No. 616,292. Patented Dec. 20, 1898.

S. C. DAVIDSON.

APPARATUS FOR MOISTENING LEAF TOBACCO.

(Application filed July 24, 1897.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.

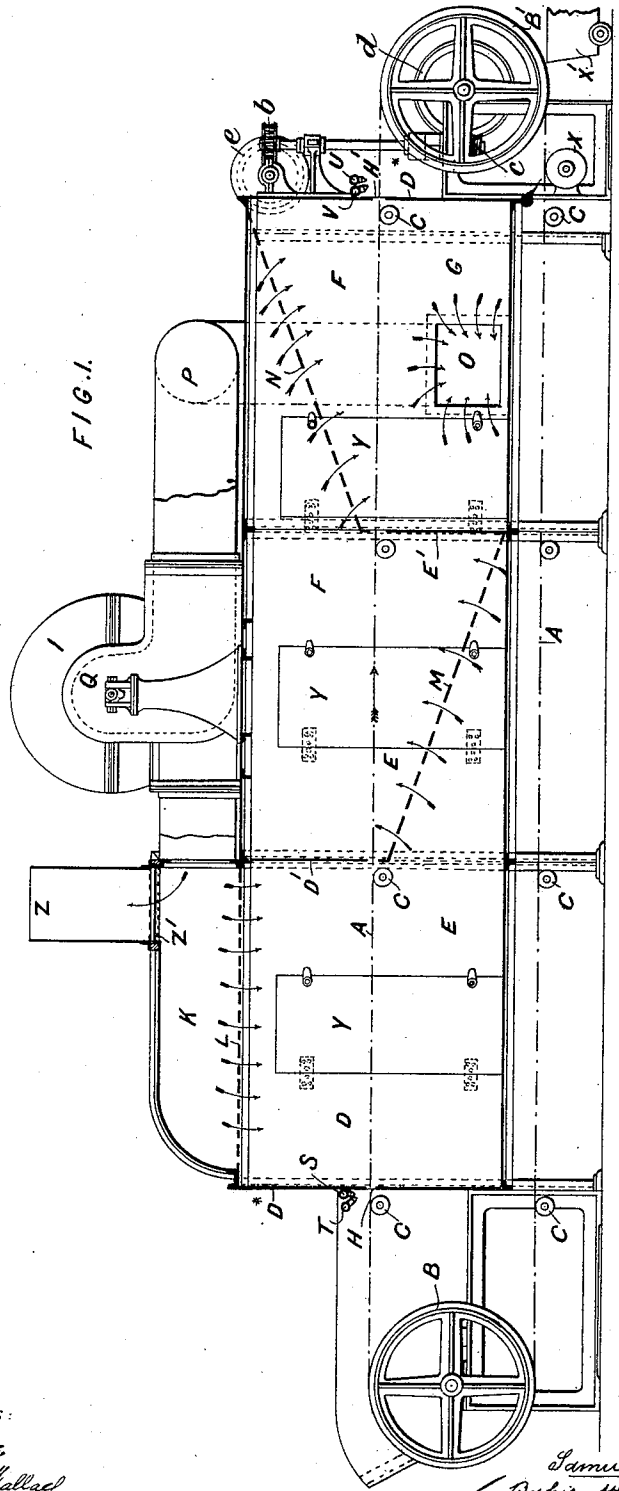

