June 5, 1934. G. D. HARRIS 1,961,687

TREATMENT OF TOBACCO AND SIMILAR MATERIALS WITH CONDITIONED GAS

Filed March 29, 1930 4 Sheets-Sheet 1

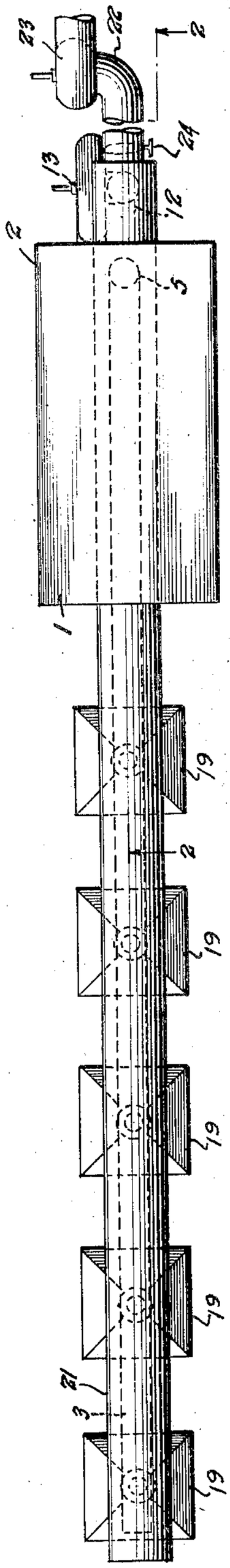

FIG. 1.

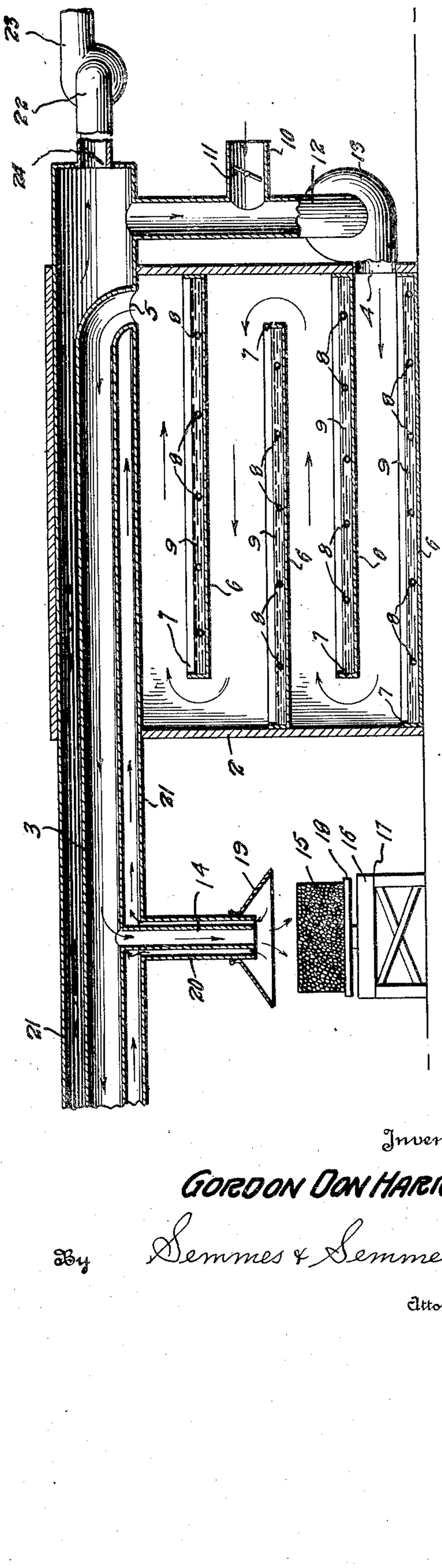

FIG. 2.

