

(No Model.)

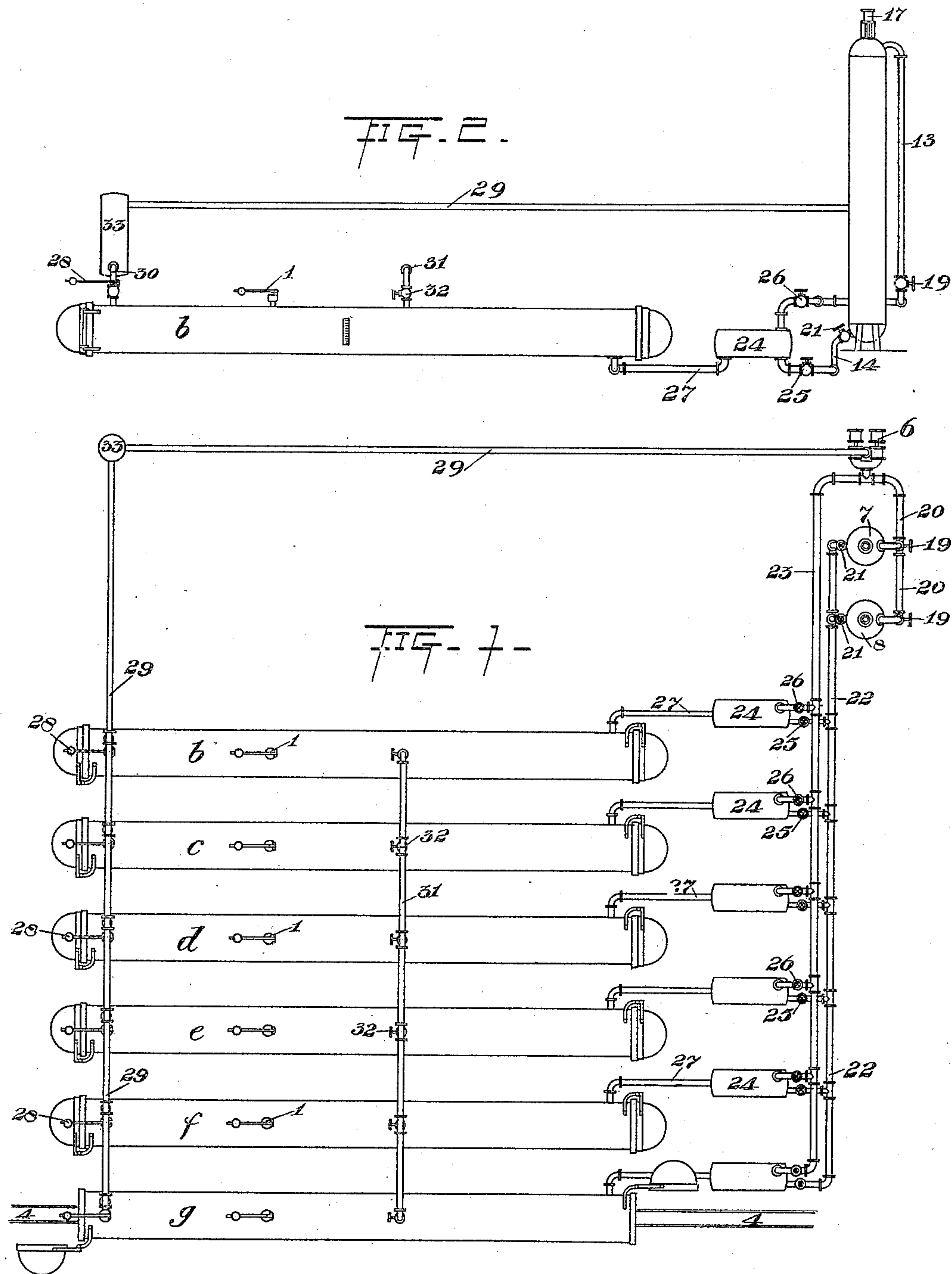
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J. P. WITHEROW.