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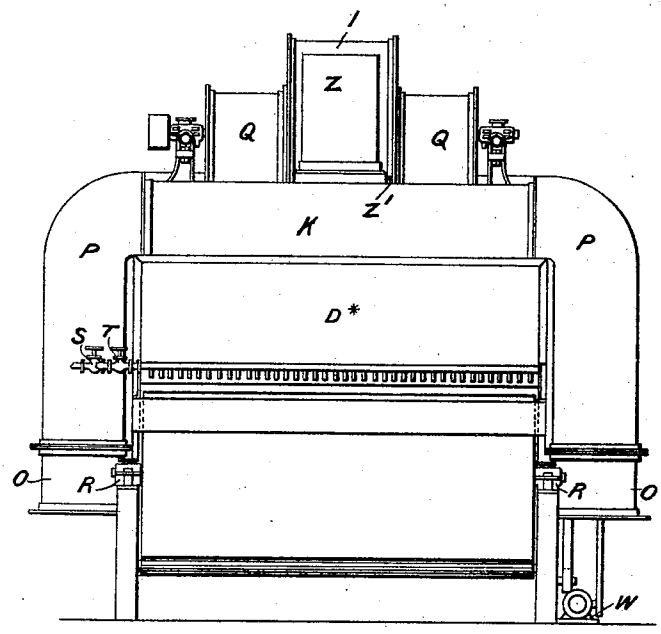
FIG. 2.



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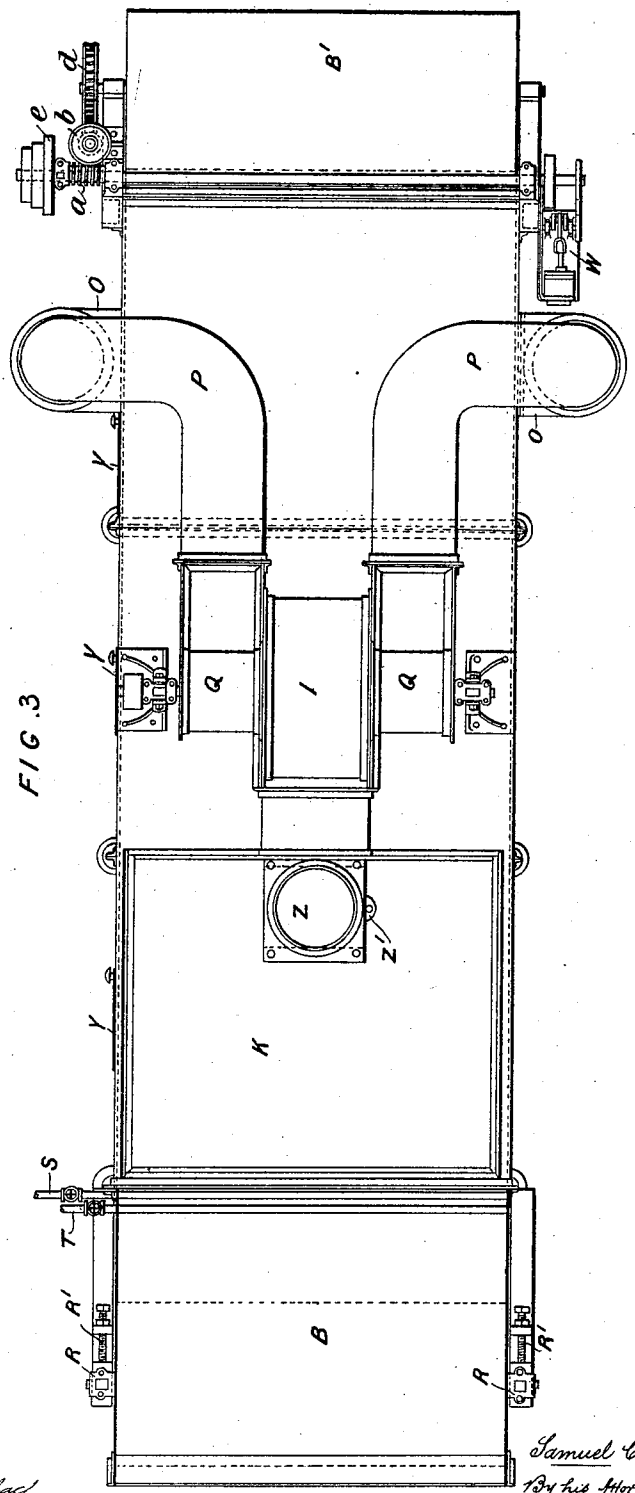

FIG. 3

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UNITED STATES PATENT OFFICE.

