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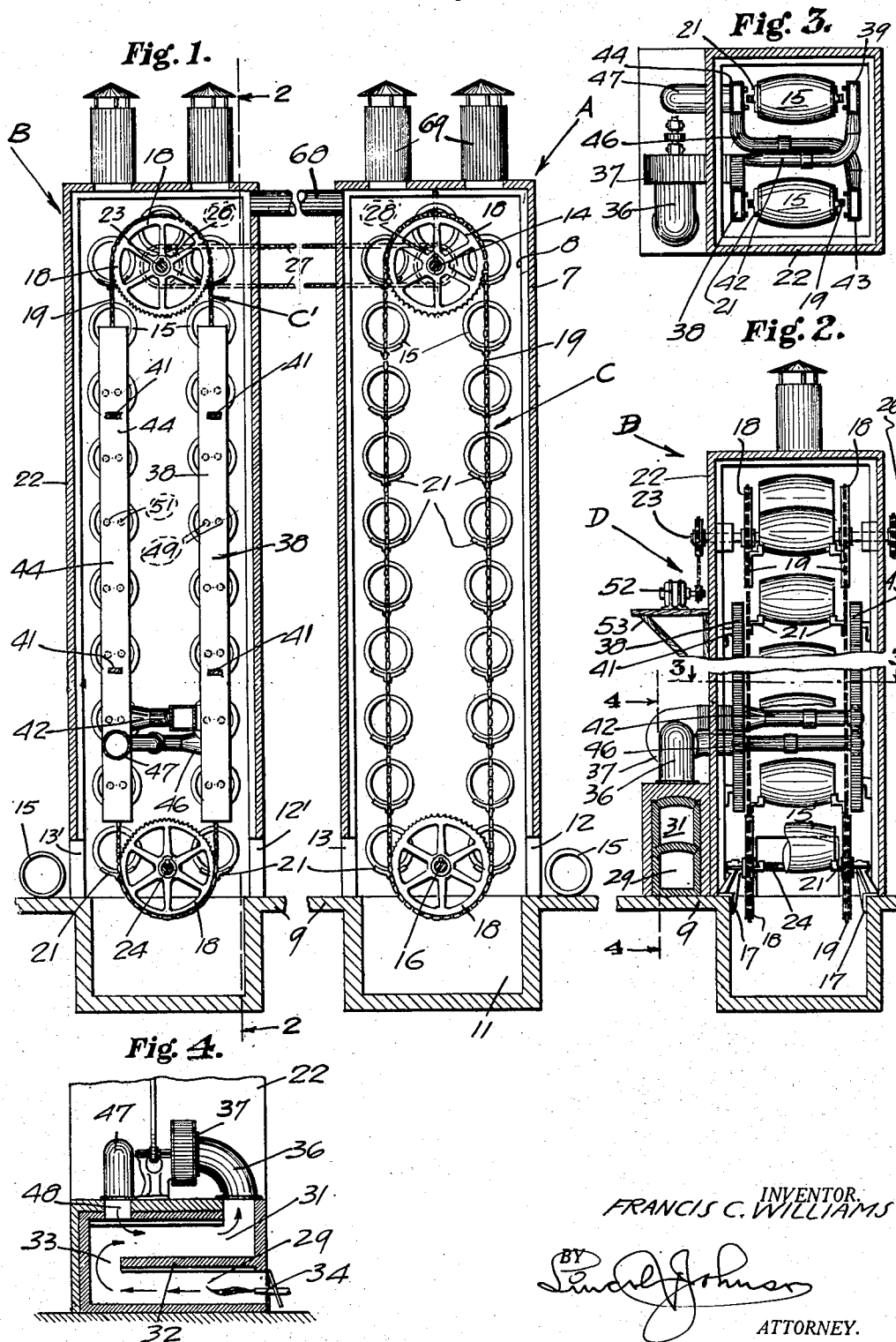
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BARREL STEAMER AND DRIER

Filed Sept. 11, 1929

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Fig. 5.

