(No Model.)

T. F. ROWLAND.

DOOR FOR DIGESTERS.

No. 320,971. Patented June 30, 1885.

Fig. 1.

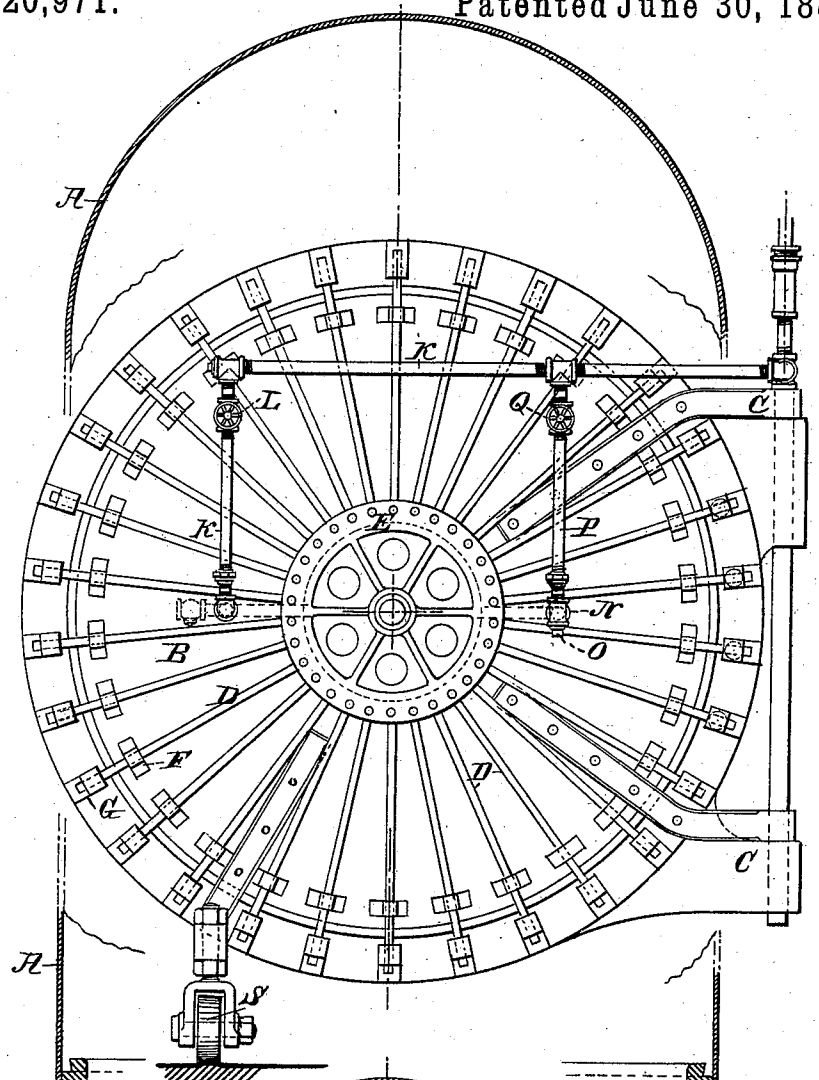
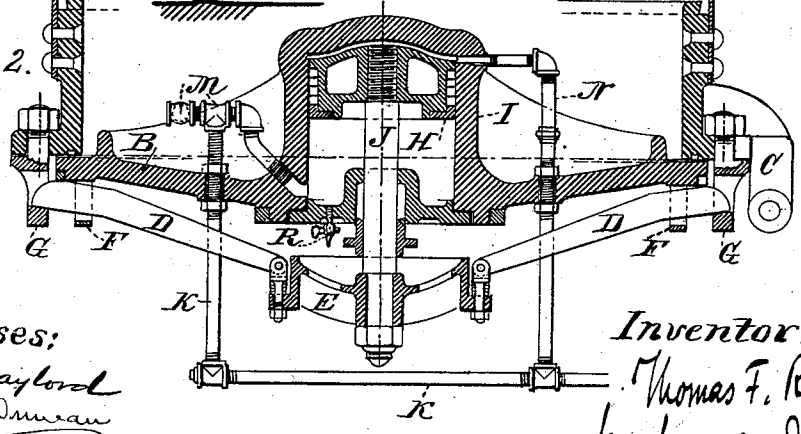


Fig. 2.