SAMUEL CLELAND DAVIDSON, OF BELFAST, IRELAND.

APPARATUS FOR MOISTENING LEAF-TOBACCO.

SPECIFICATION forming part of Letters Patent No. 616,292, dated December 20, 1898.

Application filed July 24, 1897. Serial No. 645,824. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL CLELAND DAVIDSON, merchant, of Sirocco Engineering Works, Belfast, Ireland, have invented certain new and useful Improvements in Apparatus for the Moistening and Softening or Ordering of Dried Tobacco-Leaf, (which invention is the subject of Letters Patent in Great Britain, No. 15,107, dated June 23, 1897; in India, No. 305 of 1897, dated February 9, 1898, and in Ceylon, No. 561, dated January 18, 1898,) of which the following is a specification.

This invention has reference to the moistening or softening or, as it is usually termed, the "ordering" of dried tobacco-leaf; and its chief object is to effect this operation more efficiently and expeditiously than when done by apparatus such as has hitherto been ordinarily used for this purpose.

The chief features of the invention are as applied to apparatus for the passing of a current of hot aqueous vapor or moist warm air for moistening the leaf twice or oftener through the leaf as this is being carried by a traveling web of foraminous material through a moistening-chamber, the current passing alternately downward and upward through the web; a special construction of the moistening-chamber whereby the said current is caused to follow a serpentine course, so as to pass through the web downward and upward alternately, and whereby the distribution of the current is approximately equalized over the whole area of the web; a special arrangement of ducts from the outlet end of the moistening-chamber to a fan and from this fan to the inlet end of the moistening-chamber, and the general construction and arrangement of the whole apparatus.

Having stated the chief features of the invention, I will now describe an apparatus in which the invention is embodied.

The body of the apparatus consists of a horizontal box or inclosure (herein termed the "moistening-chamber") mounted on a suitable stand or legs and its interior divided into upper and lower compartments by a traveling web of any suitable foraminous material, such as wire web, which is arranged to pass through said moistening-chamber from end to end and about midway between top and bottom. This web is mounted on a drum at each end and outside of the moistening-chamber, and its under stretch returns under the bottom and outside of the moistening-chamber. The upper and lower compartments of the moistening-chamber are also divided into subcompartments by means of cross-partitions so arranged alternately above and below the web that when a current of air, steam, or vapor is propelled or drawn from one end of the moistening-chamber to the other it passes alternately down and up as a serpentine-like current through the web, and in order to equalize the distribution of this current over the whole area of the web which is exposed thereto in each of these subcompartments formed by the cross-partitions a perforated and preferably inclined plate is inserted above or below the web, as the case may be, in which plate the total area of the perforations is adjusted, so that without throttling the current unduly about an equal speed of the current will be passing through each of the perforations.

To create the main current through the moistening-chamber, I employ a fan mounted, preferably, on the top of the moistening-chamber, and I lead one or more ducts to the inlet eye or eyes thereof from the last subcompartment below the delivery or outgoing end of the web, and I lead another duct from the nozzle of the fan to the subcompartment above the inlet or feed end of the web, so that if there were no openings in the moistening-chamber the same air would thus circulate continuously through it and back again through the fan; but as there are openings for the web and the material thereon to pass through, and as also fresh air is driven in along with the steam or vapor injected at the feed end of the web, I provide for the escape of an equivalent volume from the circulating current by having a relief pipe or chimney in the pressure-duct connecting the nozzle of the fan with the feed end of the moistening-chamber.