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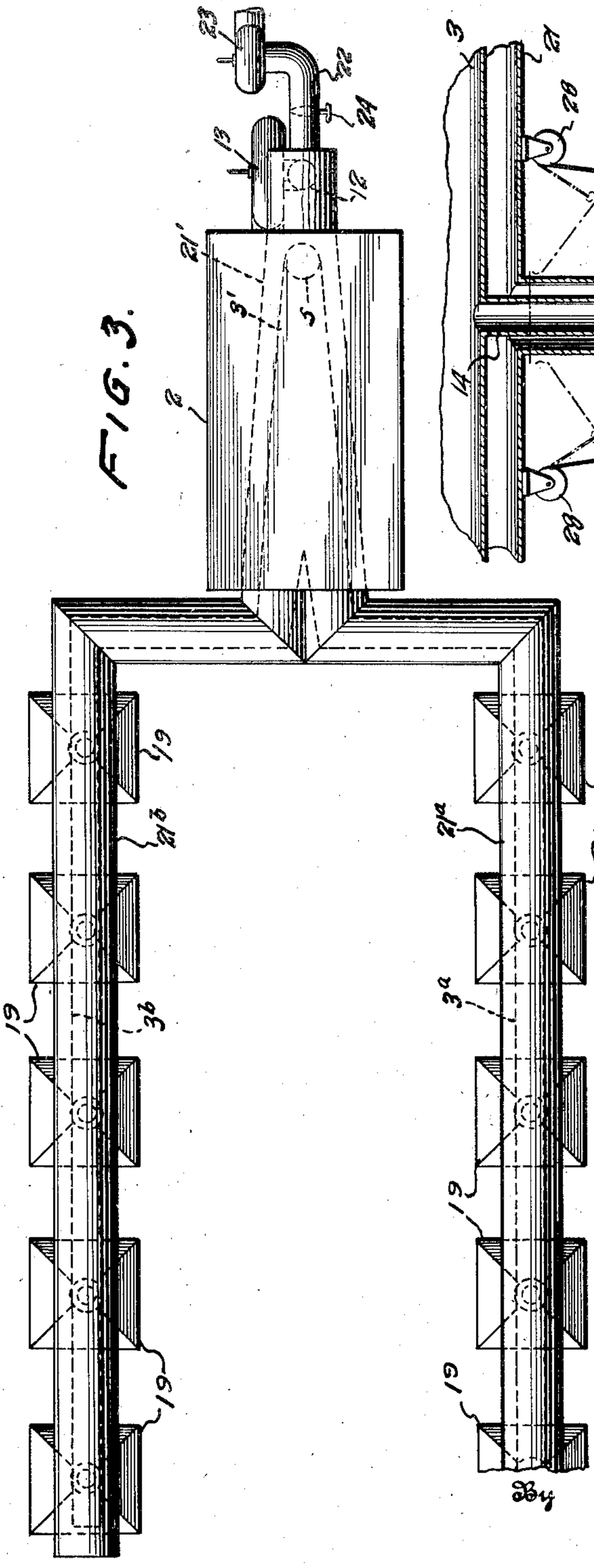
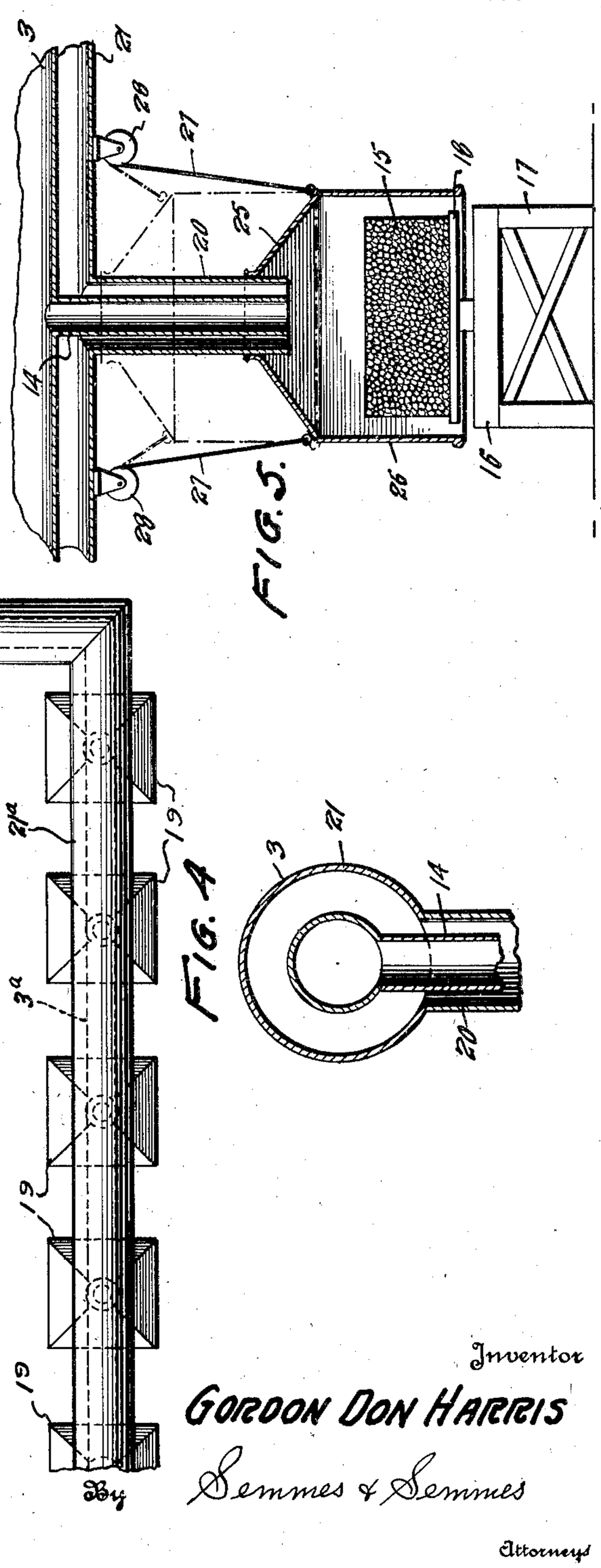
TREATMENT OF TOBACCO AND SIMILAR MATERIALS WITH CONDITIONED GAS

Filed March 29, 1930 4 Sheets-Sheet 2





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TREATMENT OF TOBACCO AND SIMILAR MATERIALS WITH CONDITIONED GAS

Filed March 29, 1930 4 Sheets-Sheet 3

FIG. 6.

