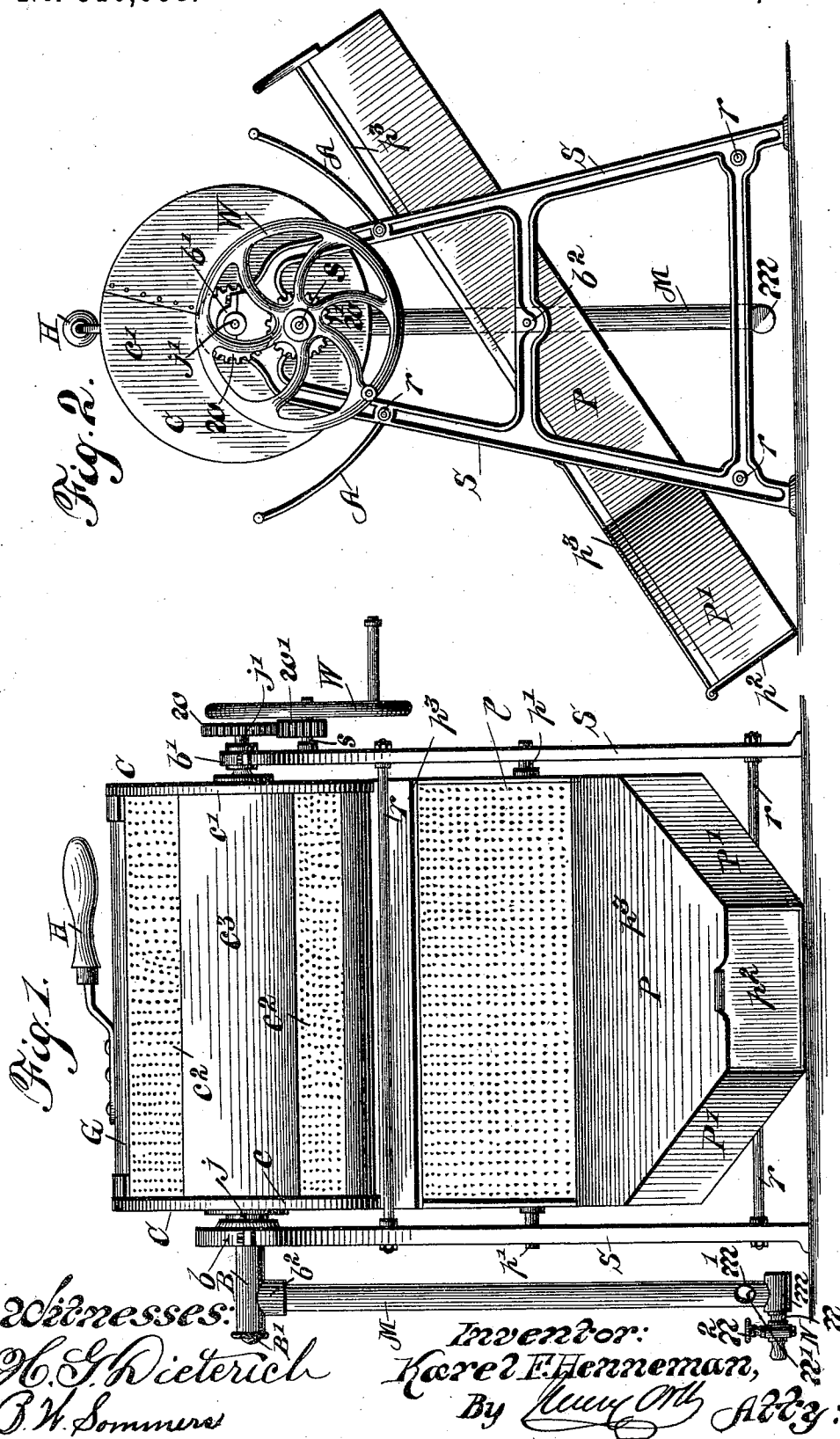
(No Model.)

