(No Model.) 2 Sheets—Sheet 1.

E. R. BARDEEN.

TOBACCO CURING APPARATUS.

No. 393,532. Patented Nov. 27, 1888.

Fig. 1.

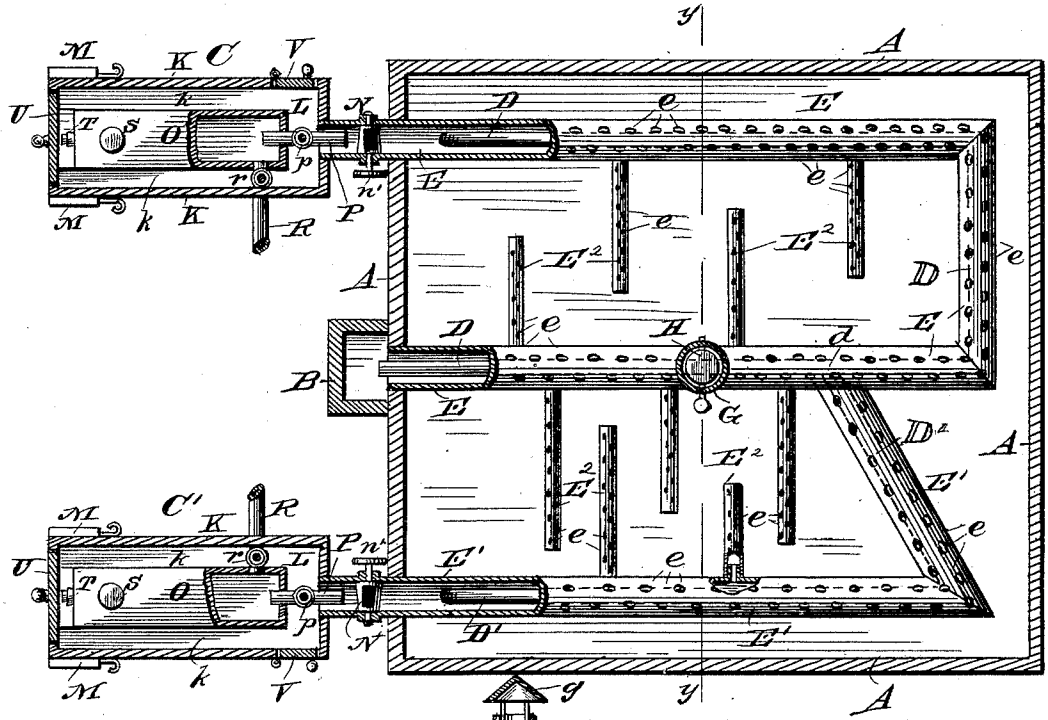
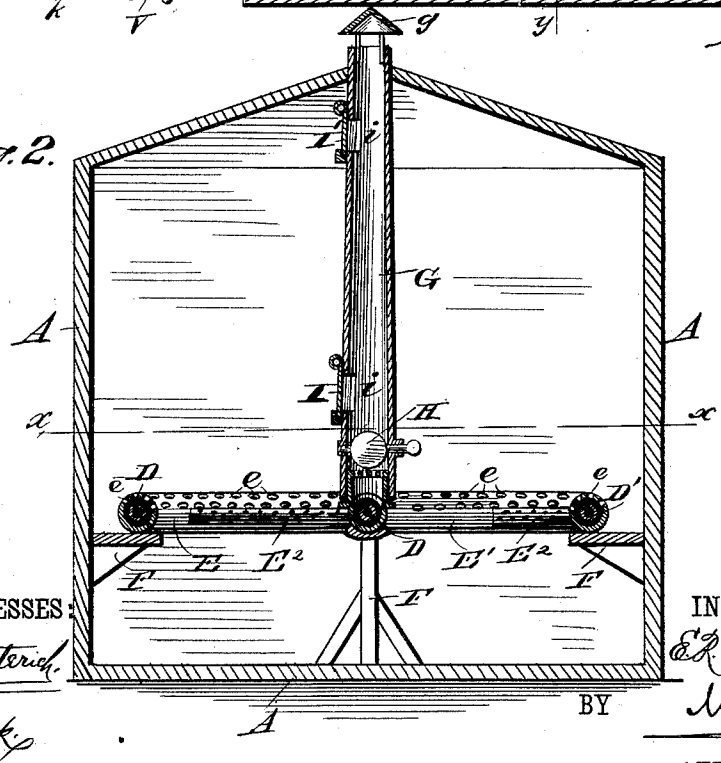