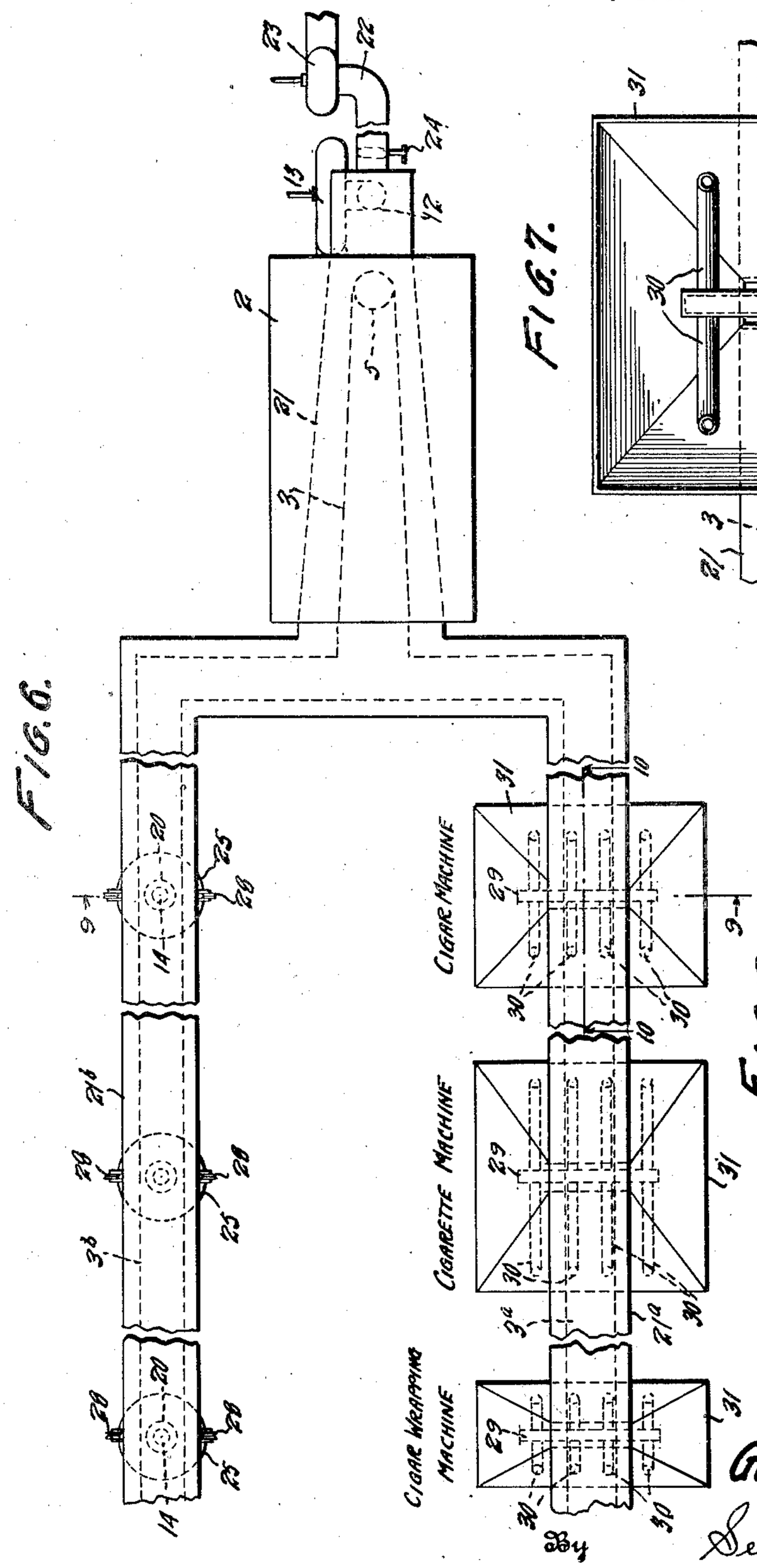

FIG. 7.

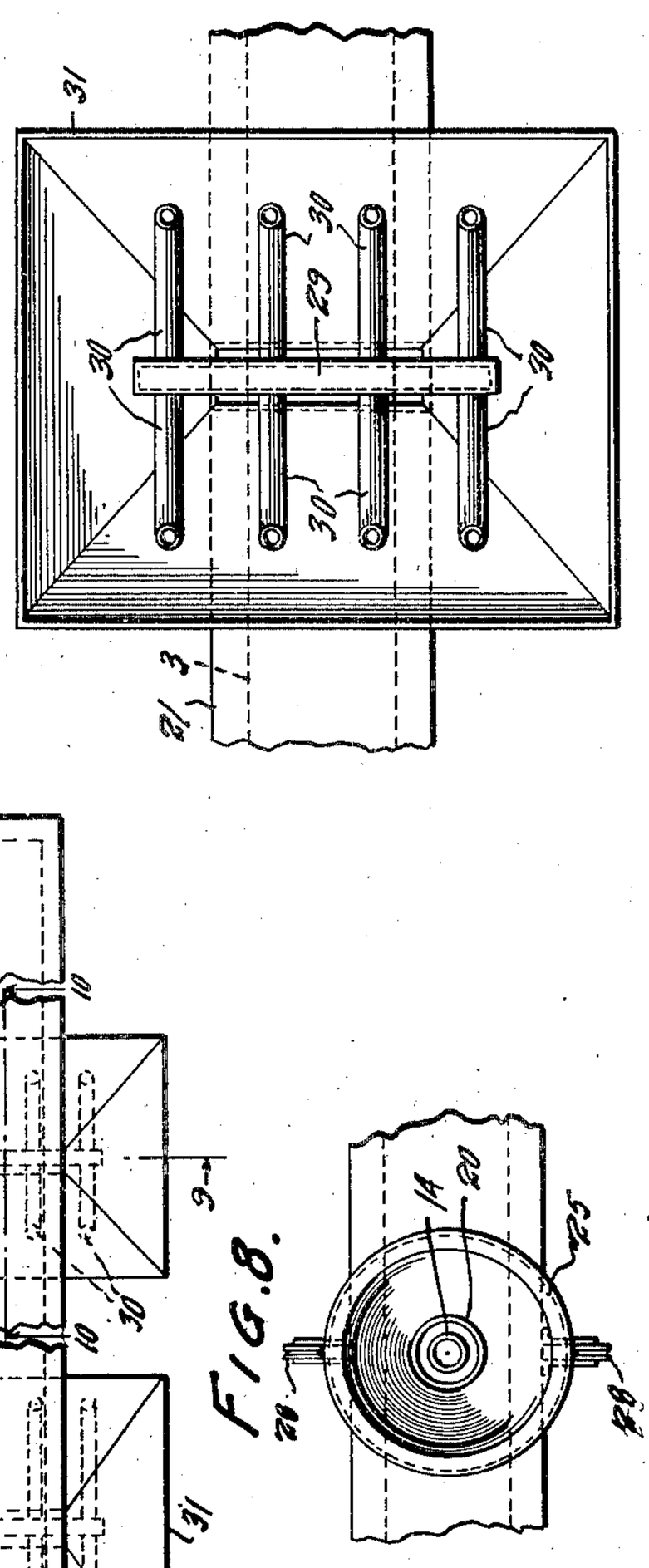

FIG. 8.