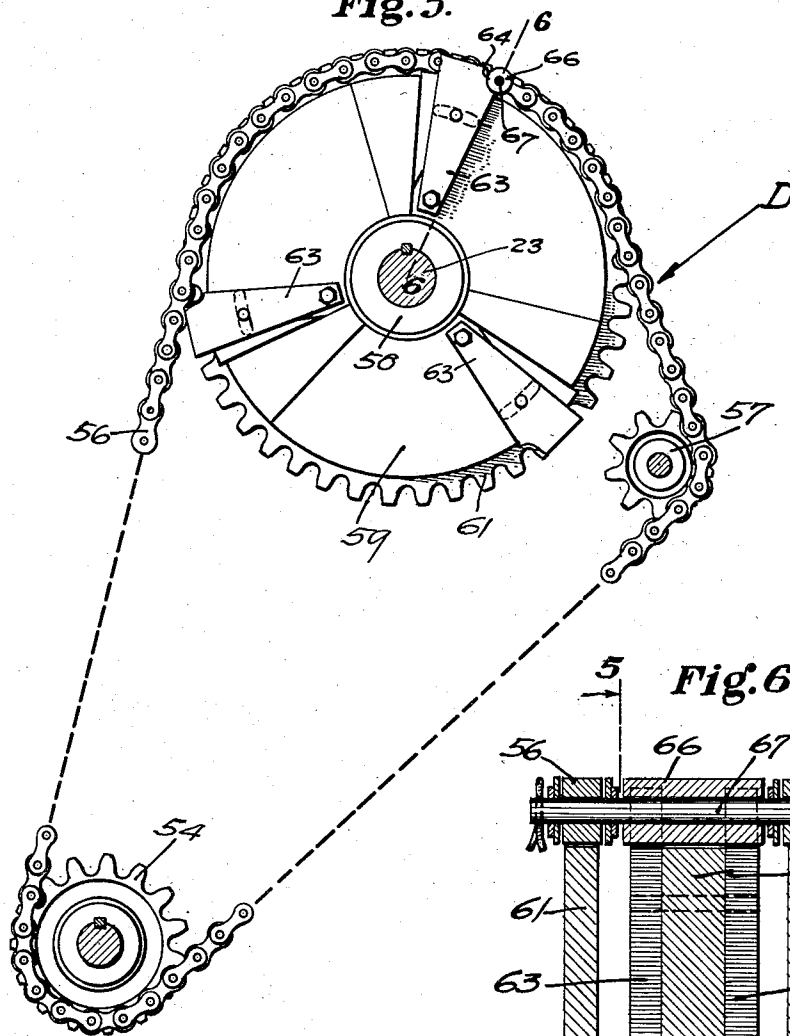
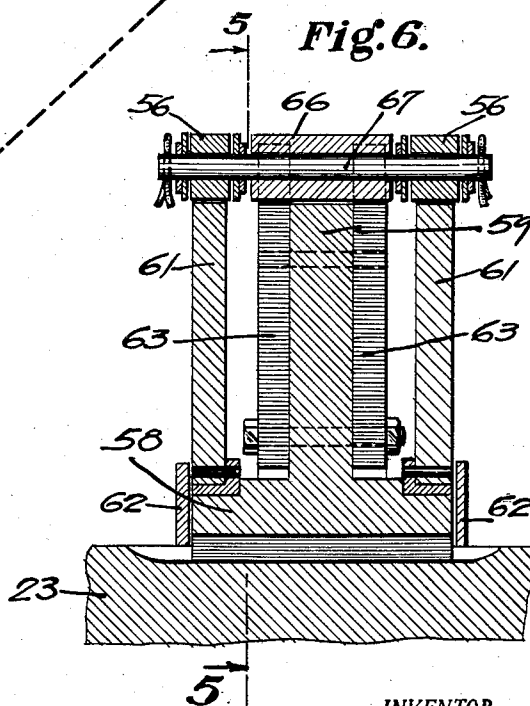


Fig. 6.



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UNITED STATES PATENT OFFICE

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BARREL STEAMER AND DRIER

Application filed September 11, 1929. Serial No. 391,956.

The invention forming the subject matter of this application relates to a steaming and drying apparatus and particularly an apparatus for treating barrels before and after the barrels are shaped.