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

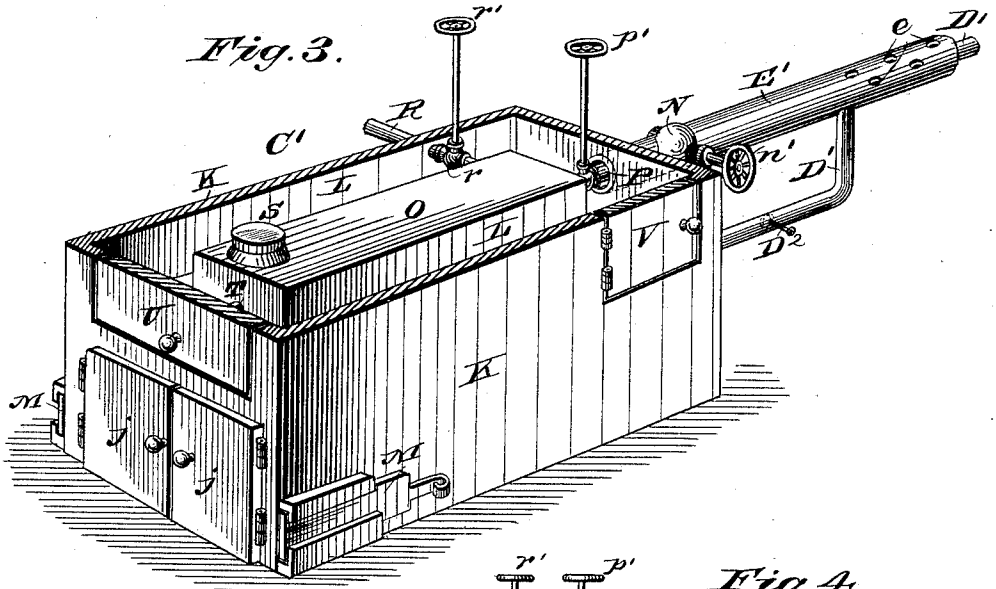


Fig. 4.

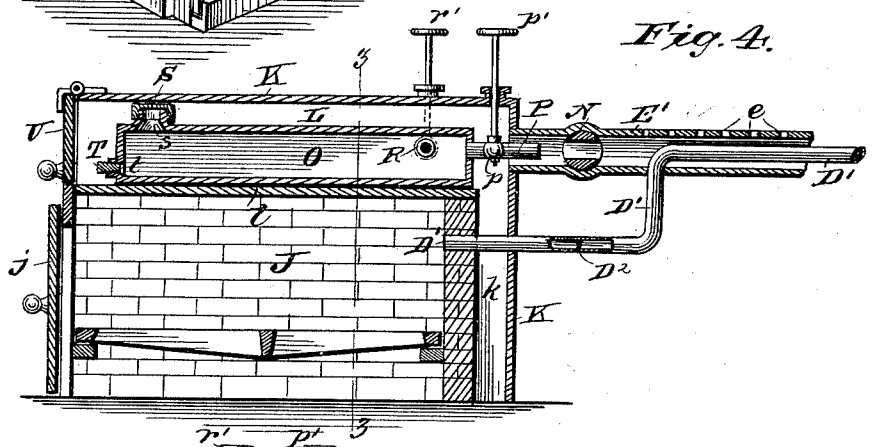
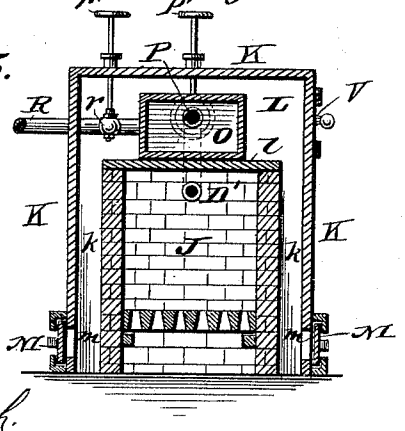


Fig. 5.



