

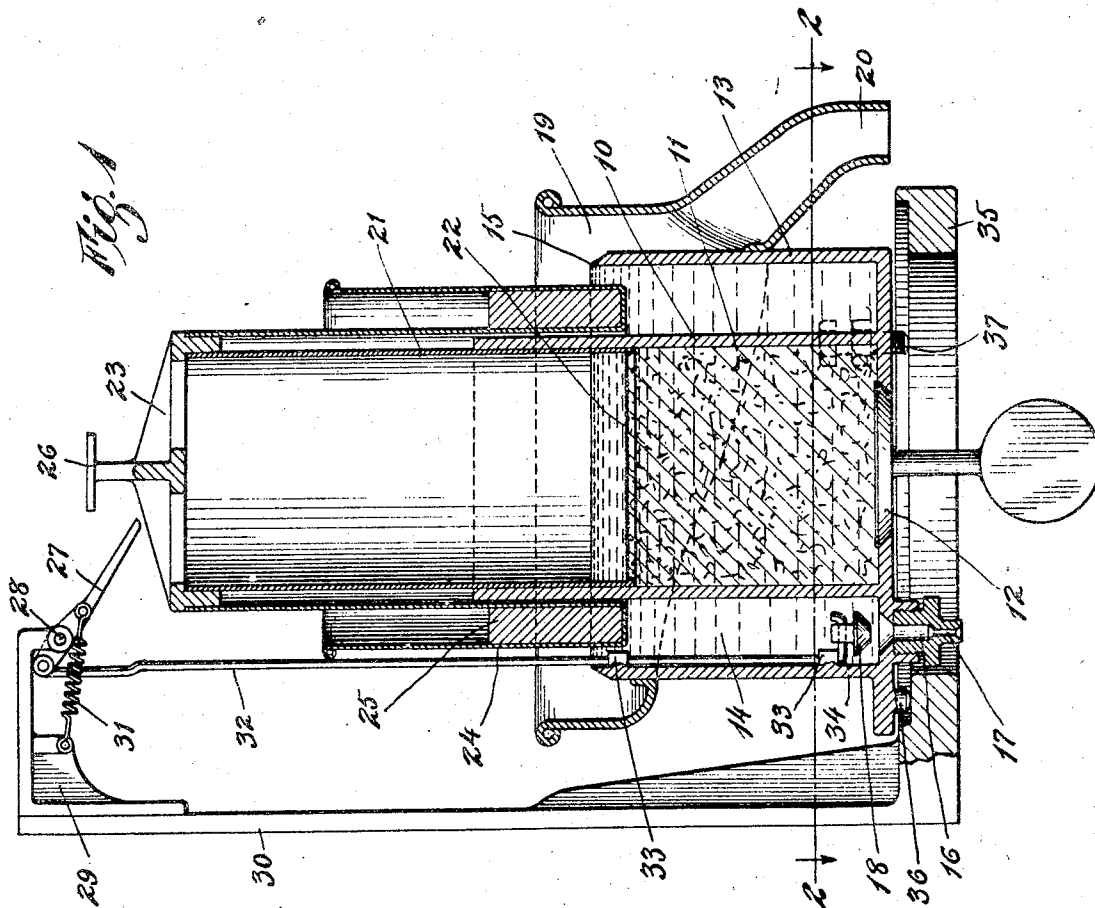
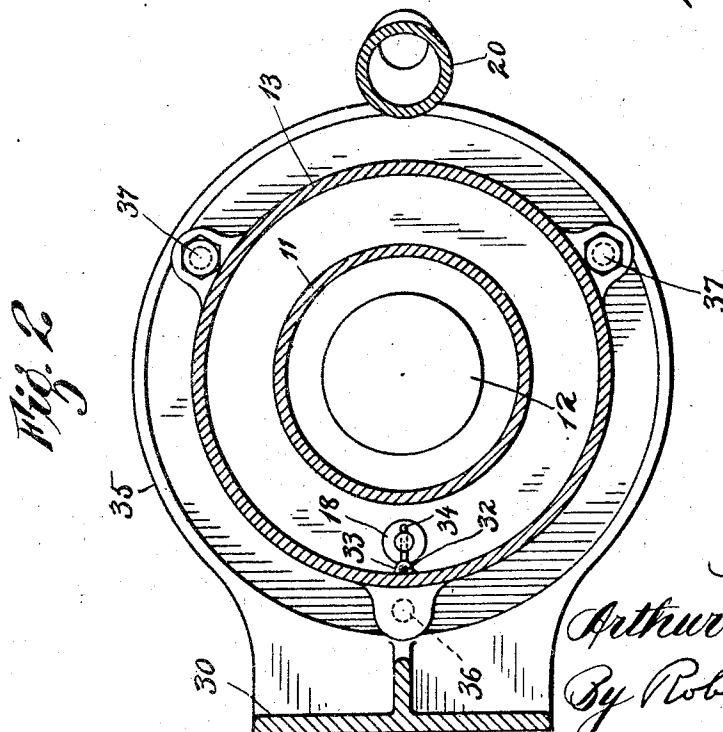
Sept. 2, 1930.