2 Sheets—Sheet 1.

K. F. HENNEMAN.
GAS COFFEE ROASTER.

No. 510,068.

Patented Dec. 5, 1893.



Witnesses:
H. S. Dieterich
C. W. Sommers

Inventor:
K. F. Henneman,
By *Henry M. Atty*

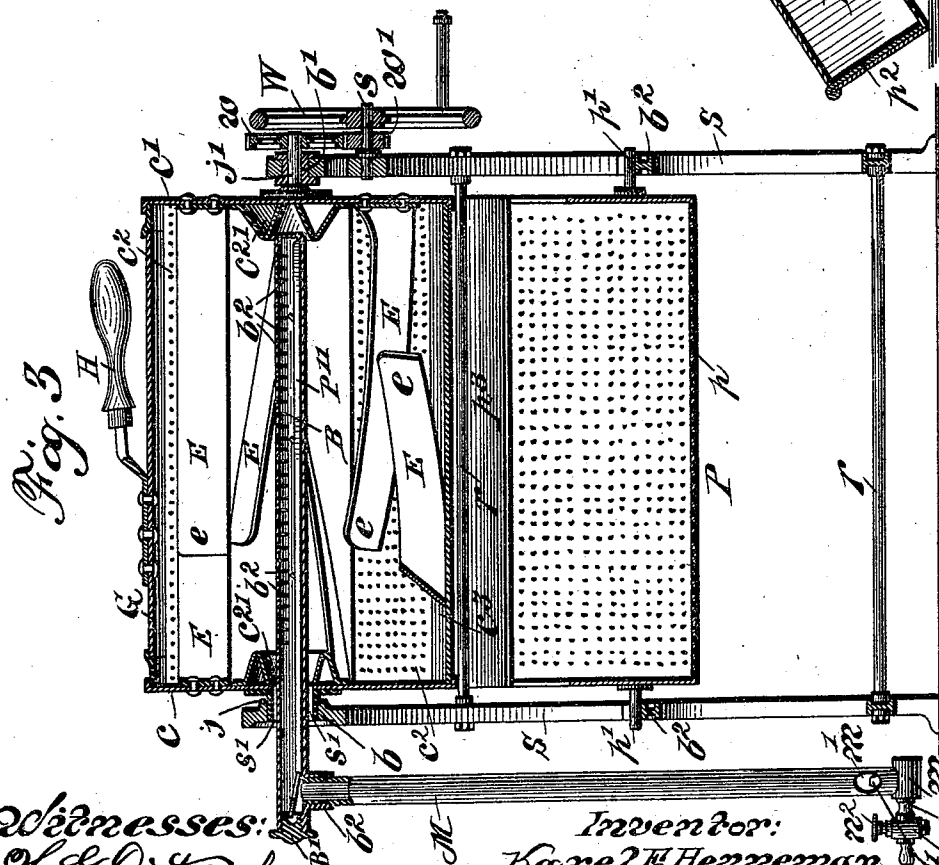
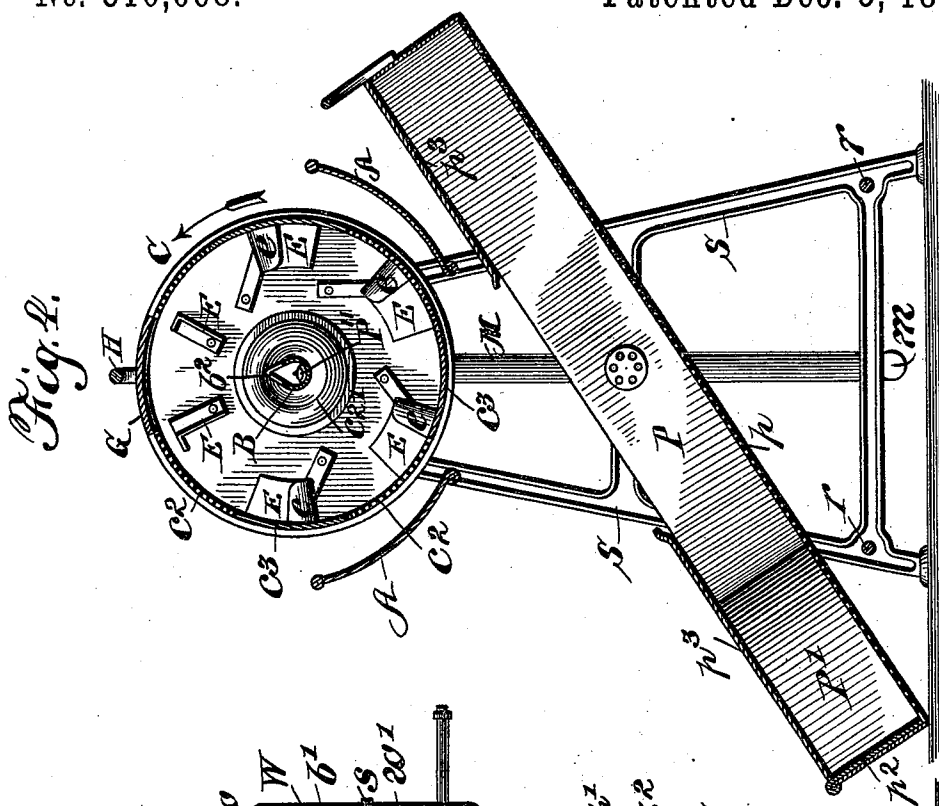
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UNITED STATES PATENT OFFICE.