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UNITED STATES PATENT OFFICE.

EDWIN RUTHVEN BARDEEN, OF AIKEN, SOUTH CAROLINA, ASSIGNOR TO HIMSELF AND HAROLD M. BARDEEN, OF SAME PLACE.

TOBACCO-CURING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 393,532, dated November 27, 1888.

Application filed October 12, 1887. Serial No. 252,142. (No model.)

To all whom it may concern:

Be it known that I, EDWIN RUTHVEN BARDEEN, of Aiken, in the county of Aiken and State of South Carolina, have invented a new and Improved Tobacco-Curing Apparatus, of which the following is a full, clear, and exact description.

My invention relates to a curing or drying apparatus intended more particularly for curing tobacco-plants, but useful for drying or curing other substances; and the invention has for its object to provide a simple inexpensive apparatus of this character which may be operated effectively with economy of time and labor.

The invention consists in novel features of construction of the apparatus, all as hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of a tobacco-curing house in horizontal section on the line *x x*, Fig. 2, and with my improved apparatus applied thereto, and shown partly broken away and in section. Fig. 2 is a vertical transverse section through the curing-house, taken on the line *y y*, Fig. 1. Fig. 3 is a perspective view of one of the furnaces and portions of the connected hot-air and steam pipes, the top of the furnace being removed. Fig. 4 is a central longitudinal section of the furnace and parts of the connected hot-air and steam pipes; and Fig. 5 is a vertical transverse section of the furnace, taken on the line *z z*, Fig. 4.

The object of the invention is to provide for the admission into the curing-house, in which the green tobacco is hung, of dry heated air or moist heated air alternately, under absolute control of the attendant, for drying and sweating out the nicotine and empyreumatic oils and poisonous matters from the tobacco and bleaching it to produce any desired color and allowing it to be put "in case" at proper time without delays, to insure quick curing and very little loss or waste of the tobacco, and assuring the highest possible market value of a crop.

The curing-house may have any ordinary tight or close construction, and may be of any required size and adapted for storing tobacco in one horizontally-ranging series of bunches suspended on sticks or cords in the usual way, or in one or more horizontal rows or tiers of bunches ranging one over the other.

The curing-house A shown is provided with a chimney or flue, B, at one end, to which the gaseous products of combustion from the furnaces C C′ are conducted through pipes D D′, connected to the fire-chamber of the furnaces and to each other. I show the pipe D bent horizontally in ⊐ form inside of the house A and connected at opposite ends to the furnace C and chimney B, and the pipe D′ is shown ranging from the furnace C′ into the house A and along near one side of it, and is then bent inward and connects at *d* with the pipe D, as shown in dotted lines in Fig. 1 of the drawings. The pipes D D′ are each provided with a damper, D^2, which may be closed to shut off the direct heat of the furnace fire-boxes from the curing-house.

Around the pipes D D′ are fitted larger pipes, E E′, which are perforated at *e*, preferably throughout their whole length within the house A, for escape of air to the interior of the house, said air being heated at times more or less by passing along the pipes D D′ and between said pipes and the pipes E E′, which surround them. The pipes E E′ are provided with laterally-projecting and communicating pipes E^2, which also are perforated at *e*, and are preferably closed at their outer ends, and are preferably fitted to thimbles or collars on the pipes E E′, to allow them to be removed easily while the house is being filled or refilled with tobacco. Suitable brackets and struts, F, are provided to support the lines of double pipes in the house A.