PROCESS OF AND APPARATUS FOR VULCANIZING WOOD.

No. 446,501.

Patented Feb. 17, 1891.



WITNESSES

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(No Model.)

2 Sheets—Sheet 2.

J. P. WITHEROW.

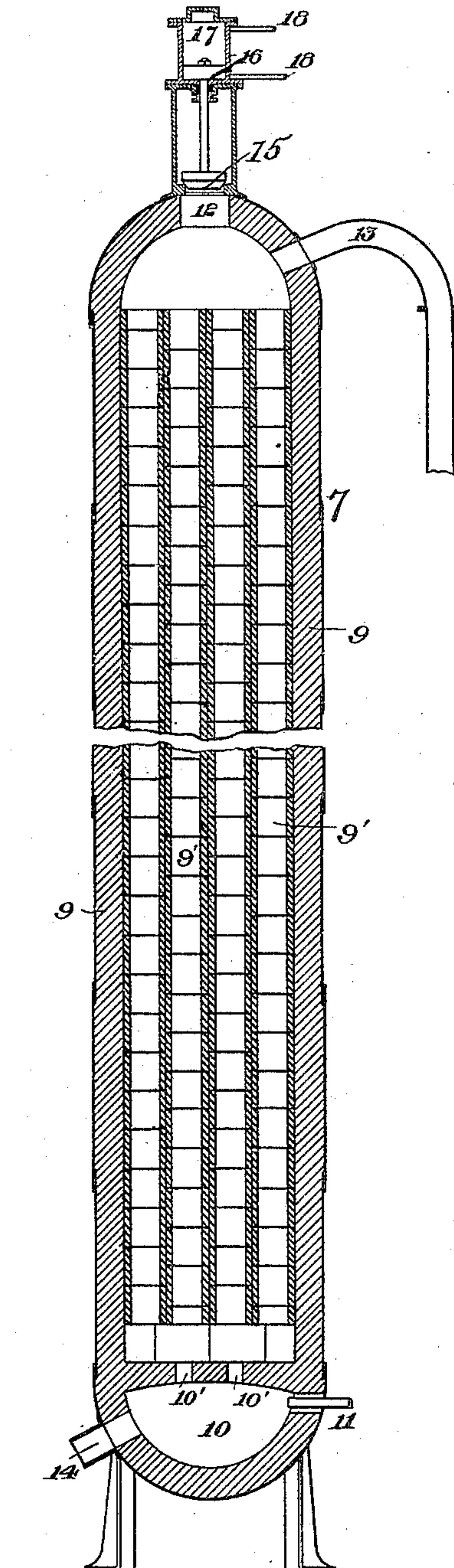
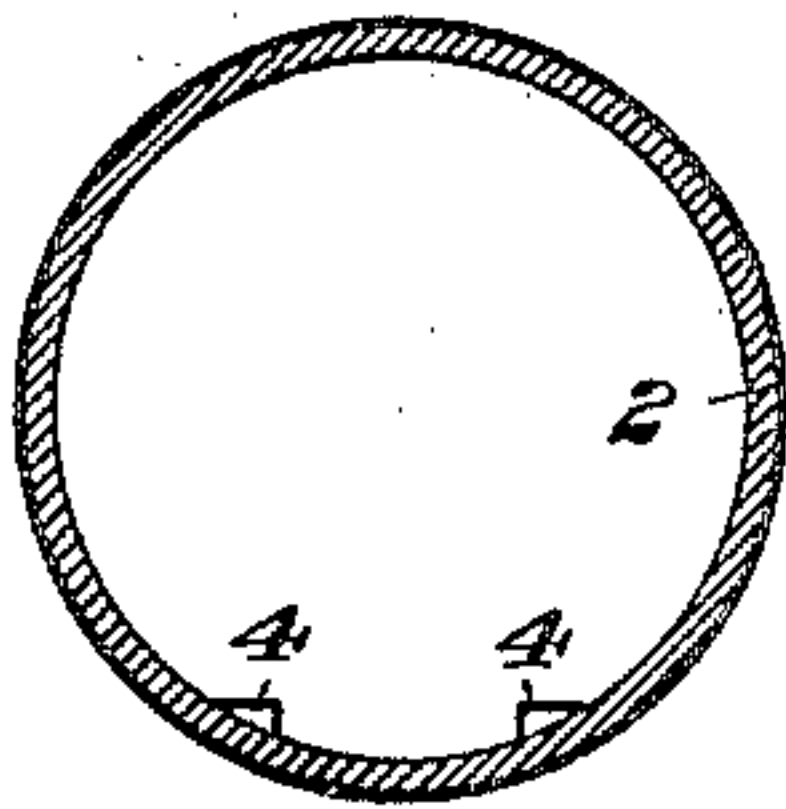
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FIG. 3.