In the manufacture of barrels, first the straight staves are temporarily secured into a substantially conical vessel converging toward one end; then the barrel is steamed so as to allow the shaping of the staves, and the desired bulging of the middle portion of the cylindrical vessel is accomplished by the windlass, after the staves are steamed. Before the hooping of the barrels, it is necessary to dry the true shaped barrel so as to allow that provision be made, before the hooping, for the usual shrinkage due to the evaporation of moisture from the wooden staves of the barrel.

The primary object of the invention is the provision of an apparatus by which a plurality of barrels may be simultaneously treated, both in the steaming and in the drying operations thereon: means being provided to co-ordinate the operation of the steaming and drying elements of the apparatus.

Another object of the invention is the provision of a steaming and drying apparatus for treating the barrels in which the time of steaming and drying is determined by the speed and the path of travel of the barrels in the respective apparatus, the steaming and drying elements of which are simultaneously operated by an intermittent driving mechanism.

Another object of the invention is the provision of a drying apparatus for barrels in which a drying substance is introduced by means of impelling means, such as a blower, and is withdrawn by the action of the suction created at the intake side of said impelling means, thereby allowing not only the circulation of the drying substance through the drying apparatus but also a recirculation of the spent drying substance to intermix with the fresh drying substance.

Another object of the invention is the provision of a drying apparatus in which a compression chest and a suction chest are disposed in spaced relation to each other, which

chests are provided with complementary orifices, the circulation thru the orifices being accomplished by means of impelling means forcing a drying substance, such as heated air, into the compression chest, which air is withdrawn from the drying apparatus through the suction chest by reason of the connection of the suction chest to the intake side of the impelling means, thereby effecting great economy through the recirculation of the spent drying substance or heated air, in a mixture with the fresh drying substance, or heated air.

Another object of the invention is the provision of a steaming and drying apparatus, in which the steaming and the drying elements are disposed in operative relation to each other, each element being provided with a suitable conveying system to carry a plurality of barrels in succession from the respective barrel receiving opening to the respective barrel discharge opening of each element, means being provided common to both elements for imparting a properly timed intermittent movement to said conveyers, the drying element being so connected to the steaming element that a part of the drying substance may be used for heating the steam in the steaming element.

Other objects and advantages are to provide a steaming and drying apparatus of the character described, that will be superior in point of simplicity, inexpensiveness of construction, positiveness of operation, and facility and convenience in use and general efficiency.

In this specification and the annexed drawings, the invention is illustrated in the form considered to be the best, but it is to be understood that the invention is not limited to such form, because it may be embodied in other forms: and it is also to be understood that in and by the claims following the description, it is desired to cover the invention in whatsoever form it may be embodied.

In the accompanying two sheets of drawings:

Fig. 1 is a vertical section of the steaming and drying apparatus, the connection between the steaming and drying elements are

shown broken away so as to indicate that the spacing between the elements may be varied, in accordance with the requirements.

Fig. 2 is a sectional view of a drying element of the apparatus, the section being taken on the line 2—2 of Fig. 1. The middle portion of said element is broken away.

Fig. 3 is a sectional plan view of the drying element, the section being taken on the line 3—3 of Fig. 2.

Fig. 4 is a sectional view of the heating chamber and the heated air circulating mechanism, the section being taken on the line 4—4 of Fig. 2.

Fig. 5 is a detail view of the conveyer driving mechanism, the section of the driving sprocket being taken on the line 5—5 of Fig. 6.

Fig. 6 is a fragmentary sectional view of the intermittent driving sprocket of the conveyer driving mechanism, the section being taken on the line 6—6 of Fig. 5.

Referring to the accompanying drawings, similar reference characters designate similar parts throughout. The various figures described above adequately illustrate my invention and the following detailed description is commensurate with the above mentioned drawings in enabling an artisan to construct and assemble the constituent parts of the same.

In carrying out my invention, I make use of a steaming apparatus A, a drying apparatus B, each being provided with a conveying mechanism C, and a driving mechanism D for intermittently driving said conveyers in a manner hereinafter set forth.