As it is necessary to use hot aqueous vapor or water spray at the beginning of the operation of moistening the leaf, I preferably employ jets of steam for this purpose and project same (with or without water added thereto from jets directed into and atomized into fine mist-like spray by the steam-jets, accord-

ing to the amount of moisture that may be necessary to add to the leaf) through a suitable opening into the subcompartment of the moistening-chamber which is above the feed end of the web, and the force of the steam blowing in through this opening carries with it a certain amount of fresh atmospheric air, notwithstanding that the circulating current from the fan is more or less under pressure in this subcompartment and would otherwise have a tendency to blow out through this opening; but the force of the steam-jets being greater than the outward pressure of the circulating current the steam and its accompanying fresh air therefore rush into the moistening-chamber.

At the delivery end of the web, and preferably after the leaf has come out of the moistening-chamber, I further apply to the leaf a cold aqueous spray, if more moisture be wanted in it, by jets of air under pressure blowing through jets of water, so as to atomize the water into a fine mist-like rain, which besides distributing this extra moisture perfectly evenly all over the leaf also cools and prevents it steaming after it comes out of the machine.

The web-drums may be driven in any suitable manner to give the web the proper speed of movement, and a revolving brush may be applied to the under side of the web at the delivery end to brush the web clean of any adhering leaf.

In working the machine the leaf to be moistened is fed onto the web at the feed end, the steam-jets are turned on with or without the additional water-jets, and the machine being then in motion the web carries the leaf through the moistening-chamber. The circulating current from the pressure-duct from the fan now mixes with the steam and the fresh air driven in therewith, and the mixture then passes down through the leaf on the web to the subcompartment below the web. As its passage along this subcompartment toward the exhaust-ports of the suction-ducts leading to the fan is blocked by the cross-partition forming the farther end of the first subcompartment below the web, (and which is double the length of the first subcompartment above,) the current now passes upward through a perforated plate and through the web and leaf thereon to the first half of the second upper subcompartment, then to the second half of this compartment, and through a second perforated plate and through the leaf and web to the second lower subcompartment. The current then passes into the suction duct or ducts to the fan, from whence it is again driven into recirculation through the pressure-duct from the fan-nozzle, minus a portion of the current equal to the amount of fresh air injected by the steam at the feed end and also drawn in by the fan-suction at the outlet end of the web, which excess portion of the current escapes through the relief-chimney from the pressure-duct. If when the leaf begins delivering out of the machine it is considered desirable to add a further amount of moisture, the compressed-air-jet spray of cold water may then be turned onto it to whatever extent may be required.

In the accompanying drawings, Figure 1 is a central longitudinal section, but with the fan shown in elevation, of an apparatus constructed in accordance with this invention. Fig. 2 is an elevation of the feed end of the apparatus. Fig. 3 is a plan of the apparatus.

A represents the woven-wire endless web carried upon the two revolving drums B B′ and supported between same by the rollers C.

D is the moistening-chamber, through which the upper portion of the wire web A travels in the direction indicated by the arrow. The said chamber is divided into upper and lower compartments by the web A, and these compartments are further divided into the subcompartments D, E, F, and G by the cross-partitions D′ and E′.

M and N are perforated inclined plates in the subcompartments E and F, respectively.

H and H′ are openings in the ends of the moistening-chamber for the entrance and exit, respectively, of the wire web.

Upon the moistening-chamber is mounted the fan I, delivering air into the pressure-duct K. The air from this duct passes down through the perforated plate L into the upper subcompartment D, down through the wire web A into the lower subcompartment E, and up through the perforated plate M, in the direction indicated by the arrows, into the upper subcompartment F, then down through the perforated plate N into the lower subcompartment G, and out through suction ports or openings O O in each side of the subcompartment G, and up through the return suction-ducts P P to the eyes Q Q of the fan I, so that a constant circuit of air is maintained from the fan through the four subcompartments of the moistening-chamber and back into the fan.

The bearings R of the shaft carrying the drum B at the feed end of the machine are fitted with adjusting-screws R′, so that the web may be kept just sufficiently tightly strained for satisfactory working.