FIG. 4.



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UNITED STATES PATENT OFFICE.

JAMES P. WITHEROW, OF PITTSBURG, PENNSYLVANIA.

PROCESS OF AND APPARATUS FOR VULCANIZING WOOD.

SPECIFICATION forming part of Letters Patent No. 446,501, dated February 17, 1891.

Application filed November 26, 1889. Serial No. 331,689. (No model.)

To all whom it may concern:

Be it known that I, JAMES P. WITHEROW, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for and Process of Vulcanizing Wood, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view of my improved apparatus. Fig. 2 is a side elevation thereof. Fig. 3 is an enlarged vertical section of one of the air-heating stoves. Fig. 4 is an enlarged vertical cross-section of one of the retorts.

Like symbols of reference indicate like parts in each of the figures.

My invention relates to an apparatus designed for the practice of the process of vulcanizing wood for the purpose of preserving it and preventing its decomposition. The vulcanizing process, of which, broadly considered, I do not claim to be the first inventor, consists in subjecting wood to a considerable degree of heat—say from 200° Fahrenheit and upward—while the wood is contained within a chamber, in which is maintained an internal air-pressure of sufficient extent to prevent the heat from boiling the sap or contained moisture, the result of the process being a destruction of the germs of decomposition and coagulation or solidification of the albuminous constituents of the wood, so that the wood is rendered to a certain extent impervious to moisture, and is enabled to resist for a long time the natural progress of decay. Although this process has been for a long time known to the art, yet its successful practice has been impeded by the defective nature of the apparatus hitherto employed.

The object of my invention is to improve the construction of such apparatus and to provide means by which the treatment of wood by this process may be performed rapidly and economically.

The particular type of apparatus to which the invention relates is that in which the wood is heated in a chamber, not by heat applied externally thereto, but by the introduction thereinto of heated compressed air.

The apparatus is clearly described in the

following specification, and the novel features thereof which I desire to cover by this patent are briefly stated in the claims.

I shall now describe my improvement with reference to the accompanying drawings, in which *b, c, d, e, f,* and *g* represent a series of cylinders or retorts designed for treating wood for the purpose of preserving the same, and each provided with a suitable safety-valve *l*. I have shown six of these cylinders; but it should be understood that there may be a greater or less number of them employed in connection with the other parts of the apparatus, and that while it is of my invention to employ a plurality of such cylinders arranged in a single system comprising an air compressor and heater or stove, and I intend to claim the same, yet in connection with other novel features of my apparatus I intend also to claim the use of any number, one or more, of such cylinders. Each cylinder consists of an exterior metal shell, made, preferably, of boiler-plates riveted together in the usual manner and having an interior lining of fire-brick. (See Fig. 4.)