The steaming apparatus A, and the drying apparatus B, are so disposed as to allow the use of a windlass between the two apparatus, so that the barrel shaping operation may be continuously performed, through the steaming apparatus A, then on the windlass, not shown, and then through the drying apparatus B. The steaming of a barrel consists of passing said barrel through a steam filled chamber for a sufficient length of time to prepare the staves thereof for the shaping thereof. Such a steam chamber is formed within a receptacle 7 which is provided with an inner casing 8 spaced from the outer walls of the receptacle 7 so as to provide a chamber between the inner and outer walls into which a heating substance may be introduced for further heating the walls of the steam chamber. The receptacle 7 is supported on the floor 9 above the usual pit 11, as shown in Fig. 1 and Fig. 2. On the opposite sides of the receptacle 7 and adjacent to the floor 9 are formed a barrel receiving opening 12 and a barrel discharge opening 13 disposed opposite each other.

The conveying mechanism C is disposed within the receptacle 7 in operative rela-

tion to the openings 12 and 13. An upper shaft of the conveyer C is journaled in the front and rear walls of the receptacle 7 and extends across the receptacle substantially in parallelism with the sides of the receptacle, in which sides the openings 12 and 13 are located; the shaft 14 is adjacent to the upper end of the receptacle 7 and the opposite ends thereof extend outside of the said receptacle. The lower shaft 16 of the conveyer C is journaled on bearing brackets 17, which brackets are supported on the floor 9 in the manner shown in Fig. 2. The shafts 14 and 16 are parallel with each other and each has a pair of sprockets 18 spacedly disposed thereon. The respective sprockets on the upper and lower shafts are in vertical alignment with each other and are connected by endless chains 19, thereby forming substantially a double strand conveyer. On each endless chain 19 are attached carriers 21 extending from said chains toward each other. The carriers 21 on each chain 19, are equally spaced and extend in registry with each other. The carriers 21 are curved so as to conform to a section of the barrel periphery. It is to be noted that the opposite carriers 21 are so spaced from each other that when a barrel is placed thereon, the ends of the barrel are supported on the opposite curved carriers 21. Intermittent movement is imparted to the conveyer C by rotating the upper shaft 14 thereof by the said driving mechanism D, in a manner to be hereinafter described in detail.

The receptacle 7 has suitable steam inlet openings thereon, not shown, so that a suitable moist atmosphere is maintained therein.

In operation the barrels 15 are introduced into the receptacle 7 through the barrel receiving opening 12 at a time when a set of carriers 21 is in alignment with the opening 12, then the usual movement of the conveyer C carries the barrel around the interior of the receptacle 7. The barrel is withdrawn through the discharge opening 13 after completing its travel through the steam filled chamber in the receptacle 7. Both the insertion and the removal of the barrel is accomplished manually. After the barrels are thus steamed, they are introduced into the usual windlass machine by which the bulging shape of the barrel is formed and the staves are temporarily secured in said shape.

The finally shaped barrels are then introduced into the drying apparatus B, the receptacle 22 of which is identical in structure with the receptacle 7 of the steaming apparatus. A conveying mechanism C' identical with the conveyer mechanism C heretofore described, is supported within the receptacle 22 upon an upper shaft 23 and a lower shaft 24, the upper shaft being journaled in the front and rear walls of the re-

ceptacle 22, and the lower shaft 24 being supported upon brackets 17 in the manner of the support of the lower shaft 16. The upper shaft 23 extends beyond the opposite walls of the receptacle 22. At one end of said upper shaft 23 is a transmission sprocket 26 which is connected by a transmission chain 27 to a complementary transmission sprocket 28 upon the end of the shaft 14. The other end of the shaft 23 is directly driven by the said intermittent driving mechanism D. Thus, the conveyers C and C' of the steaming and drying apparatus respectively, are moved in synchronism with each other.

The structure of the drying apparatus B differs from the structure of the steaming apparatus A merely by the addition of means to circulate a drying substance, in the present illustration, heated air, throughout the chamber within the receptacle 22. In order to provide heated dry air to the drying apparatus, a heating chamber 29 is constructed on one side of the receptacle 22 as shown in Figs. 2 and 4. Above the heating chamber 29 is a draft chamber 31 separated from said heating chamber by a partition 32 and communicating with said heating chamber through a passage 33 at the open end of the partition 32. Within the heating chamber 29 is a suitable burner 34 to provide the required heat thereat. The air flows in the direction of the arrow shown in Fig. 4, from the heating chamber 29 into the draft chamber 31. At the end of the draft chamber 31 farthest from the passage 33, is disposed the inlet 36 of a blower 37. The blower is operated in the usual manner and it sucks the air from the draft chamber 31.