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June 5, 1934. G. D. HARRIS 1,961,687

TREATMENT OF TOBACCO AND SIMILAR MATERIALS WITH CONDITIONED GAS

Filed March 29, 1930 4 Sheets-Sheet 4

FIG. 9.

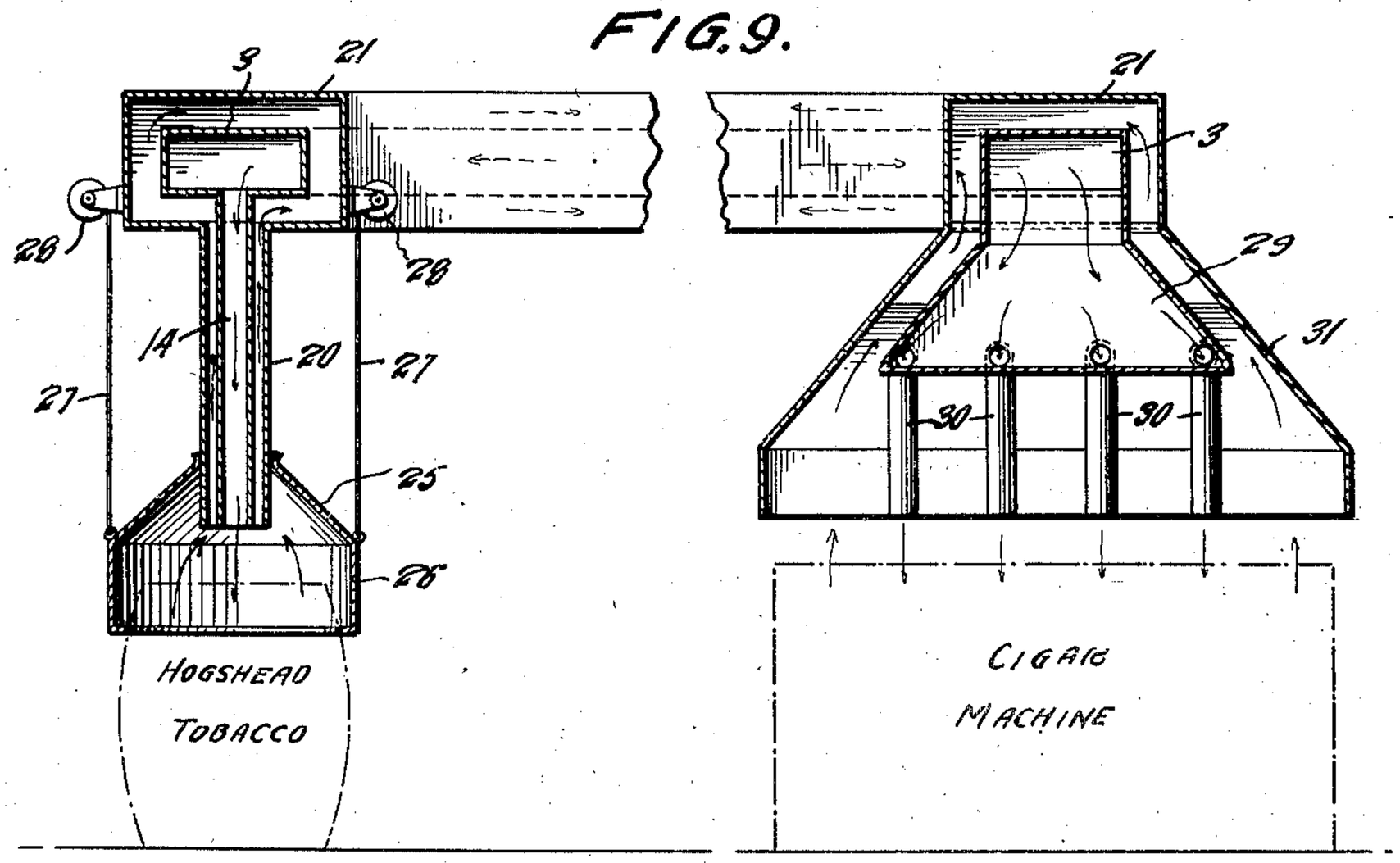
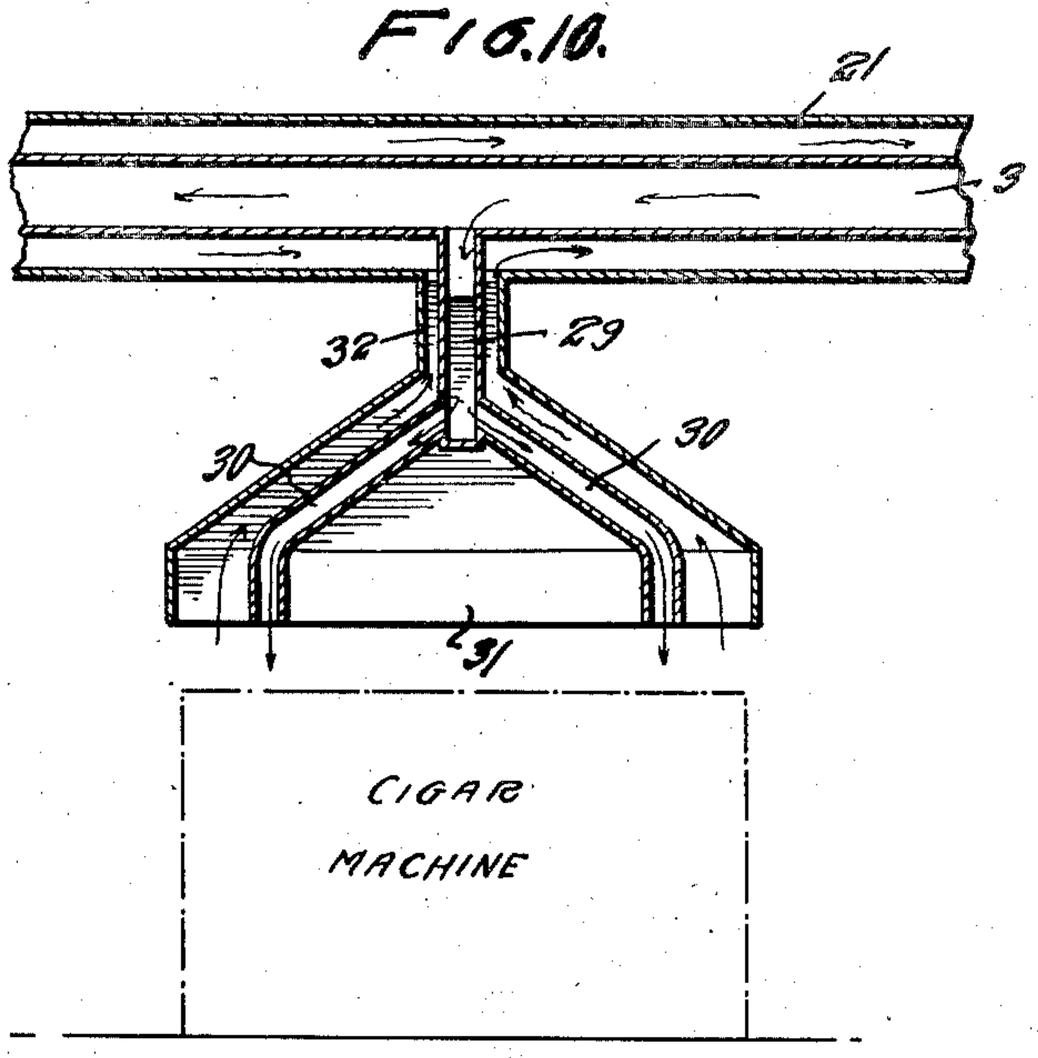


