

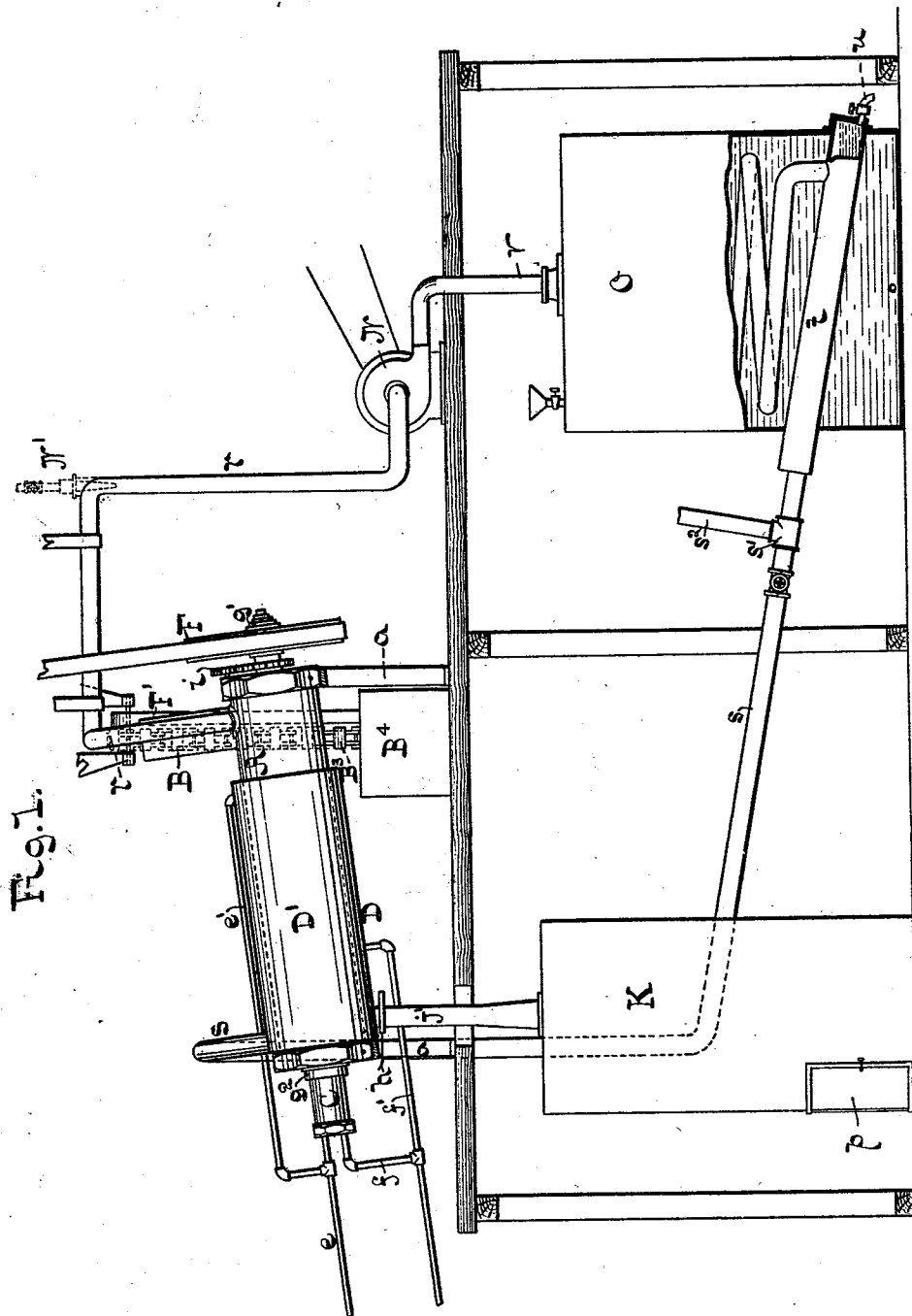
(No Model.)