KAREL FREDERIK HENNEMAN, OF THE HAGUE, NETHERLANDS.

GAS COFFEE-ROASTER.

SPECIFICATION forming part of Letters Patent No. 510,068, dated December 5, 1893.

Application filed January 26, 1893. Serial No. 459,923. (No model.) Patented in Spain August 23, 1888, No. 9,700; in Belgium May 27, 1889, No. 86,399; in France May 29, 1889, No. 198,600; in England June 7, 1889, No. 9,499; in Germany June 13, 1889, No. 53,885; in Austria-Hungary April 7, 1890, No. 49,006, and No. 8,873, and in Switzerland March 21, 1891, No. 3,417.

To all whom it may concern:

Be it known that I, KAREL FREDERIK HENNEMAN, a subject of the Queen of the Netherlands, residing at The Hague, in the Kingdom of the Netherlands, have invented certain new and useful Improvements in Gas Coffee-Roasters, (for which patents have been obtained in the following countries, to wit: England, No. 9,499, dated June 7, 1889; Germany, No. 53,885, dated June 13, 1889; Belgium, No. 86,399, dated May 27, 1889; Switzerland, No. 3,417, dated March 21, 1891; Spain, No. 9,700, dated August 23, 1888; France, No. 198,600, dated May 29, 1889, and Austria-Hungary, No. 49,006 and No. 8,873, dated April 7, 1890;) 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

My invention has relation to apparatus for torrefying granular substances, such as coffee, and like substances, and it has for its object the provision of means whereby said substances may be more uniformly, more effectually and expeditiously torrefied than has been the case in apparatus of usual and well-known construction.

To these ends the invention consists in structural features and combinations of co-operative elements as will now be fully described, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation; Fig. 2 an end elevation; Fig. 3 a longitudinal sectional view, and Fig. 4 a sectional end elevation of a torrefying apparatus embodying my invention.

The apparatus comprises a revoluble vessel for the reception of the material to be torrefied, a source of heat supply consisting of a multi-jet gas burner constructed on the principle of the Bunsen burner, and hereinafter referred to as multi-jet Bunsen burner, the jet pipe whereof extends axially into the torrefying vessel from one end thereof, to, or practically to the other, the burner pipe being pro-

vided with closely arranged transverse fish tail burner jet slots or slits, so that a broad and practically solid mass or body of flame is obtained that extends across the burner pipe and fills or nearly fills the upper portion of the vessel. The object of using a Bunsen burner is to obtain a smokeless flame and avoid the deposition of unconsumed carbon upon the material to be torrefied.