FIG. 10.



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UNITED STATES PATENT OFFICE

1,961,687

TREATMENT OF TOBACCO AND SIMILAR MATERIALS WITH CONDITIONED GAS

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Application March 29, 1930, Serial No. 440,060

12 Claims. (Cl. 131—55)

This invention relates in general to the treatment of materials and more particularly has reference to methods and apparatus for treating materials with a conditioned gas.

Tobacco, particularly of the type employed for cigar wrappers, is sometimes packed in bales for shipment, and often remains in bale form for long periods of time. Usually the tobacco leaves become dry and brittle, and when an attempt is made to remove the tobacco from the bale, considerable breakage of the leaves results. It will be appreciated that broken or fractured leaves are not as valuable for wrappers as the whole unbroken leaves, consequently, any method of removing the leaves without the loss due to breakage is desirable.

Similar disadvantages are encountered in removing tobacco leaves from hogsheads or other receptacles in which the tobacco is shipped.

It is possible to wet the tobacco prior to unpacking, but this procedure while eliminating the breakage to a certain extent, nevertheless, involves the disadvantages of rendering the tobacco unworkable by excessive wetting, nonuniform moistening and spotting and discoloring the leaves so that its value as wrappers is depreciated.

I have found that tobacco can be removed from the bale or hogshead by placing the bale or hogshead in a tobacco casing machine such as disclosed in my copending applications, Serial Nos. 322,432 and 322,433, filed Nov. 28, 1928; 379,966, filed July 22, 1929; and 404,386 and 04,387, filed Nov. 2, 1929.

While this procedure is adequate from the standpoint of the product, nevertheless, it necessitates workmen entering the casing machine to remove layers of tobacco from the bale or hogshead as the same becomes conditioned to a sufficient extent to permit its proper removal.

In cigar, cigarette, as well as other factories where an entire factory room is humidified for the purpose of conditioning material, many different methods may be employed. It will be found, however, that disadvantages are encountered in this type of treatment in that it is impossible under ordinary practice to maintain the desired conditions within narrow limits at all of the points of operation. This condition of the atmosphere is also objectionable in that the windows become coated with condensed vapor and condensate collects on the ceiling and suspended devices.

The present invention overcomes the foregoing disadvantages and provides a method and apparatus which may be effectively and economically employed for treating tobacco and other materials requiring similar treatment. By my method, I condition the material by a controlled and directed application of a humidified gas to the material to be treated, thereby making it possible to uniformly condition different lots of materials located separately.

An object of this invention is to provide a method and apparatus for treating tobacco and similar materials which avoids the prior art disadvantages.

Another object of this invention is to provide a method and apparatus for assimilating moisture in materials, which avoids humidifying the atmosphere in the factory in which the operation is carried out.

Yet another object of this invention is to provide a method and apparatus for humidifying air or other gases and conveying the treated gas to a plurality of spaced zones to supply the proper conditioned atmosphere at the zones.

A further object of this invention is to provide a method and apparatus to facilitate the removal of hands of tobacco from bales or hogsheads without detrimentally affecting the value of the tobacco.

A still further object of this invention is to provide a method and apparatus for conveying conditioned gases from the conditioner to spaced zones.

With these and other objects in view, which may be incident to my improvements, the invention consists in the parts and combinations to be hereinafter set forth and claimed, with the understanding that the several necessary elements comprising my invention may be varied in construction, proportions and arrangement without departing from the spirit and scope of the appended claims.

The present invention is based on the concept of treating material with conditioned air or other gases, and consists of methods and apparatus for conditioning air or other gases and conveying the so conditioned gases to a plurality of spaced zones in which material is treated by subjecting the same to the action of the conditioned gas. In order to minimize variation in the condition of the gas during transit from the conditioner to the material treating zones, another gas which may be that exhausted from the treating zones or stages is circulated in a stream surrounding the conditioning gas.

