M. Nixon.

Pulp Digester.

No. 26,199. Patented Nov. 22, 1859.

Fig: 1.

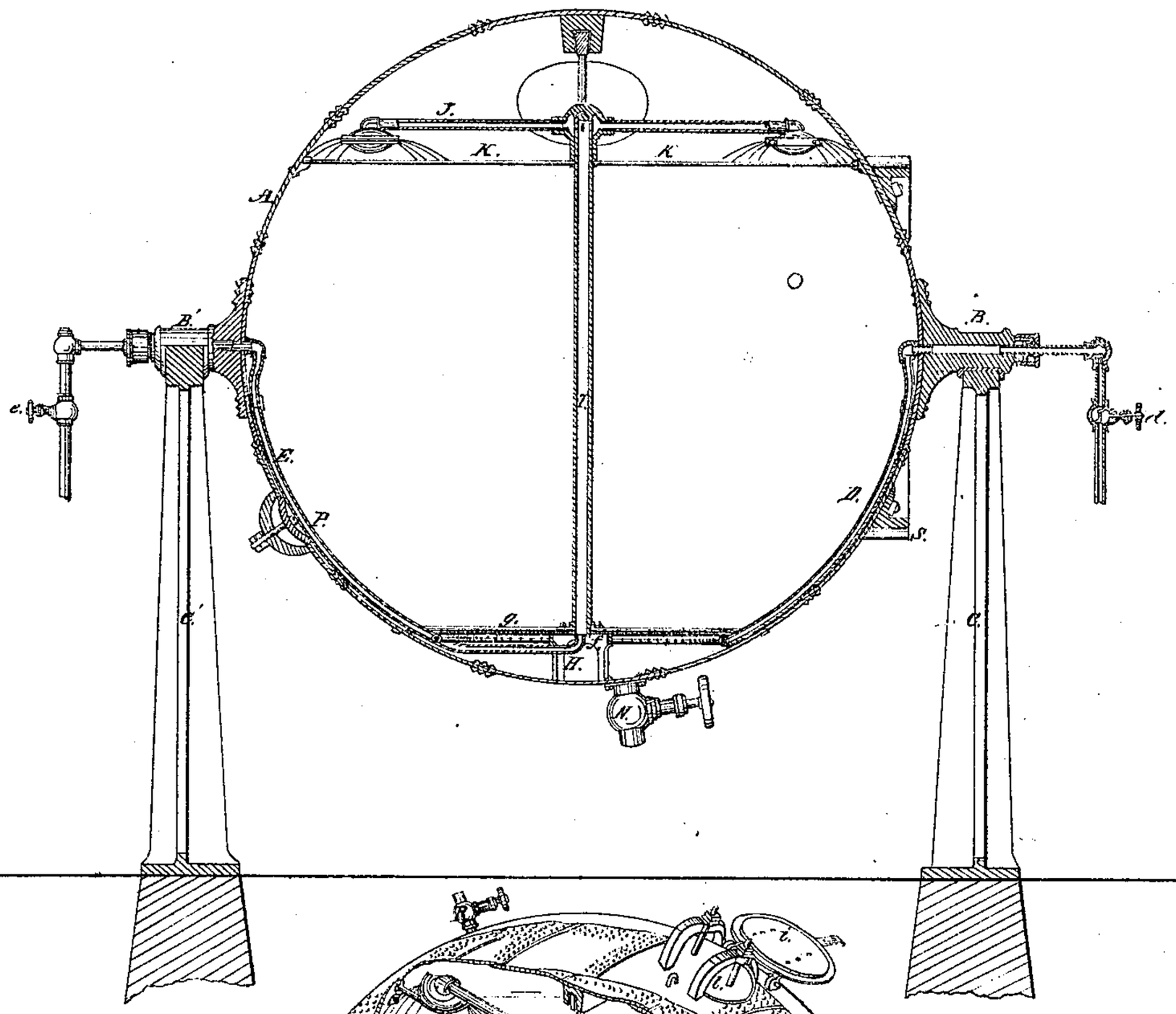

Fig: 2.