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1,774,830

SLOWNESS TESTER FOR PAPER PULP

Filed April 15, 1929



UNITED STATES PATENT OFFICE

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SLOWNESS TESTER FOR PAPER PULP

Application filed April 15, 1929. Serial No. 355,049.

This invention relates to means for measuring the rate of release of a liquid from its mixture with a solid or solids,—for example, the readiness of paper pulp of known density to give up its water by draining through a screen or sieve. Devices of this class are known as slowness testers and are used in the paper making industry for testing samples of pulp to determine the rate at which water will drain from the pulp on the wire of the paper-making machine, which factor has an influence on the speed at which the machine can be run and the quality of the paper produced.

Slowness testers have heretofore depended on straining the pulp through the perforated or wire-mesh bottom of a vessel, collecting the water separated from the pulp, discharging it through orifices located at different heights in the collection vessel, collecting and measuring the discharges from one or more orifices and comparing them if there is more than one.

My present invention has for its object to simplify and improve the construction and operation of devices of this class and to provide a method which will avoid any direct measurement of the volume of the liquid released from the pulp or other mixture. My improved method and apparatus may be operated with speed and accuracy, and without requiring any great skill on the part of the operator.

Of the accompanying drawings, Fig. 1 is a vertical section showing a slowness tester embodying and adapted to carry out my invention in a preferred form.

Fig. 2 is a horizontal section on the line 2—2 of Fig. 1.

In practicing the invention, I provide a screen or sieve which is moved through the liquid under the influence of a predetermined force such as gravity, to strain the solids therefrom, and I then measure the resistance offered by the pulp to the travel of said

screen. As a preferred means of effecting such measurement, I concurrently displace a separate body of water or other liquid which is being allowed to escape at a predetermined rate, and determine the volume of the displaced liquid, such determination being a measure of the slowness of the pulp sample under test.

In the drawings, 10 is an upright, cylindrical receptacle or container for the sample of pulp 11 to be tested, said container having a large opening in its bottom normally closed by a weighted valve 12 for draining the container when the test has been completed. 13 is a chamber adapted to contain a separate body of clear liquid 14 such as water, and provided with a circular, horizontal overflow lip or weir 15 at its upper edge. Preferably the chamber 13 concentrically surrounds the container 10 as shown, and forms a stationary unit therewith, although this is not broadly essential. From the bottom of chamber 13 leads a discharge passage 16 terminating in an orifice 17 of predetermined capacity and provided with a vertically-movable valve 18 for opening and closing said passage. 19 is an annular overflow-channel or collecting ring surrounding the weir 15 and having a sloping bottom terminating in a discharge spout 20 under which may be placed a graduated beaker or other receptacle for collecting the overflow of water from chamber 13 and measuring its volume.

21 is a vertical, hollow, cylindrical screening vessel or sleeve mounted to slide telescopically with a close, running fit in the container 10, and 22 is a fine-mesh screen or sieve forming the bottom of said vessel. Said sleeve is connected at its upper end with a head frame 23 apertured to provide free ventilation for the air space within said vessel. Also connected with said head frame, and in this instance concentrically surrounding the vessel 21, is

an annular displacer 24 having the same cross-sectional area as the screening vessel and adapted to descend vertically through the body of water in the chamber 13, said displacer having inner, outer and bottom walls, the first of which is extended upwardly to connect with the head frame 23, and containing a weighting substance 25 such as lead, in quantity sufficient to bring the weight of the movable unit to a predetermined figure, such as three pounds.