This invention further comprehends subject-

ing bales or hogsheads of tobacco to the action of moisture containing gases to soften the tobacco to an extent to permit its removal from the bale or container without danger of breaking the leaves, and thereby rendering them less valuable to the trade.

In order to make my invention more clearly understood, I have shown, in the accompanying drawings, means for carrying the same into practical effect without limiting the improvements in their useful applications to the particular constructions which, for the purpose of explanation, have been made the subject of illustration.

In the drawings:

Figure 1 is a diagrammatic plan view of one form of apparatus.

Figure 2 is a sectional view taken on line 2—2 of Figure 1.

Figure 3 is a diagrammatic plan view of a modified form of the apparatus.

Figure 4 is a sectional view showing the relation between the conduit for supplying conditioned gas to the treating zones and the exhaust conduit.

Figure 5 is a sectional view of the gas conduits and the adjustable hood at a treating station.

Figure 6 is a diagrammatic representation of a system for conveying conditioned gas to a plurality of stages at which varying operations are carried out.

Figure 7 is a view showing the construction of the hood and gas distributing apparatus used, for instance, to supply conditioned gas to cigar machines.

Figure 8 is a similar view of a modification employed for supplying humidified gas to a hogshead or barrel.

Figure 9 is a view taken on line 9—9 of Figure 6.

Figure 10 is a view taken on line 10—10 of Figure 6.

As heretofore pointed out, the present invention is based upon the concept of treating materials with gases conditioned as to temperature and humidity, in order to assimilate moisture in the materials to an extent sufficient to permit the materials to be handled and worked without danger of affecting their value.

One particular embodiment of the invention involves the treatment of bales or hogsheads of tobacco with moisture containing gas, prior to removing the hands of tobacco from the bale or hogshead, so as to soften the tobacco so that it may be removed without damaging the tobacco leaves. It will be appreciated that any apparatus for dispersing or playing a stream of gas having a relatively high humidity on the bale or hogshead of tobacco, will serve to accomplish the desired results.

In the drawings, I have shown an apparatus indicated by the reference numeral 1, which comprises a conditioner 2 and a conduit 3 for conveying the conditioned gas from the conditioner 2 to a station at which the material to be treated is arranged. The conditioner 2 comprises a chamber provided with a gas inlet 4, and a gas outlet 5, to which is connected the conduit 3. One form of conditioner may comprise the chamber 2 having a plurality of horizontally arranged staggered baffles 6, positioned within the chamber 2 in such a manner as to cause gas passing from the inlet 4 to the outlet 5 to flow in a circuitous or zigzag path through the conditioning chamber 2. As shown in Figure 2, the baffles 6 have tanks 7 associated therewith, in which may be maintained bodies of water or other liquid with which the gas is to be saturated or humidified. Suitable liquid inlets, (not shown) are provided for supplying liquid to the tanks 7, and suitable regulating devices (not shown) may be provided for controlling the amount of liquid supplied to the tanks 7, so as to maintain sufficient liquid in the tanks 7 to compensate for evaporation. Other control means (not shown) may be provided for maintaining the level of the liquid substantially constant.

In order to effect the generation and diffusion of the liquid vapor into the gas flowing through the chamber 2, suitable heating elements 8, submerged in the bodies of liquid 9, maintained in the tanks 7 are provided. The heating elements 8 may be in the form of coils through which hot fluids are circulated, or may comprise electric heating elements of any desired and suitable type. If found desirable, means (not shown) for controlling the heating effect of the elements 8 may be provided. While the apparatus just described and shown in Figure 2 serves adequately to diffuse vapor of liquid into the gas passing through the chamber 2, I wish it to be clearly understood that any other type of apparatus for humidifying or saturating a gas with the vapor of a liquid may be employed. For instance, the apparatus disclosed in my copending applications, Serial Nos. 81,606, filed January 15, 1926; 101,868, filed April 14, 1926; 204,157, filed July 8, 1927; and 204,507, filed July 9, 1927, may be employed to advantage.

A gas such as air may be drawn through the conduit 10, which is controlled by the valve 11 into the intake conduit 12 of the blower 13, and from the blower 13 is forced through the inlet 4 into the conditioning apparatus 2. By controlling the rate of flow of the gas through the conditioner 2, and by regulating the heating effect of the heating elements 8, the gas may be conditioned to meet the desired requirements by the time it reaches the outlet 5. From the outlet 5, the gas conditioned both as to humidity and temperature, passes through the conduit 3 and the branch supply conduit 14, from which it is dispersed or played onto a bale of tobacco or into a container of tobacco, in order to soften the leaves of tobacco to an extent to permit their removal from the bale or container without loss due to breakage.

As shown in the drawings, a body of tobacco 15, is positioned on a support 16, which comprises a stand 17 and a table 18, rotatably mounted thereon. By constructing the stand with a rotatable table, the bale or container of tobacco may be rotated which will make it possible to put the work benches or stands supporting the bale, much closer together, and consequently, will save floor space. The rotatable feature of the bale support is also of advantage in that a worker standing on one side of the bench may rotate the bale and pick hands of tobacco from various portions of the bale at will, without having to walk around the bale.

In order to eliminate the disadvantage of condensation forming on the walls and roof of the factory in which the tobacco is being treated, and to prevent the atmosphere in the factory becoming too humid, I have provided a construction for removing the moisture containing

gas, dispersed onto the bale, so that none of this gas will leak or spill into the factory. It is obvious that heat conservation is a very important function of this gas return feature.

The gas is removed from the zone about the bale of tobacco by means of a gathering hood 19, which serves as the inlet or mouth of a branch exhaust conduit 20. The branch exhaust conduit is communicatingly connected with a header or manifold exhaust conduit 21, which is connected to the intake conduit 22 of a conventional blower or exhauster 23. To prevent any spilling or leakage of the humidified gas into the factory, it is preferable to exhaust the gas from about the bale at a rate slightly greater than that at which the humidified gas is supplied to the zone, in which the bale is placed. As shown in Figures 1 and 2, a valve 24 is operatively mounted in the conduit 22 to regulate the amount of gas withdrawn from the exhaust manifold or main 21.