The apparatus further comprises a suitable supporting frame for the torrefactor or roaster, means for revolving the same, and a receiver for the reception and cooling of the torrefied material. Any suitable support for the torrefying vessel may be provided. In the drawings I have shown two standards, S, S, provided with bearings, b, b' , for the journals, j, j' , of the torrefying or roasting vessel, C, said standards being coupled or connected together by means of brace or tie rods, r, r . In said standards are also formed bearings, b^2, b^2 , below the bearings, b, b' , for the journals of a pan, P, into which the roasted material is dumped and cooled, and said pan is provided with a perforated bottom, p , for the admission of air, so that by rocking the pan on its journals, p' , the roasted coffee is agitated or caused to roll from one end of the pan to the other, and cooled by the air passing through the perforated bottom. As shown in Fig. 4, the journals p' of the pan P are not located midway between its ends, so that the pan will normally lie in a plane inclined to the horizontal, the preponderating end of the pan being constructed with converging sides, to form a discharge throat P' , Fig. 1, that is normally closed by a gate, p^2 , so that the contents of the pan P may be readily discharged.

The vessel C, intended for the reception of the material to be torrefied is preferably of cylindrical form in cross section, and constructed of sheet metal, the sheet metal for the cylindrical shell or body being perforated, or said shell or body may be constructed of alternate longitudinal perforate and imperforate sections, c^2, c^3 , respectively, as shown in Figs. 1 and 3. The head, c' of the vessel, C, has a solid journal, j' , that is revoluble in the bearing, b' , in one of the standards, S, said

journal having secured thereto a gear wheel, w , that meshes with a like wheel, w' on a short spindle, s , secured to one of the standards, S , said wheel w' being revoluble with a hand wheel, W . The said hand wheel, W , may, however, be secured to the journal, j' , of cylinder, C , or in lieu thereof, a belt pulley or a driven gear may be secured to the said journal, j' , or to the counter shaft or spindle, s , according as the vessel, C , is to be revolved by hand or other power. The head c , of the vessel C , is provided with a tubular journal j , that is adapted to revolve in bearing, b , in one of the standards, S , and through said journal extends a multi-jet burner tube B , that is of ovoidal or prismatic form in cross section, the tapering portion forming an acute angle as shown in Fig. 4, said tube having transverse slits, b^2 , cut through the apex to about the transverse center plane of the tube, so as to produce a burner orifice and flame similar to that of the so-called fish tail burner, whereby a broad flame is produced. These slits, b^2 , as shown in Fig. 3, are sufficiently close together to produce a substantially compact body of flame extending the full length of the burner tube, B , and vessel, C , which, as shown, projects from one head, c , of said vessel, nearly to the opposite head, c' , each of which heads has an annular hollow cone, c^{21} , encompassing and projecting over the burner tube, said cone directing the material to be torrefied onto said tube. By constructing the burner tube as described a lodgment thereon of material to be torrefied is effectually avoided, and a sheet of flame obtained that extends across and substantially fills the upper portion of the vessel, C , thus insuring the contact of the material elevated, as hereinafter described, with the torrefying flame, and materially expediting the operation of torrefaction.

The burner tube, B , passes loosely through the hollow journal, j , of the vessel, C . In fact, the said journal is preferably made of such interior diameter as to leave an annular space, s' , around the burner tube, as shown in Fig. 3, through which space air is drawn into the vessel, C , that not only assists in the combustion of the gas, but produces a draft through said vessel, the tendency of which is to rapidly carry off the vapors and prevent sweating.