In order to deliver the heated air into the receptacle 22, two compression chests 38 and 39 are supported on brackets 41 on the inner casing of the receptacle 22. The compression chest 38 is opposite one side of one of the double strand conveyers C', while the other compression chamber 39 is opposite the other side of the other strand of the conveyor C'.

The compression chests 38 and 39 are connected to each other by means of a conduit 42. A suction chest 43 is supported on the receptacle 22 along side the conveyor C' and opposite the compression chest 38. Another suction chest 44 is supported on the receptacle 22 along side the other strand of the conveyor C' opposite the compression chest 39. It is to be noted that the compression chest 38 and the suction chest 43 are in registry with the position of the set of carriers 21 on one side of the receptacle 22, while the compression chest 39 and the suction chest 44 extend along side the set of carriers 21 adjacent to the other side of the receptacle 22. The suction chests 43 and 44 are connected to each other by means of a conduit 46. The suction chest 44 is also connected to an outlet 47 which opens in to the draft chamber 31 as at

48. Thus, the carriers 21 and the barrels 15 thereon, are carried past a set of chests both in the upward and downward movement.

When the blower 37 is in operation, the heated air is passed into the compression chests 38 and 39 through the cross connection 42. The compression chests 38 and 39 have orifices 49 thereon which are arranged in pairs so that each pair of said orifices are spaced from each other substantially corresponding to the vertical spacing between the adjacent carriers 21. The said orifices 49 are disposed on the sides of the compression chests 38 and 39 adjacent to the conveyor C'. On the inner faces of the suction chests 43 and 44 are formed orifices 51 complementary and opposite to the orifices 49. The compression created in the compression chests 38 and 39 forces the heated air out of said chests and into the interior of the receptacle 22. The circulation of the heated air is accomplished by the withdrawal of the spent air from the interior of the receptacle 22 through the orifices 51 and suction chests 43 and 44 by reason of the suction created by the heated air passing the opening 48 of the outlet 47. The flow of heated air through the draft chamber 31 and to the inlet 36 of the blower 37 acts at the opening 48 similarly to an ejector, creating suction thereat, thereby forming the suction in the suction chest 44, conduit 46 and suction chest 43. The suction thus created draws the spent air out of the interior of the receptacle 22, thereby causing the circulation of the air in said receptacle.

The spent air withdrawn through the outlet 47 and at the opening 48, is carried by the suction to the inlet 36 of the blower 37 and is reintroduced into the compression chests 38 and 39 in a mixture with the heated air which was drawn by the blower 37 from the heating chamber 29. It is apparent that the spent air in the receptacle 22 still contains a certain amount of heat and capacity to absorb or evaporate moisture from the barrels 15, and this is fully utilized by the partial reheating and the reintroduction of the spent air by and with the fresh, heated air entering through the draft chamber 31. The circulation of the heated air and the recirculation of the spent air, efficiently accomplishes the drying of the barrels 15 carried through the receptacle 22 by the conveyor C', and the waste of heat is reduced to a minimum. The barrels 15 are manually introduced into the receptacle 22 through the inlet opening 12' thereof, and are withdrawn through the outlet or discharge opening 13' thereof, formed in an identical position with the inlet opening 12 and discharge opening 13 of the receptacle 7.

The driving mechanism D imparts movement to the upper shaft 23 of the conveyor C', which movement is transmitted in the manner heretofore set forth to the conveyor C.