It will be appreciated that the gas exhausted from the zone containing the tobacco undergoing treatment will normally have a relative humidity considerably higher than that of atmospheric air. Consequently, it is generally desirable to recirculate some or all of the gas withdrawn through the exhaust conduit 21 back through the conditioner and to the tobacco undergoing treatment. As shown in Figure 2, the inlet conduit 12 of the blower 13, is directly connected to the exhaust main 21. This construction, together with the valves 11 and 24 permit the exhaust gas withdrawn from the zone containing the tobacco undergoing treatment to be forced by the blower 13 through the conditioner. By regulating the valves 11 and 24, the ratio of exhaust gas to fresh gas may be controlled.

The construction herein described may be operated so that all of the gas sent to the various stages may be exhausted or recirculated. It will probably be desirable under most conditions to exhaust a greater volume of gas than is being supplied to the several stages in order to prevent spill of the humidified gas into the room. This operation would involve a drawing up of a small amount of atmospheric air around the material being treated into the exhaust conduit.

I have found that very desirable results can be obtained by circulating the gas exhausted from the zone containing the tobacco undergoing treatment, in a stream surrounding the conditioned gas passing from the conditioner to the zone or stage of treatment. A construction for carrying out this concept is illustrated in the drawings. As shown clearly in the drawings, conduit 3 is concentrically mounted in the exhaust main or manifold 21, in such a manner that the exhaust gases completely surround the conduit 3. This construction is also employed in the branch supply and exhaust conduits. For instance, as shown in the drawings, the branch supply conduit 14 is concentrically mounted within the exhaust conduit 20. The construction just described is of advantage in that the exhaust gases serve as insulation to minimize the effect of the atmospheric air on the condition of the gas passing through the main conduit 3 of the branch conduits 14.

In some instances it may be advantageous to circulate another gas about the conduit supplying the humidified gas to the several stages of treatment. For instance, a dry gas could be heated to the proper temperature and passed through the conduit surrounding the supply conduit so as to maintain the temperature of the humidified gas at the proper point to prevent condensation within the supply conduit.

The foregoing construction for surrounding the conditioning gas by a stream of exhaust gases is of particular advantage when an installation having a single conditioner and a plurality of treating stages or zones is employed. As shown in Figure 1, the supply main 3 and the exhaust main 21 extend for a considerable distance, and have a plurality of branch conduits 14 and 20 extending therefrom for supplying the conditioned gas and withdrawing gas from a plurality of segregated stages.

To illustrate the flexibility of the arrangement of the treating stages, a modified installation has been shown in Figure 3. In this figure, the supply and return exhaust conduits 3′ and 21′ respectively, communicate with supply and exhaust conduits, positioned so as to supply and exhaust gas from a plurality of rows of treating stages or stations. For instance, the conduit 3′ communicates with conduits 3*a* and 3*b* from each of which extend the branch conduits 14. Similarly, the conduit 21′ communicates with conduits 21*a* and 21*b* from which extend the branch conduits 20.

With the construction as shown in the drawings, or with further modification by providing additional conduits, any number of treating stations may be employed.

As hereinbefore pointed out, this invention comprehends the supplying of a gas conditioned as to temperature and humidity, to zones spaced from the gas conditioner for any operation requiring conditioned gas. To illustrate the field of application of the present invention, I have shown in Figure 6, an installation suitable for use in a factory carrying on a number of operations. In this figure, the conditioner 2 supplies conditioned gas to the supply conduit 3, which is communicatingly connected to supply mains 3*a* and 3*b*.

Supply mains 3*a* and 3*b* may be extended to convey the air or other gas to stages at which the tobacco is softened prior to unpacking, to cigar machines, to cigar wrapping machines, to cigarette machines or any other machine in which a supply of conditioned gas would be beneficial. In order to remove the gas supplied to the several stages, exhaust mains 21*a* and 21*b* are provided, which connect with the exhaust or return conduit 21. The branch conduits for supplying and returning the conditioned gas to and from the zone in which the tobacco is softened prior to removal from the bale or container, may be constructed as shown in Figure 9. This particular construction may also be employed for other purposes.

When the apparatus herein described is used for softening bales of tobacco to facilitate the removal of hands of tobacco from the bale, it may be desirable to provide an enclosure such as shown in Figures 5 and 9, to reduce the spill or leakage of humidified gas into the surrounding atmosphere. In Figure 5, a hood is shown comprising a roof portion 25 of substantially conical form and depending sides 26 which may be cylindrical or of other shape, depending on the construction desired. The hood is slidably associated with the conduit 20 and is adapted to be raised and lowered by means of the cables 27, which run over the pulleys or sheaves 28. If desired, weights can be associated with the cables

27 to balance the weight of the hood so that the latter can be raised and lowered with a minimum exertion on the part of the operator.

A somewhat similar construction is shown in Figure 9, which is especially adapted for use with hogsheads. The parts in the figure which correspond to those shown in Figure 5, are indicated by similar reference numerals. While the hoods can be made in various sizes, it is possible to construct them of a standard size, which can be employed either for treating baled tobacco or tobacco in hogsheads.

In some instances, I have found it desirable to distribute the gas at a treating stage. This may be accomplished by a structure such as shown in Figures 6, 7, 9 and 10. As shown in these figures, the conduit 3*a* or 3*b* is provided with headers 29 at desired locations, which communicate with gas distributing tubes 30. The tubes 30 may be positioned so as to distribute the gas in any desired manner to the material or machine in the treating zone.

Surrounding the gas supplying and distributing mechanism, is a hood 31, communicating through suitable ducts 32 with the return or exhaust main 21. This is made sufficiently large so as to remove gas from about the machine at a rate greater that that at which it is supplied, to prevent spilling of the humidified gas into the atmosphere.