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UNITED STATES PATENT OFFICE.

THOMAS F. ROWLAND, OF NEW YORK, N. Y.

DOOR FOR DIGESTERS.

SPECIFICATION forming part of Letters Patent No. 320,971, dated June 30, 1885.

Application filed May 12, 1884. (No model.)

To all whom it may concern:

Be it known that I, THOMAS F. ROWLAND, of the city, county, and State of New York, have invented certain new and useful Improvements in Doors for Digesters and Similar Structures; and I hereby declare the same in and by the following full, clear, and exact description thereof, reference being had to the accompanying drawings.

This invention relates, broadly, to devices for securing the doors of structures that are subjected to heavy internal pressure, such as certain kinds of kilns, vulcanizers, air or gas receivers, or storage-chambers, and any of the other various structures in which gases or fluids are confined or stored under pressure, temporarily or otherwise.

More particularly, the invention relates to the doors of structures in which material is to be treated under pressure, and which are frequently opened for the purpose of recharging them with the material to be treated, and which, therefore, require large doors to give ready and unobstructed access to their interiors, and fastenings for such doors that not only have the necessary strength, but are adapted to quickly secure and unfasten the door.

Usually, heretofore, the fastenings for the doors of such structures have consisted of some form of cross-bars or levers that were caused to act upon the doors through the medium of hand-screws or wedges; but such devices are inconvenient, and with large doors, where many fastenings are necessary, much time is lost in securing all of them. So, also, with such appliances it is impossible to secure any correspondence or interaction between the internal pressure and the power exerted by the locking devices; hence when the internal pressure of the structure is brought to bear upon the door the door may be found not to be closed sufficiently tight, which will necessitate the removal of the internal pressure to better secure it; or a sudden increase of the internal pressure may so loosen the door from its seat that a blow-out will occur, and the whole process of treatment be interrupted.

The object of this invention, therefore, is, first, to furnish the door with fastenings that can quickly be brought into operative condition; second, to provide a construction by which the power acting within the main structure can be applied to the fastening devices in such manner that they will be caused to hold the door tightly closed under all conditions; third, to establish such a communication between the power acting upon the fastening devices and the agent exerting the pressure within the structure that any increase of the force exerted by the latter will proportionately increase the former; and, fourth, to furnish the fastening mechanism with a safety device arranged to prevent the agent that is used to create the interior pressure from acting by leakage to lose its control over or reverse the action of such mechanism.

The particular construction that is chosen to illustrate the principles of the invention is a kiln or drying-chamber designed for treating lumber by a certain drying process not necessary to elaborate here; and the invention consists in devices and combination of devices shown in the accompanying drawings, in which—

Figure 1 is a face view of a door having my improved fastening devices, and Fig. 2 is a central longitudinal section of the door and the walls of the drying-chamber.

In these views, A represents the shell or walls of the structure, and B is the door, located at one end thereof and occupying nearly the whole of the end. The door is circular in shape and is supported on hinges C C.

D indicates lever-bars arranged radially upon the outer face of the door with their inner ends jointed to a common cross-head, E, and their outer ends held loosely in place by guides F. These levers have a bearing against the door at or close to the edge thereof, and the staples G, or any equivalent devices attached to the frame-work of the door, are constructed and arranged to receive the outer ends of the levers and serve as their fulcra. Moving the cross-head toward the door causes all the levers to be simultaneously extended beyond the edge of the door and brought into engagement with these staples, as seen particularly in Fig. 2, thereby securing the door, and moving the cross-head away from the door withdraws said levers from the staples, leaving the door free to be swung around on its hinges.

H is a piston contained in a cylinder, I, which is built in or otherwise secured to the door, and J is the rod of the piston which passes through the head of the cylinder, and carries on its outer end the cross-head which operates the levers.

K is a steam-pipe leading from some source of steam to the outer end of the cylinder. It is provided at L with a cut-off valve, and on the inside of the door at M with a check-valve which is arranged to establish communication between the cylinder and the interior of the drying-chamber whenever the pressure within this chamber is greater than that within the cylinder.

N is a waste or leak pipe running from the inner end of the cylinder in front of the piston to a point outside of the door, where it has a discharge-opening at O.

P is a branch pipe connecting this waste-pipe to the steam-pipe K, and is provided with a cut-off valve, Q.

R is a petcock, whereby the cylinder is exhausted.