The driving mechanism D comprises an electric motor 52 supported on a standard 53 on the outside of the receptacle 22. A double sprocket 54 is keyed to the free end of the shaft of the motor 52 and it drives a double strand transmission chain 56. The two strands of the chains 56 are in parallel with each other and are guided over an idler 57 mounted on the outside of the receptacle 22. On the end of the shaft 23 extending in the direction of the motor 52, is keyed the hub 58 of a circular disk 59. Sprocket disks 61 are rotatably disposed on the opposite recessed ends of the hub 58 and are prevented from outward lateral movement by retaining disks 62, which retaining disks are secured upon the shaft 23. The sprocket disks 61 are spaced from each other so as to correspond to the spacing of the double sprocket 54, and the double strand chain transmission 56 is disposed over the teeth of the sprocket disks 61 in the usual manner. The rotation of the sprocket 54, therefore will cause the rotation of the sprocket disks 61 relatively to the central disk 59 on the hub 58, without actually transmitting any rotation to the shaft 23. It is to be noted, viewing Fig. 6, that the central disks 59 has a thickness substantially less than the clearance between the inside faces of the sprocket disks 61. Therefore, there is a clearance between the faces of the central disk 59 and the inside faces of the respective sprocket disks 61. Upon the opposite faces of the central disk 59 are disposed three pairs of catch plates 63. It is to be noted that the diameter of the central circular disk 59 is substantially smaller than the root lines of the gears of the sprocket disks 61, but the catch plates 63 extend radially beyond the outer circumference of the central disk 59. The upper corners of the catch plates 63 have an arcuate cut-away portion 64 opposite to the direction of rotation of the sprocket disk 61. On the chain 56 is mounted a dog 66 in the form of a roller extending between the opposite strands of the chain 56 and being rotatable on a pin 67 extending through both strands of the chain 56. While the chain 56 is driven by the sprocket 54, the said dog 64 travels around with the chain. When the dog 66 is brought into the position shown in Fig. 5, then it abuts against the cut-away corners 64 of the respective catch plates 63 and turns the same with the movement of the sprocket disk 61. After the respective catch plates 63 are turned by the movement of the dog 66, approximately 120°, the dog is permitted to release the catch plate 63, thereby stopping the movement of the central disk 59 with the sprocket disk 61. The central disk 59 remains stationary while the dog 66 is carried around with the chain in the usual manner and until it is brought again into the position shown in Fig. 5. Inasmuch as there are three catch plates 63, ar-

ranged radially and 120° apart, the turning of one of said catch plates 120° will bring the successive catch plate 63 in operative position.

The function of the idler 59 is to hold the plates in such a position that the dog 66 cannot by any means be brought into engagement with any other pair of catch plates but the pair of catch plates extending upwardly from the disk 59. When the disk 59 is rotated it will cause the rotation of the upper conveyer shaft 23 due to the keyed engagement of the hub 58 thereof with said shaft 23. Thus an intermittent movement of the conveyer is accomplished which is transmitted from the conveyer C' to the conveyer C in the manner heretofore set forth. The driving mechanism is so proportioned in the present illustration, that the conveyer is moved four seconds and is at a standstill for twenty seconds, between two movements thereof.

In operation the barrel 15 is manually inserted in the steaming apparatus A and is carried around the interior thereof whereby the staves of the barrel are prepared for the shaping operation in the windlass. The barrels 15 are withdrawn when they reach a position opposite the discharge opening 13. After the barrel is shaped it is introduced to the respective opening 12' into the drying apparatus B and is carried around the interior thereof by the conveyer C', and when it reaches a position opposite the discharge opening 13', it is withdrawn therefrom. During the travel of the barrel within the drying apparatus B, the circulation and recirculation of the heated air, as heretofore set forth, accomplishes the drying of the said barrel so as to prepare the same for the hooping, which is accomplished by another machine, not shown.

It will be recognized that a particularly facile and efficient apparatus is provided to accomplish the steaming and drying of the barrels before and after the shaping thereof, which apparatus is especially adapted to be used in connection with mass production of barrels; the timing of the steaming and the drying is readily determined by the adjustment of the driving speed and the design of the intermittent movement of the conveyers so that it will be suitable for the purpose set forth. The device is unitary in character; it does not require any careful setting up or adjustment, and the only manual operation connected therewith is the insertion and the withdrawal of the barrels from the respective receptacles, therefore, the device is particularly adapted for its use and it may be efficiently operated by the labor ordinarily available.