Witnesses.

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MARTIN NIXON, OF PHILADELPHIA, PENNSYLVANIA.

BOILER FOR TREATING PAPER-STOCK.

Specification of Letters Patent No. 26,199, dated November 22, 1859.

To all whom it may concern:

Be it known that I, MARTIN NIXON, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Keirs for Boiling Paper-Stock; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the annexed drawings, making a part of this specification.

My invention relates to: a provision for subjecting straw and other fibrous substances, to the action of continuous opposing currents of alkaline solution, and steam under a heavy pressure combined with provisions for the ready charging and discharging of the contents of the keir.

In the accompanying drawings, Figure 1, is an axial section of my keir. Fig. 2, is a perspective view thereof.

A represents a spherical vessel about 14 feet in diameter, of boiler plates $\frac{5}{8}$ inch thick, and lapped 6 inches, and treble riveted so as to be capable of sustaining about 200 pounds pressure of steam. This vessel A is supported about $4\frac{1}{2}$ or 5 feet from the floor, by axial trunnions B, B′, which rest upon suitable piers C, C′. These trunnions are hollow so as to permit the passage into the keir of two $1\frac{1}{2}$ inch pipes D, E, conveying steam to the interior of the keir.

Extending across the keir about 12 inches above its extreme bottom is a floor F, of thin boiler plate pierced over its entire surface with holes about $\frac{1}{2}$ to $\frac{5}{8}$ of an inch in diameter and about 2 inches apart. Upon this floor is secured a second floor G, made of thick sheet iron, and pierced with scant $\frac{1}{8}$ inch holes about $\frac{1}{2}$ inch apart. These floors F, G, are firmly held in position by cross bars *f*, *g*, bolted to the keir.

Both the steam pipes D and E pass down in contact with, and are secured, to the sides of the keir, and terminate below the perforated floors; the pipe D coils around immediately beneath the floors, and is so perforated with $\frac{1}{4}$ inch holes about 15 inches apart, as for steam to issue from it in jets, directed horizontally toward a common center. The other pipe E being $\frac{3}{4}$ inch in diameter inside the keir, passes along the bottom to immediately beneath the center of the perforated floors, and is there turned up about 4 inches. The central part of the floor F rests on a trivet H, attached to the keir.

At their center the floors F and G are pierced to admit and support the lower end of a 3 inch pipe I, extending vertically upward about $10\frac{1}{2}$ feet where it is surmounted by a centrifugal rose or spreader J, such as described in my patent of 18th May 1858. The upper end of the pipe I is held in position by stay rods K. The pipe I and spreader J, and rods K, are made capable of being removed previous to the discharge of the deglutenized stock.

d and *e* are cocks in the pipes D and E.

L is a man hole through which the keir is charged. During the operation of boiling the said man hole is closed by a head *l*, but immediately preceding the inversion and discharge of the keir the man head *l* is removed and the man hole is then temporarily closed by a cover *l′* hinged to the keir. Diametrically opposite to this man-hole is a 4 inch cock M for the attachment of a water hose connected with a force pump to facilitate discharging the contents when the keir is inverted.

N is a 4 inch draw off cock.

O is a try cock for testing the condition of the straw or other stuff from time to time.

P is a small man hole for use when the keir is in an inverted position.

Q is a small screw nozzle for the occasional attachment of a pressure gage.

R is a blow off cock.

S, T, is the gearing by means of which the keir is inverted.

U is a pin projecting downward from the top of the keir to prevent the unshipping of the spreader while in motion.