It will be appreciated that the concept of supplying the conditioned gas to the various machines and returning it from the machines to the conditioner in the ducts surrounding the gas passing from the conditioner to the various machines, will permit the conditioned gas to be delivered at the desired point on various machines, without effecting the general atmospheric conditions in the room. As heretofore pointed out, when high humidity is maintained in an ordinary factory which is not properly insulated, such as by placing layers of cork on the walls, and providing double windows, condensate forms on the ceilings and walls, drips off and results in damage to the product and makes working conditions very undesirable.

In the present system, it is possible not only to equip the ordinary factory with proper humidifying apparatus, but the windows of the factory may be open to permit the existence of natural conditions therein, which are not permissible in the present day factory equipped with double doors and windows, in which conditioned air is present.

A further advantage of the present invention resides in the fact that there will be very slight variation in the temperature and humidity of the gas when delivered to the tobacco treating stages or the tobacco working machines, as herein set forth. Whereas, on the other hand, there are wide variations in temperature and humidity when an attempt is made to condition the air in an entire room. For instance, when the atmosphere in a large room is conditioned, changes both in temperature and humidity will be occasioned, not only by shifts in the wind, but by the fact that the sun may shine on one side of the factory and not on the other. The foregoing factors and a number of others, result in wide variations in the conditions of the air existing in a large room.

While in the foregoing description, specific arrangements have been described in detail, I wish it to be clearly understood that variations in the arrangements of the conditioner and the treating stages may be made. For instance, the generating unit can be located on one floor, the tobacco softening stages on another floor, and the several tobacco working machines located on still other floors in the factory. While specific mention has been made as to the use of the tobacco softening process and apparatus herein described for wrapper tobacco, the process and apparatus may be used with equally advantageous results for conditioning other types of tobacco. For instance, Turkish and other imported tobaccos employed for making cigarettes may be treated in accordance with the present invention, so that it may be handled to advantage and without loss.

In carrying out the foregoing process, I have found that after treating tobacco for from 10 minutes to an hour, with conditioned gas, a layer of tobacco can be removed.

Particularly desirable results can be obtained with the herein described process by conditioning the gas so that it is substantially saturated.

I wish it to be clearly understood that the present invention is applicable to the treatment of materials other than tobacco and consequently may be employed in many industries.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise method steps or details of construction herein set forth, by way of illustration, as it is apparent that many changes and variations may be made therein by those skilled in the art without departing from the spirit of the invention, or exceeding the scope of the appended claims.

I claim:

1. A method of conditioning materials comprising conditioning a gas as to temperature and humidity and then passing it to a plurality of material treating stages, returning the gas from the treating stages to the gas conditioning stage in a path surrounding the gas passing from the conditioning stage to the treating stages.

2. A method of treating materials comprising saturating a treating gas with water vapor at a predetermined temperature, passing the gas to a material treating stage, and passing a heated gas about the treating gas to minimize the temperature drop in passing from the point of saturation to the treating stage.

3. A method of treating materials comprising conditioning air as to temperature and humidity, passing the conditioned air to a plurality of treating stages, displacing the gas about said stages with the conditioned air, removing the air from the treating stages, discarding a portion and returning the remainder together with fresh air to the conditioning stage.

4. An apparatus for treating material comprising a gas conditioner, a plurality of segregated material treating devices, conduits extending between the conditioner and the treating devices, and means associated with the conduits to minimize the change in condition of the gas flowing through the conduits.

5. An apparatus for treating material comprising a gas conditioner, a plurality of segregated material treating devices, conduits extending between the conditioner and the treating devices, and conduits surrounding the first mentioned conduits to minimize the variation in condition of the gas as affected by the atmosphere.

6. An apparatus for treating material com-

prising a gas conditioner, a plurality of segregated material treating devices, conduits extending between the conditioner and the treating devices, conduits surrounding the first mentioned conduits, and means for passing the gas from the treating devices through the second mentioned conduits.

7. An apparatus for treating materials comprising a chamber having inlet and outlet openings, a plurality of staggered baffles mounted therein between the inlet and outlet adapted to cause a gas flowing through the chamber to pass in a circuitous path, means associated with the baffles to condition the gas, a conduit connecting the outlet with a plurality of spaced treating stages, a conduit surrounding each of said first mentioned conduits and spaced therefrom to form compartments therebetween, and means for passing a gas through said compartments.

8. An apparatus for treating materials comprising a chamber having inlet and outlet openings, a plurality of staggered baffles mounted therein between the inlet and outlet adapted to cause a gas flowing through the chamber to pass in a circuitous path, means associated with the baffles to condition the gas, a conduit connecting the outlet with a plurality of spaced treating devices, a conduit surrounding each of said first mentioned conduits and spaced therefrom to form compartments therebetween, said compartments being communicatingly connected and in communication with the treating devices, and means for withdrawing gas from the devices through the compartments.

9. A device for distributing a humidified gas to a zone in which a material working machine is located comprising a header, a plurality of distributing tubes in communication with said header adapted to distribute the gas in said zone, a hood surrounding the header and distributing tubes, and means for withdrawing gas from said hood.

10. An apparatus for treating material comprising a gas conditioner, means for passing conditioned gas in a path to a tobacco treating device, means for returning the gas from the treating device in a body surrounding the means for passing the conditioned gas to the treating device.

11. An apparatus for treating material comprising a gas conditioner, a plurality of segregated material treating devices, means for conveying the conditioned gas to each of the devices, and means for withdrawing gas from the plurality of treating devices and returning it to the conditioner in a path about the means for conveying the conditioned gas to each of the devices.

12. An apparatus for treating material comprising a gas conditioner and a device for treating material with conditioned gas, a supply conduit extending from the conditioner to the treating device, and a chamber surrounding the supply conduit through which the gas after contacting with the material to be treated is returned to the conditioner.

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