About at the center of the curing-house a vertical pipe, G, is supported on the heated or moist-air-distributing pipe E, which has a thimble or collar over which the pipe G fits to allow its removal when the house is being filled with tobacco, and a little above this collar, which is perforated or open at the top, a damper, H, is fitted to cut off upward passage of the moist heated air as may be required. The ventilating-pipe G extends upward through the

roof of the curing-house, and at its top is fitted with a suitable weather-cap, *g*. At a couple of places, and preferably one near its top and one near its bottom, the pipe G is provided with holes *i*, over which, on the pipe, are fitted suitable slide-dampers, I I′, which may be shifted by connected rods or cords to open the passages *i* more or less to afford requisite ventilation to the interior of the curing-house, as hereinafter more fully explained.

The pipes E E′ receive steam to provide for circulation of moisture or moist air through them from generators heated by the furnaces C C′, and as both of these furnaces are preferably made alike and are so shown a detailed description of one furnace and its generator and pipe-connections will suffice, as follows, and with more particular reference to Figs. 3, 4, and 5 of the drawings, which show the furnace C′ drawn to a larger scale than in Fig. 1:

The furnace has an interior fire-box, J, having a plate of metal, *l*, for its top, and surrounded, except at its front and bottom, by an outer wall or jacket, K, large enough to provide an air-space, *k*, at the sides and rear of the fire-box, and also a hot-air chamber, L, of considerable size, over the fire-box. The hot-air space *k* and chamber L have free communication with each other, but have no communication with the fire-box, into which the pipe D′ enters to give draft from the chimney B to the furnace. The fire-box is or may be provided with a suitable fire-grate, and at its front is provided with fire-doors *j*, which may have dampers for controlling the draft. The jacket J is or may be provided at the sides, and preferably at its front lower parts, with slots or openings *m m*, over which slide-dampers M M are fitted to control inlet of fresh air to the jacket to be heated by circulation around the walls of the fire-box J prior to its exit from the jacket to the heated or moist-air-distributing pipe E or E′, which passes from the curing-house into the upper chamber, L, of the jacket. These pipes E E′ are provided with dampers N, whereby the supply of heated air to the pipes E E′ may be regulated at the will of the attendant. The smoke flues or pipes D D′, after leaving the furnaces, enter the pipes E E′ and traverses them within the curing-house on their way to a connection with the chimney B, as above explained.

Within the upper chamber, L, of the jacket K, and on the plate *l*, which forms the top of the fire-box and the floor of said chamber, is placed a metal steam-generator, O, from which a pipe, P, passes to the interior of the air-pipe E′, to discharge steam therein from the generator, and under control of a valve, *p*, fitted in the steam-pipe. The steam-generator is also provided with a blow-off pipe, R, controlled by a valve, *r*. The stems of both these valves *p r* preferably extend through the top of the jacket J, and are provided with hand-wheels *p′ r′*, respectively, for convenience in manipulating the valves, and the stem of the valve N also has a hand-wheel, *n′*, by which it may be operated. At its top and front end the generator is provided with a pipe, *s*, preferably extending through the top of jacket, allowing water to be filled into the generator, and at its lower part the generator is provided with an outlet at *t*, through which the water may be drawn off from the generator, and which outlet may be closed by a plug, T, or by a cock or stopper of any preferred construction. The jacket K has a door, U, at the front to give access to the steam generator, and also has a side door, V, at its rear part, giving access to the rear valves, and also allowing entrance of air to the chamber L or interior of the jacket, as may at times be necessary.