S is a carrying-wheel to relieve the hinges when the door is open.

The operation of the mechanism is this: After the drying chamber has been filled with lumber and the door swung into its closed position, and before admitting steam or the other agent to be employed in the chamber, steam is let into the cylinder I, driving the piston inward and thereby extending the levers and locking the door securely in place by the action of the levers upon the fixed staples and movable edge of the door. Steam or the other agent employed is then admitted to the drying-chamber through any suitable conduit, and the drying process proceeds, the pressure in the cylinder being maintained as long as it is desired to have the door closed. If, while the cylinder is thus filled with steam, any steam should leak past the piston to the inner end of the cylinder, it is carried off by the waste-pipe, and thus prevented from counteracting the effect of the steam behind the piston, as it would otherwise do. So, also, if, during the time the lumber is being treated, the pressure within the drying-chamber should be increased, and if for any reason the same increase of pressure is not communicated to the piston H through the pipe leading to the locking-cylinder, the check-valve will open, thus putting the cylinder in communication with the interior of the drying-chamber, and the pressure upon the piston will be correspondingly increased to meet and resist the additional strain to which the door-fastenings are subjected. If there were no channel of communication provided between the cylinder and the drying-chamber, such increase of the pressure in the latter might overcome the retaining power of the fastenings and force the door open. The check-valve serves to confine the pressure within the cylinder during the process of first closing the door, and also whenever the pressure in the main chamber is less than that in the cylinder.

To open the door, first, the steam is exhausted from the drying-chamber, then the steam is cut off from the cylinder and its petcock opened to exhaust the steam, and then steam is carried from the main steam-pipe to the inner end of the cylinder to force the piston outwardly and withdraw the lever-bars; it being understood that the discharge-opening in the waste-pipe, while sufficiently large to permit the escape of the waste or leaking steam, is too small to permit the free escape of the live steam, which, though escaping slightly at this opening, is still amply active to drive the piston outwardly and unlock the door. It will in practice be found advisable not to provide a cock for closing this waste-pipe. If, accidentally, such a cock, if used, should be left closed, the accumulation of steam in front of the piston might seriously interfere with the working of the apparatus by tending to equalize the pressure on both sides of the piston.

It is necessary that the leverage of the fastening-bars should be such that the product of it into the power applied to the piston, which product represents the holding power of these bars, shall be something greater than the internal pressure that the door sustains; and, as a matter of safety, it is preferred that this excess of power exerted by the fastening mechanism should be at least one-fourth more than is required to hold the door locked.

It will be plain to those familiar with this kind of mechanism that it is susceptible of various modifications in construction, and I do not therefore confine myself to the exact form shown. So, too, it is not necessary, though usually desirable, to employ the same medium of pressure to operate the piston that is employed within the drying-chamber; thus the piston might be operated by hydraulic or air pressure, and steam be used within the drying chamber; and it is when two distinct media of pressure are thus used that the check-valve connection is more particularly required. And, while in the special construction shown in the drawings the steam or other agent used in the main chamber is to be introduced thereto through some other channel than the pipe which supplies the cylinder, it is plain that the main chamber might be supplied from the cylinder itself, in which case a check-valve in the passage leading from the cylinder to the chamber would not be necessary.

What is claimed as new is—

1. The combination, in a digester or other similar structure, of a door for closing the same, one or more lever-bars for securing the door in the closed position, and a cylinder and piston, the piston being arranged to extend and withdraw said bars, substantially as and for the purpose set forth.

2. The combination of the door, a system of lever-bars arranged radially thereon, and

a piston and cylinder attached to the door, said piston being arranged to extend and withdraw said bars, substantially as and for the purpose set forth.

3. The combination of the door, a system of levers arranged thereon, a cross-head common to said levers, and a cylinder and piston, said piston being arranged to operate said bars through the medium of said cross-head, substantially as set forth.

4. In combination with the door of a digester or similar structure, bars for holding the door in its closed position, and a locking cylinder and piston, said piston being arranged to operate said bars, and said cylinder communicating with the interior of the digester, for the purpose set forth.

5. In combination with the door of a digester or similar structure, bars for holding the door in its closed position, and a locking cylinder and piston, said piston being arranged to operate said bars, and said cylinder communicating with the interior of the digester by means of a channel provided with a valve arranged to operate as and for the purpose set forth.

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