The burner tube, B , is closed at one end and open at the other, said open end being normally closed by a screw plug or screw cap, B' , and within the tube is placed a shallow pan, P'' , for the reception of unconsumed carbon and calcined or burned shells or skins of the material roasted that may find access to the interior of the tube through the burner orifices b , either during or after the process of torrefaction. The said burner tube has a coupling branch, b^2 , to which is screwed a vertical pipe, M , whose lower end is connected with a horizontal branch, m , in which is located the corresponding branch of a jet nozzle N , the horizontal branch, n , of the jet

nozzle, N , being provided with a stop-cock, n^2 , and a nipple, n' , to which a rubber pipe can be secured for connection with a gas supply pipe, or the said nozzle branch, n , may be connected directly with a suitable gas supply. Opposite the jet nozzle the vertical pipe, M , is provided with air inlet ports, m' , the said pipe, M , constituting the mixing chamber wherein a sufficient volume of atmospheric air is mixed with the gas entering said pipe to produce a smokeless flame at the burner orifices, b^2 , the combustion of the gas being materially assisted by the air admitted to the vessel, C , through its hollow journal, j , the burner pipe, B , the mixing chamber, M , and jet nozzle, N , operating on the principle of a Bunsen burner. Within the vessel, C , and secured to the heads, c, c' , thereof I arrange elevating buckets E , a bucket projecting from one head extending between two buckets projecting from the opposite head. These buckets may be arranged parallel to one another, but I prefer to arrange them so as to alternately incline from a plane with the axis of the burner tube, B , for the purpose of delivering the material in a thin sheet into the burner flame. As shown, the buckets have their edges parallel, but they may be alternately tapered from opposite ends, and produce the same results as the inclined parallel edged buckets above referred to. The outer end, e , of the buckets is recurved in a direction opposite to the direction of rotation of the vessel C , as shown in Fig. 4, where said direction of rotation is indicated by an arrow, and as arranged, said buckets will take up but a comparatively small amount of material and deliver the same in the form of a thin sheet into the torrefying flame. Any other suitably constructed and arranged elevating buckets that will perform the same function, may, however, be employed.

The vessel, C , is provided with a suitable charging and discharging orifice normally closed by a gate, G , which may either be hinged to the body of the cylinder, or arranged as shown to slide longitudinally in suitable guide ways, as is usual, in which case said gate is provided with a handle, H . In order that the torrefied material may be directed into the pan P , which is preferably partly closed at top, as shown at p^3, p^3 , to prevent the roasted material from being tossed out when the pan is rocked on its journals for the purpose of cooling the said material, I provide curved directing wings, A , not shown in Fig. 1, but shown in Figs. 2 and 4, that perform the function of a hopper.

From what has been said the operation of the apparatus will readily be understood, and will therefore need no further description.

I have described the torrefying vessel as of cylindrical form in cross section and provided with elevating buckets of peculiar construction. It will be understood, however, that I do not desire to limit myself to this form of

vessel, as said vessel may be constructed in the form of a polygon in cross section, as for instance in the form of a pentagon or hexagon.

I am aware that it has been proposed to torrefy granular substances by subjecting the same to the direct action of a substantially smokeless torrefying flame issuing either from a fixed burner or from a burner revoluble with the torrefactor, the burner consisting simply of a pipe extending into the revoluble torrefactor and having perforations arranged at considerable distances apart about its periphery. It will readily be seen that with a burner of this construction a large proportion of the gaseous fuel is lost, whether the burner is stationary or revolves with the torrefactor, and that it is impossible to obtain a compact sheet or mass of flame extending across the upper portion of the torrefactor the full length thereof and filling or substantially filling said upper portion.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. In a torrefying apparatus, a revoluble

vessel provided with draft ports, and centrally of each head with an inwardly projecting hollow cone, in combination with a multi-jet Bunsen burner extending through one of said cones to or slightly into the opposite cone, and elevating buckets revoluble with the vessel for delivering the material to be torrefied into the burner flame, for the purpose set forth.

2. In a torrefying apparatus, a revoluble vessel provided with draft ports, a multi-jet Bunsen burner arranged axially within the vessel, said burner consisting of a pipe open at one end and provided with burner orifices, and a screw-plug for closing the open end of the pipe, in combination with a pan of the same length as the burner pipe and contained therein, for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

KAREL FREDERIK HENNEMAN.

Witnesses:

D. DUNBAR,
U. D. GARDNER.