2 Sheets—Sheet 1.

G. L. JAEGER.
APPARATUS FOR TORREFYING HOPS.

No. 514,265.

Patented Feb. 6, 1894.



WITNESSES:
Klas H. Tennstedt
J. J. Malle

INVENTOR:
Gustav L. Jaeger
BY *A. Faber du Ruyff*
ATTORNEY

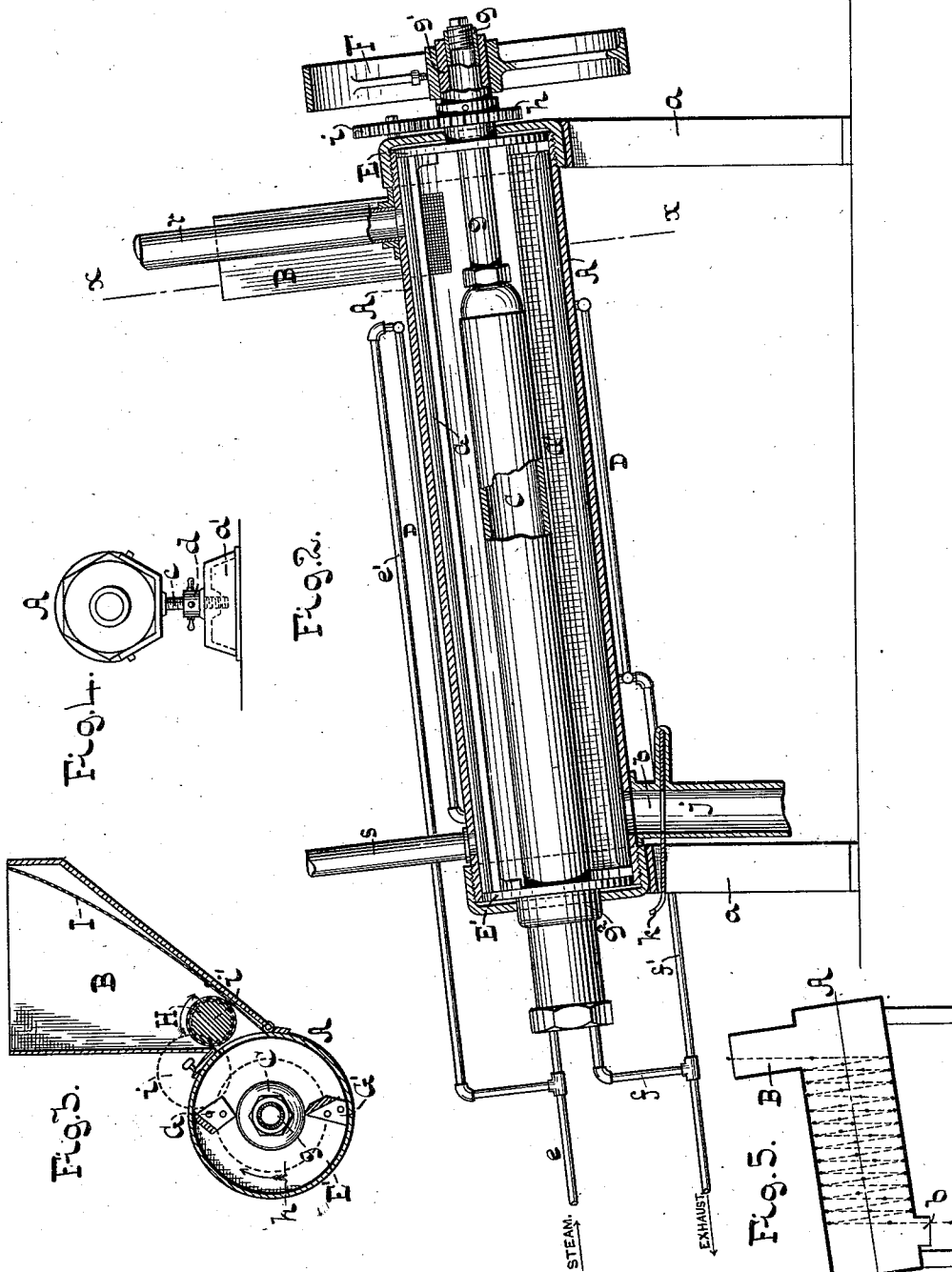
(No Model.)