The cylinders may be made of any length and diameter suitable to the dimensions and style of the timber to be treated therein; but it is necessary that they should be made strong and air-tight, so that when in use they shall not be injured by the internal pressure to which they are subjected and shall not permit the escape of air. The cylinders are provided with doors at each end and with tracks, and affording means for cars loaded with wood to be introduced at one end and to be withdrawn at the other. The doors are constructed and applied in such manner as to air-tightly close the ends of the cylinder.

I shall now describe the means which I employ for heating the air and supplying it to the retorts or cylinders in which the wood is treated.

6 is an air compressor or pump, which may be of any usual construction, and, if desired, a set of several compressors or pumps may be used to compress the air to the required degree.

7 8 are stoves for heating the air. There are two or more of these stoves, and their interior construction is shown in Fig. 3. Each stove consists, preferably, of a hollow cylin-

der of metal having a lining 9 of brick and interior vertical flues or checker-work 9'. At the bottom of the stove is a combustion-chamber 10, in which any suitable fuel may be burned for the purpose of heating the flues or checker-work to the required degree. I may use for this purpose a gas-burner 11. The combustion-chamber is connected with the overlying portion of the stove by short flues 10'. The stove is provided with a stack-flue 12 for the escape of the waste products of combustion, and with inlet and outlet pipes 13 and 14 for the admission and delivery of air. The stack-flue is closed by a valve 15, which seats inwardly, its stem being connected to a piston 16, which works within a cylinder 17, and is of somewhat greater area than the under side of the valve. The cylinder is connected by valve-controlled pipes 18 with the air-compressor, so that when air is passed through the stoves the air may be admitted to the cylinder on the upper side of the piston, making the pressure thereon the same as that in the stove; but as the area of the piston is somewhat greater than that of the lower face of the valve the admission of air to the cylinder will keep the valve on its seat, and when the air is cut off from the stove the pressure may be applied to the under side of the piston, so as to unseat the valve and open the stack-flue. This forms a convenient means for seating the valve and for operating it from the ground-level without the use of cumbersome mechanical appliances. The reason for employing two or more of the stoves is to enable a continuous heating of the air to be carried on. The stoves are used alternately—that is, while air is heated by passing through the flues of one stove and abstracting the heat from its interior structure the other stove is heated by internal combustion, and vice versa. By these means a higher temperature may be maintained with less difficulty than with any other form of stove, and in practice it will be found that by reason of the brick structure a high degree of internal air-pressure may be applied without substantial loss by leakage and without injury to the parts of the stove. The inlet-pipes of the stoves are controlled by valves 19 and are connected with the air-compressor by pipe 20, and the delivery-pipes of the stoves are likewise provided with water or air cooled valves 21 and are connected with a pipe 22, which leads to the retorts. The delivery-pipe of the air-compressor is also connected with a pipe 23, which leads to the retorts, as hereinafter described, and is without direct connection with the stoves. Each of the retorts is connected with the pipes 22 and 23, preferably in the following manner: A mixing-chamber 24 is interposed between each retort and the pipes, being connected therewith by valve-controlled pipes 25 and 26, and being connected also with the retort by a pipe 27. Each retort is provided with an escape-passage controlled by a pressure

safety-valve 28, which is regulable so as to open and permit the discharge of air at any degree of internal pressure within certain limits, and it may also be connected with a discharge-pipe 29 by a branch pipe 30, which may be controlled by the safety-valve 28 or by an independent safety-valve. The retorts are also preferably put into communication with each other by a pipe 31, connected with the several retorts by valve-controlled branch pipes 32. The pipe 29 enters a cooling chamber or coil 33 and extends thence to the inlet-pipe of the air compressor or compressors.

The operation of the apparatus is as follows: The cylinders or retorts or any number of them is or are charged by introducing cars loaded with wood. The doors at the ends of the retorts are then closed and made air-tight.