The operation of the apparatus is as follows: After the tobacco is in the house, and while firing up the furnaces, the dampers N D^2 M and the door V will be open, and also the ventilating-pipe dampers H and I. When a proper dry-air heat or temperature is reached in the house, it is important that it be maintained for a time, which can be accomplished by manipulating the dampers N D^2, aided, it may be, by admission of air at the door V, which can be opened more or less for this purpose. Should the effects of the hot air cause too quick drying of the plants, steam may be admitted to the air-pipes E E′ by opening the valves *p* to supply moisture or moist air to prevent premature drying of the plants, and thus by manipulating the fire and steam-pipe dampers and valves hot dry air and hot moist air may be admitted alternately to the curing-house to sweat out of the plants by the moist hot air the nicotine and other poisonous matters and to dry out the plants by the dry hot air, and also to nicely bleach the plants to any desired color to enhance their market value considerably over tobacco cured by other processes and apparatus. During the curing process it is necessary to manipulate the furnace-dampers in a manner relatively to the ventilating-pipe G and its dampers I I′, to assure a constant circulation of fresh warm air through the curing-house to prevent spotting of the plants. For instance, should the heat be too great at the lower part of the curing-house, the ventilating-pipe dampers H I′ will be closed, and the ventilating-damper I will be opened to give free draft of air from the lower part of the house to the atmosphere; but if the heat is excessive at the upper part of the curing-house the dampers H I will be closed and the damper I′ will be opened to allow more free escape of heated air from the upper part of the house. When the tobacco has been subjected for a sufficient time to these alternate effects of dry and moist hot air to cure it, as above described, the fire-pipe dampers D^2 will be closed, and all the dampers and doors in the furnace-jackets will also be closed, and the steam will be admitted freely from the generators O through the valves *p* and pipes E′ E^2, and thence through their perforations *e* to the house and into the plants, which will thereby be softened or "put in case" at once after the

curing is effected, to allow immediate removal of the plants and refilling of the house or kiln with new plants to be treated or cured in the manner above described, thus avoiding dangerous delays in handling the crop.

It will be noticed that by this apparatus the entire curing process is under full control of the attendant and nothing is left to chance, and every advantage is afforded for quick, economical, and satisfactory curing of an entire crop.

I do not limit myself to the precise construction of jacketed furnaces herein shown and described for supplying hot air to the curing-house in dry and moist condition; nor do I limit myself to the position of the furnaces relatively to the curing-house, as they may be placed partly or wholly within the house, provided their jackets have communication with the outer fresh air to maintain a pure hot-air supply to the house. When the house is small, but one furnace may be used, or more than two may be used in larger kilns. There may also be as many bends of the horizontal pipes D D′ E E′, and as many of the ventilating-pipes G, having dampers, as the size of the curing-house and the nature of the substances to be cured may require, as the herein-described apparatus is not limited in its use to the curing of tobacco, but may also be employed for other substances usually subjected to a drying or curing process.

The relative arrangement of the air-distributing and furnace-draft pipes may vary from that shown, as these two series of pipes may be arranged independently of and parallel with each other in any preferred manner throughout the curing-house.

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

1. In a curing or drying apparatus, the combination, with a house and a jacketed furnace, of a smoke pipe leading from the furnace to and ranging in the house, and connected to the chimney of the said house, a perforated pipe leading from the jacket of the furnace and extending into the house and surrounding the smoke-pipe, and perforated pipes projecting laterally from the pipe surrounding the smoke-pipe, substantially as herein shown and described.

2. In a curing and drying apparatus, the combination, with a house, a jacketed furnace, and a generator on the furnace and within the jacket of the same, of a smoke-pipe leading from the furnace to and ranging in the house and connected to the chimney of the said house, a perforated pipe leading from the jacket of the furnace to and within the house and surrounding the smoke-pipe, and a pipe leading from the steam-generator and projecting into the perforated pipe, substantially as herein shown and described.

3. In a curing and drying apparatus, the combination, with a house and a jacketed furnace, of a smoke-pipe leading into and ranging in the house, a perforated pipe leading from the jacket of the furnace to and within the house and surrounding the smoke-pipe, a vertical pipe connected to the perforated pipe and provided with openings near the top and bottom, and dampers for closing said openings, substantially as herein shown and described.

EDWIN RUTHVEN BARDEEN.

Witnesses:

M. L. GUDGES,

P. H. DIVINE.