The drying chamber of the receptacle B is connected to the heating chamber formed between the outer and inner walls of the re-

ceptacle A by means of a conduit 68, whereby heated air is transmitted into the heating chamber of the receptacle B, which may be suitably exhausted thru the stacks 69. Thus
 5 part of the heated air of the drying apparatus is utilized to heat the inner walls 8 of the steaming chamber A, thereby maintaining the steam therein at a desired temperature.

Having thus described this invention, what
 10 I claim and desire to secure by Letters Patent is:

1. An apparatus for the described purpose, the same comprising a drying receptacle, means to carry barrels through said drying
 15 receptacle on a circuitous path of travel, and means to circulate heated air through said drying receptacle and to withdraw the spent air from the drying receptacle so as to recirculate the same with the fresh heated air,
 20 said air circulating means comprising oppositely disposed compression and suction chests arranged directly adjacent opposite ends of the barrels and having orifices therein registering with the barrel ends, means to impel
 25 the heated air into the compression chest, said suction chest being in communication with the intake side of the impelling means so as to allow the withdrawal of the spent air from the receptacle by the suction created
 30 thereat and to allow the recirculation of said spent air through said impelling means.

2. An apparatus for the described purpose, the same comprising a drying receptacle, means to carry barrels through said drying
 35 receptacle on a circuitous path of travel, means to circulate heated air through said drying receptacle and to withdraw the spent air from the drying receptacle so as to recirculate the same with the fresh heated air,
 40 said air circulating means comprising oppositely disposed compression and suction chests arranged directly adjacent opposite ends of the barrels and having orifices therein registering with the barrel ends, means to
 45 impel the heated air into the compression chest, said suction chest being in communication with the intake side of the impelling means so as to allow the withdrawal of the spent air from the receptacle by the suction
 50 created thereat and to allow the recirculation of said spent air through said impelling means; and means to impart to said carrying means an intermittent movement.

3. An apparatus for treating barrels comprising a drying receptacle having a barrel
 55 receiving opening and a barrel discharge opening thereon; means in said drying receptacle to carry the barrels from the receiving to the discharge opening of the drying receptacle; a compression chest; a suction chest,
 60 said chests being disposed to communicate with opposite sides of the barrels axially thereof and discharge heated air into the barrels longitudinally thereof and exhaust the
 65 air from the barrels in said drying recep-

tacle; an air heater related to said drying receptacle; means to impel the air from the air heater into the compression chest, said chests having complemental orifices thereon to discharge heated air into and exhaust heated air
 70 from the barrels, said suction chest being connected to the intake side of said impelling means so as to allow the withdrawal of the spent air from the drying receptacle by the suction of said impelling means and to recirculate the spent air in mixture with the heated
 75 air.

4. An apparatus for treating barrels comprising a drying receptacle having a barrel
 80 receiving and a barrel outlet opening thereon; a conveyer in said receptacle for carrying the barrels around the interior of the receptacles from the receiving opening to the outlet opening thereof; means to impart intermittent movement to the conveyer; means disposed
 85 on the opposite sides of the conveyer in the drying receptacle having openings in communication with open ends of the barrels substantially axially thereof for circulating heated air lengthwise through the barrels
 90 passing thru the receptacle; and means to impel heated air into said circulating means, said circulating means being connected to the intake side of the impelling means so as to allow the recirculation of the spent air from
 95 the drying receptacle.

5. An apparatus for treating barrels comprising a drying receptacle having a barrel
 100 receiving and a barrel outlet opening thereon; a conveyer in said receptacle for carrying the barrels around the interior of the receptacle from the receiving opening to the outlet opening thereof; means to impart intermittent movement to the conveyer; a compression chest on one side of the conveyer in
 105 the drying receptacle; a suction chest on the other side of said drying conveyer and opposite said compression chest, said chests having complemental orifices thereon to register with open ends of the barrels substantially axially
 110 thereof when the barrels are stationary for the passage of heated air therethrough; and means to impel heated air into said compression chest, said suction chest being connected to the intake side of said impelling means so
 115 as to withdraw the spent air from the suction chest and recirculate the same.