One of the stoves which has already been heated by internal combustion—say the stove 7—is then put in communication with the pipes 20 and 22, and the latter pipe is put in communication with the charged retorts. The air-compressor is then started and forces air through the pipe 20, stove 7, pipes 22 and 25, chamber 24, and pipes 27 into the retorts included in the system. The air is heated in its passage through the stove, and there is thus furnished to the retorts a supply of heated and compressed air. The air-pressure in each retort continues to increase from the accumulating action of the compressor until it reaches the point at which the safety-valve is set, and when such point is reached the valve opens and by permitting the escape of air prevents further elevation of pressure. The valve is provided with a spring or weight which returns it to its seat when the pressure is reduced to the normal limit. As the safety-valves of the several retorts may be set at different points, the pressure therein may be maintained independently at different degrees. This is desirable, because in practice it is found that different degrees of heat are required to produce given results in treating the different grades and qualities of wood with which the retorts may be charged.

The escape of air through the safety-valves causes a continuous current from the compressor through the stoves and into the retorts, so that the heat is kept up by a continually-entering hot-air supply. The temperature in each retort is regulated independently and kept at any desired degree, as follows: In using the apparatus in the manner above explained all the air-supply for the retorts passes through the stove and is heated thereby; but if the valve of the pipe 26 of any retort be opened cold air will pass directly from the compressor through the pipes 23 and 26 and into the mixing-chamber 24, where it will mix with and reduce the temperature of the hot air entering through the pipes 22 and 25. The proportional volumes of cold air from the pipes 23 and 26 and hot air from the pipes 22 and 25 may be nicely

regulated by proper relative adjustment of the controlling-valves, so that air of the highest degree of heat afforded by the stove, or quite cold air or air of any intermediate degree of temperature, may be supplied, and as each retort has or may have independent connections with the pipes 22 and 23 the temperature of each may be regulated independently of all the others. The temperature of the retorts is indicated by suitable pyrometers connected with each. It will be understood that in the use of the stoves as the one through which air is passing loses its heat to such extent as to be unable to heat the air properly it is cut off from communication with the pipes 20 and 22, the stack-valve is opened, and the fire in the combustion-chamber is started, and in the other stove the stack-valve is shut and the valves 19 and 21 are opened to put the stove in communication with the pipes 20 and 22 and the compressor.

I shall now describe the function of the pipe 29, which may be used in connection with the pressure-valves 28 or without the same. This pipe performs the function of conducting air from such of the retorts as may be in communication therewith to the compressor, and thus maintaining an air-current, and also by supplying the compressor with air at a higher pressure than that of the atmosphere it materially hastens the work of the compressor and reduces the power necessary to be employed. The air passes from the retorts through the pipe 29 to the compressor, and is repumped with an increment of pressure back through the stove to the retorts. As, however, the air generally leaves the retorts at too high temperature to be taken with advantage into the cylinder of the compressor, I employ the cooler 33, through which the air passes, as a means for reducing its heat. The cooler may conveniently consist of a coil of pipe set in a water-vessel, or it may be otherwise constructed.

The effect of the action of the heated air on the wood in the retorts has been already explained, and as the process employed has been known in the art and is not, broadly, my invention it is unnecessary in this specification to state in detail the proper degrees of heat and pressure needed to effect given results. When the wood in any of the cylinders has been sufficiently treated, that cylinder is cut off from the remainder of the apparatus by means of its valves, the air-pressure therein is reduced, the door at the rear of the cylinder is opened, and the car with its load of wood is withdrawn. This may be done without in any way checking or interfering with the progress of the operation in the other retorts.

In order to prevent wasting all the compressed air contained in any of the cylinders at the close of the operation, such cylinder is first cut off from communication with the other parts of the apparatus, and then by

means of the connecting-pipe 31 and its valves 32 it is put into communication with one or more of the other retorts, which are likewise cut off from the rest of the system and contain air at atmospheric pressure and are charged with wood. The compressed air flows from the one retort into the other and reduces the air-pressure proportionately, so that the whole thereof is not lost.

The advantages of my invention will be appreciated by those skilled in the art.