As the material spread upon the web A enters the upper subcompartment D by the entrance-port H it is moistened and heated by jets of steam from the pipe S, supplied from any convenient source, into which jets of water may be directed in front of each steam-jet to increase its moistening properties from the water-pipe T. The steam-jets atomize the water into mist-like steamy vapor, which the force of the steam injects along with an induced current of fresh air into the upper subcompartment D, where it mixes with and is drawn down through the material on the web A by the circulating current of air from the fan I into the subcompartment E, then up again into the subcompartment F, and thence down again to the

subcompartment G, on reaching which nearly all the moisture and heat of the steamy vapor will have been absorbed by the material on the web, so that the return current to the fan has very little moisture left in it. Then the material leaves the subcompartment F by the exit-port H′, and if it still requires more moisture this can be added and the material at the same time cooled by jets of water from the pipe U, these jets being atomized and sprayed upon the material by jets of compressed air from the pipe V, which is supplied by the air-compressor W.

X is a rotary brush for removing any material clinging to the wire web A.

X′ is a truck in position to receive the leaf falling from the web.

Y Y are inspection and cleaning doors.

Z is a relief pipe or chimney on the pressure-duct H for the escape of an equivalent volume of air therefrom to that of the fresh air injected by the steam-jets and a further small amount drawn in through the web exit-opening H′ by the fan-suction acting in the subcompartment G. The relief-pipe Z is fitted with a sliding valve Z′.

The web A is driven by means of the drum B′ at the delivery end by any suitable gear. That shown is an arrangement of worm-gearing *a b c d*, operated by the driving-pulleys *e*.

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

1. In apparatus for moistening and softening or ordering dried tobacco-leaf the combination of a moistening-chamber, a leaf-carrying web traveling horizontally from end to end of said chamber approximately midway between the top and bottom of same, there being openings at opposite ends of said chamber respectively for the entrance and exit of the web and leaf, partitions alternately dividing the part of the chamber above said web and the part of the chamber below said web, and inclined perforated air-distributing plates disposed across the compartments formed in said chamber by said partitions substantially as set forth.

2. In apparatus for moistening and softening or ordering dried tobacco-leaf, the combination of a moistening-chamber, a leaf-carrying web traveling horizontally from end to end of said chamber approximately midway between the top and bottom of same, and said chamber having at opposite ends openings respectively for the entrance and exit of the web and leaf, partitions alternately dividing the part of the chamber above said web and the part of the chamber below said web, a fan creating a current through said chamber, ducts leading respectively from near the outlet end of said chamber to said fan and from said fan to near the inlet end of said chamber and a relief-pipe in the duct leading from the fan to said chamber substantially as described whereby the hot aqueous vapor or moist warm air for moistening the leaf is caused to follow a serpentine course in said chamber and to pass alternately down and up through the web and leaf at successive parts of said chamber, and is then drawn off from near the outlet end of said chamber and forced again into the inlet end of same, while surplus air escapes through the relief-pipe, as set forth.

3. In apparatus for moistening and softening or ordering dried tobacco-leaf, the combination of a moistening-chamber, a leaf-carrying web traveling horizontally from end to end of said chamber approximately midway between the top and bottom of same, and said chamber having at opposite ends openings respectively for the entrance and exit of the web and leaf, partitions alternately dividing the part of the chamber above said web and the part of the chamber below said web, perforated air-distributing plates disposed across the compartments formed in said chamber by said partitions, a fan creating a current through said chamber, ducts leading respectively from near the outlet end of said chamber to said fan and from said fan to near the inlet end of said chamber, and a relief-pipe in the duct leading from the fan to said chamber, substantially as described, whereby the hot aqueous vapor or warm moist air for moistening the leaf is caused to follow a serpentine course in said chamber, is evenly distributed over the whole area of the web in said compartments, is caused to pass alternately down and up through the web and leaf at successive parts of said chamber and is then drawn off from near the outlet end of said chamber and forced again into the inlet end of same while surplus air escapes through the relief-pipe as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

SAMUEL CLELAND DAVIDSON.

Witnesses:
JOHN BROWN SHAW,
ARCHIBALD H. R. CARR.