A keir of the size named will hold about 9,000 pounds straw as it comes from the threshing machine or flail, but to get in as much as possible at a charge the straw is first run through a willow or breaker, and is then "broken down" in large tubs with boiling water, or the spent liquor from the previous batch. By thus preparing I am enabled to get in 11,000 to 12,000 pounds at a charge, the straw being well tramped down as it is put in. The keir being thus packed nearly up to the spreader J, clear, caustic, alkaline liquor of about 5 degrees hydrometer test is poured in, in the proportion of 25 gallons to 100 pounds straw. The keir is then closed and a full head of steam put on the coil, and just such quantity on the axial pipe I, as will send up therethrough a stream of liquor sufficient to start the spreader. For this purpose, half a turn or

less on the valve *e*, suffices. A keir well protected from radiation, and supplied with steam at 90 pounds pressure will require for oat straw 4 to 5 hours to attain the desired heat, 300° Ft. For wheat straw the heat must be 310° Ft. For rye straw the heat must rise to 320° Ft. or over, and if flax straw is operated upon it will require about 200 pounds to the square inch; for this purpose a boiler of somewhat greater strength may be employed. The heat must be kept up from 3 to 4 hours. The steam is then shut off, and in another ½ to ¾ of an hour or longer at the discretion of the operator, is allowed to escape from the keir through the cock R. The manhole L, is then removed and the liquor is let out through the cock N. Then cold water is thrown in until the keir is cool enough for a man to go in and take out the spreader J, axial pipe I and rods K. Water is then let in through the bottom cock N, until its rise and that of the straw so equalize the weight as to enable the ready inversion of the keir. Then close the manhole temporarily by the cover *l'* until by the act of inversion it is brought to the lowest position. Then force in water through the cock M, open the man hole L, and the whole mass of straw will flow out in a few minutes. The thus discharged contents are received on sacking, spread upon a lattice or perforated floor through which the liquor drains leaving the straw. The straw is then ready to be taken to the washing engine to be washed and bleached as other paper stock.

It is believed that this keir reduces fibrous materials better and with less consumption of chemical agents fuel raw material and labor than any other keir or boiler known to the art. The shape is such that a large amount can be packed in a given space. A small amount of liquor is sufficient because the spreader distributes a continuous stream of liquor on top of the straw, through whose mass it percolates equally to the bottom. It cooks rapidly and thoroughly from the fact that the entire heat is supplied in the form of steam from the bottom whence it ascends equally throughout the mass. There is very little loss of fiber because the straw remains at rest in an open spongy mass while "cooking," and being taken out in long free fiber is easily washed of the gluten and other extraneous matters. The labor is slight, all the washing being done in the engine. By such a keir a charge may be easily worked through every 24 hours.

Rotary boilers are considered objectionable, because the straw is unequally acted upon; some parts being insufficiently disintegrated while other parts are so cut up by overdoses of alkali and steam as to become reduced to an impalpable pap comparable to cow dung, thereby wasting much staple and clogging the meshes of the washer.

The spherical form of keir has several striking advantages. Its capacity is such as to enable the economical working of very large batches of straw at one time, resulting in a great cheapening of the manufacture. The upper portion or dome presents the shape best adapted for the action of the spreader, while the lower portion or basin serves to very perfectly gather and conduct the solution back into the bottom receptacle, thus facilitating the circulation of the solution. The spherical form is also such as to present the greatest strength with a given expenditure of material.

By the above described arrangement a few minutes suffice to empty the keir, an operation which usually involves several hours of severe manual labor.

It will be apparent that with a slight modification a single steam pipe might be employed to perform the functions of the pipes D and E.

I claim as new and of my invention herein and desire to secure by Letters Patent—

The close spherical keir or boiler A, journaled on hollow trunnions B, and provided with a perforated floor F, G, steam pipes D and E, and elevating and distributing pipes I and J, the whole being constructed and arranged and operating substantially in the manner set forth, to boil paper stock under a heavy pressure by the combined action of an upward current of steam, and a downward current of hot alkaline solution and admitting of the ready inversion of the said boiler for the discharge of its contents when cooked.

In testimony of which invention, I hereunto set my hand.

MARTIN NIXON.

Witnesses:

GEO. H. KNIGHT,

FRANCIS MILLWARD.