The apparatus which I have described may be modified in many ways, and by the detailed description which I have given of the construction of the parts of the apparatus I do not limit myself strictly thereto, unless so expressed in the claims, each of which states a separate and independent item of my invention. Thus the form and mode of operation of the air-heating stove, of the connecting-pipes, and other parts may be changed, and instead of controlling the pressure automatically by the pressure-valves, valves similarly situated may be manipulated by hand to maintain the desired pressure, which can be observed by noting the indications of a suitable pressure-gage.

I claim—

1. In apparatus for vulcanizing wood, the combination of an air-compressor, a retort or chamber, two or more stoves having combustion-chambers, and flues or passages heated by internal combustion, pipes connecting the said flues or passages of the stoves with the retort or chamber, and valves by which the stoves may be connected or disconnected therefrom and may be used alternately, the compressed air passing through the heated flues or passages of one stove while the products of internal combustion may be passing through the corresponding flues or passages of the other, and vice versa, substantially as and for the purposes described.

2. In the art of vulcanizing wood, the improvement consisting in compressing air, heating it by passing it through a stove, introducing it in a heated state and under compression into a retort or retorts containing the wood, and maintaining a circulation through the retort or retorts of fresh supplies of hot compressed air by affording a regulated outlet from the retort or retorts to the atmosphere, substantially as and for the purposes described.

3. In apparatus for vulcanizing wood, the combination of a stove or stoves, an air compressor or compressors, two or more retorts or chambers, and separate pressure-regulated valves for each retort, whereby by adjustment of the valves the pressure in the retorts may be regulated independently, substantially as and for the purposes described.

4. In apparatus for vulcanizing wood, the combination, with a series of two or more retorts or chambers, of a stove or stoves, an air-compressor, a direct connection or pipe between the air-compressor and the retorts or

chambers, a second connection between them by way of the stove or stoves, and valves controlling the entrance of said connections to the retorts or chambers, whereby the supplies of hot and cold air thereto may be regulated independently, substantially as and for the purposes described.

5. In apparatus for vulcanizing wood, the combination, with a retort or retorts, a stove or stoves, and an air-compressor, of a connection or pipe between the air-compressor and the retort or retorts, a second connection between them by way of the stove or stoves, and an interposed common mixing-chamber for each retort, substantially as and for the purposes described.

6. In apparatus for vulcanizing wood, the combination, with an air-compressor, of a retort having an external metal shell and an interior brick lining, a heating-stove interposed between the retort and the compressor, and pipes connecting the same, substantially as and for the purposes described.

7. In apparatus for vulcanizing wood, the combination of an air-compressor, a retort or chamber, two or more stoves having combustion-chambers and brick flues or passages heated by internal combustion, pipes connecting the said flues or passages of the stove with the retort or chamber, and valves by which the stoves may be connected or disconnected therefrom and may be used alternately, the compressed air passing through the heated flues or passages of one stove while the products of internal combustion may be passing through the corresponding flues or passages

of the other, and vice versa, substantially as and for the purposes described.

8. The combination, with the air-compressor, of a stove having a flue or passage heated by internal combustion, a stack-flue and valve for said stove, a cylinder and piston connected with said stack-flue, and pipes leading to the cylinder and connected with the air-compressor for the purpose of operating said valve, substantially as and for the purposes described.

9. In apparatus for vulcanizing wood, the combination of an air-compressor, a retort or chamber adapted to contain the wood to be vulcanized, a stove having a combustion-chamber with flues or passages heated by internal combustion and stack or exit passage, pipes connecting said flues or passages with the retort or chamber and with the air-compressor, and valves controlling the communication of the stove with the retort or chamber and controlling the stack or exit passage, whereby the stove may be used alternately, the products of combustion passing through and heating the flues at one period and the compressed air passing through them to the retort at another period, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 26th day of September, A. D. 1889.

JAMES P. WITHEROW.

Witnesses:

JOHN F. WILCOX,

W. B. CORWIN.