2 Sheets—Sheet 2.

G. L. JAEGER.
APPARATUS FOR TORREFYING HOPS.

No. 514,265.

Patented Feb. 6, 1894.



WITNESSES:
Klas A. Fernstedt
J. J. Walle

INVENTOR:
Gustav L. Jaeger
Araker duRoi
BY ATTY

UNITED STATES PATENT OFFICE.

GUSTAV L. JAEGER, OF MAYWOOD, NEW JERSEY, ASSIGNOR TO THE BREW-
ING IMPROVEMENT COMPANY, OF SAME PLACE.

APPARATUS FOR TORREFYING HOPS.

SPECIFICATION forming part of Letters Patent No. 514,265, dated February 6, 1894.

Application filed March 2, 1892. Serial No. 423,501. (No model.)

To all whom it may concern:

Be it known that I, GUSTAV L. JAEGER, a citizen of the United States, and a resident of Maywood, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Torrefying Hops, of which the following is a specification.

My invention has reference to apparatus for torrefying hops and it consists in certain novel features as fully pointed out in the following specification and claims and illustrated in the accompanying drawings, in which—

Figure 1 represents a sectional side elevation of an apparatus for torrefying hops and collecting the vapors, constructed according to my invention. Fig. 2 is a longitudinal central section of the torrefying machine drawn to a larger scale than the preceding figure. Fig. 3 is a vertical section in the plane $x x$, Fig. 2. Fig. 4 is an end elevation of the machine, showing means for adjusting the inclination of the receptacle. Fig. 5 is a diagram illustrating the path of the contents of the receptacle.

Similar letters indicate corresponding parts throughout the several views.

In these drawings, referring at present to Figs. 2 and 3, the letter A designates a closed cylindrical receptacle mounted upon and secured to standards $a a$. At one end of the receptacle is placed a suitable hopper B for introducing the hops to be torrefied, and at the opposite end is formed a discharge opening b , which latter may be controlled by a suitable gate k . The receptacle is placed in an inclined position and if desired the inclination may be made adjustable by the use of any suitable means, such for instance as shown in Fig. 4 by employing a screw spindle c engaged by a nut d bearing on the standard a' .

C is a steam drum placed centrally within the receptacle A, and D a steam jacket or coil surrounding the exterior of the same. At some distance (a foot or more) from the charging end of the receptacle the diameter of the steam drum is reduced, or a smaller pipe g having its outer end closed is made to form a prolongation of the same, with the object of obtaining more space for the intro-

duction of the hops and less heating surface at this end. The steam coil D terminates at about the same distance from the receiving end as does the drum C. Live steam is conducted to the steam drum and to the coil by a pipe e and branch e' , and the exhaust is led away by pipes f and f' . A jacket D' (Fig. 1) may be placed about the coil D if desired.

E and E' are circular disks nearly equal in diameter to the receptacle A and arranged in close proximity to the opposite heads thereof. Said disks are respectively provided with hubs $g' g^2$ extending through the opposite heads of the receptacle and free to rotate, the one E' on the drum C and the other E upon the reduced portion g thereof. The hubs being fitted closely to the respective portions of the drum, a practically gas tight joint is formed without the use of stuffing boxes. The hub g' has mounted thereon a pulley F, for imparting a rotary motion to the disk E. The disks E E' are connected by flat bars G and G' extending across the receptacle, the one G being arranged close to the inner wall of the receptacle and the other G' close to the outer wall of the drum. The bar G in its revolutions lifts the mass which enters at the hopper B repeatedly from the bottom of the receptacle to or near the top of the same and then drops it, and consequently in virtue of the receptacle being placed in an inclined position the mass is fed a step toward the discharge opening a by each revolution of the said bar. This forward feed can best be understood from the diagram shown in Fig. 5, which delineates the course of a particle in the receptacle, and in which diagram the lines at right angles to the center line indicate the curved upward course of the particle and the vertical lines the downward course of the same. The bar G' acts in a similar manner to the bar G, and also serves to scrape and remove the mass from the surface of the drum. The two bars in conjunction keep the mass well agitated at all times.