6. An apparatus for treating barrels comprising a drying receptacle having a barrel
 120 receiving and a barrel outlet opening thereon; a conveyer in said receptacle for carrying the barrels around the interior of the receptacle from the receiving opening to the outlet opening thereof; means to impart intermittent movement to the conveyer; a compression chest on one side of the conveyer in
 125 the drying receptacle; a suction chest on the other side of said drying conveyer and opposite said compression chest; said chests having complemental orifices thereon disposed
 130

axially of the barrels when the barrels are stationary for the passage of heated air there-through; said orifices being in registry with the barrel ends, means to impel heated air into said compression chest, said suction chest being connected to the intake side of said impelling means so as to withdraw the spent air from the suction chest and recirculate the same; and carriers on said conveyers being arcuate to conform to a section of the outer periphery of the barrels.

7. A drying apparatus comprising a receptacle having a receiving and an outlet opening thereon for the passage of the object to be dried; a conveyer in said receptacle for countermoving parallel rows of the objects to be dried around the interior of the receptacle, from the receiving to the outlet opening with the objects disposed transversely of the receptacle; a compression chest supported adjacent one side of each row of said objects; a suction chest supported adjacent the other side of each row of said objects, said chests having opposed complemental orifices thereon disposed axially of the objects for the passage of heated air into and from objects carried on the conveyer; a heating chamber in operative relation to said receptacle; and means connected between the air heating chamber and the compression chest to impel heated air into said compression chest, said suction chest being connected to the intake side of said impelling means for effecting the withdrawal of the spent air from the receptacle and the recirculating of the same in a mixture with the heated air sucked from the heating chamber.

8. A drying apparatus comprising a receptacle having a receiving and an outlet opening thereon for the passage of the object to be dried; a conveyer in said receptacle for countermoving parallel rows of the objects to be dried around the interior of the receptacle from the receiving to the outlet opening; a compression chest supported adjacent one side of the conveyer; a suction chest supported adjacent the other side of the conveyer, said chests having complemental orifices thereon for the passage of heated air into and from objects carried on the conveyer; a heating chamber in operative relation to said receptacle; an outlet passage leading from the chamber; means connected to said outlet passage and to the compression chest to impel heated air into said compression chest; and an outlet connection on said suction chest communicating with said outlet passage for effecting the withdrawal of spent air through said suction chest by the suction created in said outlet passage, said spent air being mixed thereat with the heated air and being recirculated by said impeller.

9. An apparatus for heating barrels having, in combination, a closed casing; means to counter-move two rows of barrels parallelly

thru the casing; a pair of ducts in the casing diagonally opposite each other having a plurality of discharge openings for directing streams of dried heated gases into one end of the barrels, the stream of gases being directed thru one row of barrels in an opposite direction to the stream of gases directed thru the other row of barrels; a pair of ducts in the casing, arranged diagonally opposite each other, having inlet openings to exhaust moisture laden gases from the other end of the barrels; and means to supply dried heated gases to the ducts.

10. An apparatus for heating barrels having, in combination, a closed casing; means to counter-move two rows of barrels parallelly thru the casing; a pair of ducts in the casing diagonally opposite each other having a plurality of discharge openings for directing streams of dried heated gases into one end of the barrels, the stream of gases being directed thru one row of barrels in an opposite direction to the stream of gases directed thru the other row of barrels; a pair of ducts in the casing, arranged diagonally opposite each other, having inlet openings to exhaust moisture laden gases from the other end of the barrels; means to effect an intermittent movement of the rows of barrels to register the barrels with the duct ports; and means to supply dried heated gases to the ducts.

11. An apparatus for heating barrels having, in combination, a closed casing; means to counter-move two rows of barrels parallelly thru the casing; a pair of ducts in the casing diagonally opposite each other having a plurality of discharge openings for directing streams of dried heated gases into one end of the barrels, the stream of gases being directed thru one row of barrels in an opposite direction to the stream of gases directed thru the other row of barrels; a pair of ducts in the casing, arranged diagonally opposite each other having inlet openings to exhaust moisture laden gases from the other end of the barrels; means to supply dried heated gases to the ducts; and means to circulate the moisture laden gases from the exhausting ducts thru a reheating drier preparatory to returning the gases to the ducts from which the heated gases are discharged into the barrels.

In testimony whereof, I have hereunto set my hand at San Francisco, California, this 29th day of August, 1929.

FRANCIS C. WILLIAMS.