The hopper B is provided with a feed roll H bearing against a pivoted plate I and both have their contact surfaces covered, by preference, with a wire screen of wide mesh for breaking up the hops, or in lieu thereof both surfaces may be made rough. The roll H is rotated

in the proper direction by a gear connection *h*, *i* and *i'* with the hub *g'*.

The hops are fed to the hopper by any suitable form of conveyer, for instance as shown in Fig. 1, a conveyer *B*³ similar to a grain conveyer is made use of, the same being actuated by a belt *F'* and pulley to lift the hops from a bin *B*⁴ and discharge the same into the hopper.

In the operation of the torrefier the speed at which the agitating and feeding devices *G* *G'* are driven is so regulated that the hops when discharged are thoroughly torrefied, or the size of the discharge opening may be adjusted to produce the same effect, and the conveyer *B*³ is accordingly adjusted to deliver the corresponding amount into the hopper *B*, whereby the production of torrefied hops can be carried on without interruption. The final temperature to which the hops are exposed ranges from about 212° to 240° according to the age and other conditions of the hops under treatment and the desired degree of coloring for the product. The discharged hops fall through a pipe *j* into a receiving bin *K* (Fig. 1) from which they can be removed through door *p*.

From the above description it will be seen that owing to the construction of the apparatus and the incoming of cold hops, the hops are gradually fed, under constant agitation, over heated surfaces, whereby the same are gradually and thoroughly heated throughout, with the result that thoroughly and correctly torrefied hops are obtained. After torrefaction the hops may be extracted in a diffusion battery, or in suitable cookers.

For drawing off the vapors and gases arising in the torrefier and condensing the same, in order to collect the aromatic principle, a pipe *r* is led from the highest part of the receptacle *A* and conducted to a condenser *O*, from the inclosed collecting vessel *t* of which a return pipe *s* is led to the lowest part of the receptacle. A suitable suction pump *N* is used to establish a circulation, or in lieu thereof the upper portion of the pipe *r* may be cooled by a suitable water jacket, or a steam nozzle as *N'* (shown in dotted lines) may be introduced in the pipe *r*. A cock *u* in the collecting vessel *t*, serves to draw off the con-

densed vapors and gases. If desired the circuit through pipe *s* may be broken and the vapors discharged through a pipe *s*²,—the valve *s'* serving to cut out the pipe *s*, when closed.

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

1. The combination with a stationary inclined receptacle provided with a charging opening at its higher end and a discharge opening at its lower end, of a heating drum reduced in diameter at the charging end of the drum, and an agitating and feeding device consisting of two hubs extending through the heads of the receptacle and provided internally with disks arranged close to the heads, agitating bars connected with the two disks, the one being arranged obliquely to the periphery of the receptacle and the other obliquely to that of the drum, and means for rotating the hubs, substantially as and for the purpose set forth.

2. The combination with a cylindrical receptacle, of a feeding and agitating bar, and means as described for revolving the same, consisting of two hubs extending through the heads of the receptacle and having enlarged portions, or disks, located close to the opposite heads of the receptacle, and a pulley, or equivalent device, secured to one of the hubs,—all constructed to obtain substantially air-tight closures at the hubs, substantially as described.

3. The combination with a stationary inclined vessel of a central heating drum, and an agitating device comprising two substantially straight bars, the one being contiguous to the periphery of the receptacle and the other to the external periphery of the drum, combined with hubs extending through the heads of the receptacle, and connected with the bars, and means for rotating the hubs, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 15th day of February, 1892.

GUSTAV L. JAEGER.

Witnesses:

KLAS H. TERNSTEDT,
JOSEPH MALLE.