The head frame 23 is provided with a central tripper flange or disk 26 overlying the longer arm of a trip lever 27 which is pivoted at 28 to an overhanging bracket 29 on the supporting frame 30 of the device. 31 is an over-center pull-spring extending from a pin on the long arm of trip-lever 27 to another pin on the bracket 29, and 32 is a link or rod whose upper end is pivoted to the short arm of lever 27, said link passing downwardly inside the chamber 13 through guides 33 on the wall thereof and having a hooked lower end 34 on which is suspended the outlet valve 18.

Frame 30 is formed with an annular base 35 on which the fixed and movable units are supported by means of a fixed stud 36 and two screw studs 37 mounted in suitable ears at the base of the chamber 13, for leveling the apparatus to bring the weir 15 into an exact horizontal position.

In the operation of this device, the container 10 is filled to a suitable level, which may approximate that of the weir 15, with the sample of pulp stock to be tested, the density or proportion by weight of solids to water in said sample having been previously determined. The outside annular chamber 13 is filled full to the top of weir 15 with water, after its outlet valve 18 has been closed and the lever 27 brought to a horizontal position in which the spring 31 pulls substantially in line with the pivot 28. The screening vessel 21 having been placed in position in the container 10, with the bottom of displacer 24 occupying a position just above the level of weir 15, the vessel and displacer unit are quickly released and allowed to descend by gravity, the tripper flange 26 acting on lever 27 to automatically open the discharge valve 18, which allows the water to escape through the calibrated orifice 17 at a rate determined by the size of said orifice and the head of the annular water-column 14. At first the rate of descent will be so rapid that member 24 will displace the water 14 faster than it can escape through the orifice 17, because the screen 22 will be descending into pulp 11 of the maximum fluidity in container 10, and the water will be strained from the pulp through the screen 22 to the space above the latter with the maximum freedom; but the rate of descent progressively becomes less as the pulp density at the screening level increases, until

a point is reached where the rate of displacement of water in chamber 13 just equals the rate of escape through orifice 17. At this point, water ceases to overflow the weir 15. The volume of water collected in the beaker or other vessel below the spout 20 is a measure of the slowness (or freeness) of the pulp sample.

On completion of the test, the screening vessel 21 and its connected displacer may be removed, the valve 12 opened, and the pulp receptacle 10 washed out ready for the next test.

It will be understood that the above described embodiment may be modified without departing from the scope of my invention. For example, it is not essential that the displacement chamber shall concentrically surround the pulp container, nor that the overflow weir shall occupy the whole periphery of the displacement chamber, but these and other features may be varied without changing the essential principles involved. The discharge of water from chamber 13 through orifice 17 introduces a time factor which permits the measuring of the resistance offered by the pulp to the descent of the screen 22 by determining the volume of water displaced from chamber 13, but this time factor might be introduced and the measure of resistance effected in other ways.

I claim:

1. The method of measuring the rate of release of a liquid from its mixture with solid material which comprises straining the liquid from the solid material, releasing a second separate body of liquid at a predetermined rate, displacing the second liquid concurrently with the straining of the first liquid, and collecting and measuring the displaced liquid.

2. The method of measuring the slowness of paper pulp which comprises causing a screen to descend by gravity through the pulp water to strain the solids therefrom, releasing a second, separate body of water at a predetermined rate, displacing said second body of water concurrently with the straining of the pulp water, and collecting and measuring the displaced water.

3. Pulp testing apparatus comprising a pulp container, a vessel having a screen adapted to descend in said container, a chamber having an overflow lip and also having a discharge orifice of predetermined capacity, means for conducting the overflow from said lip to a point of collection, and a displacer movable in said chamber and connected for concurrent descent with the first-said vessel.

4. Pulp-testing apparatus comprising a pulp container, a screening vessel adapted to descend by gravity therein, a liquid overflow displacement chamber having a discharge orifice of predetermined capacity, a displacer of substantially the same cross-sectional area as said screening vessel, movable

in said chamber and connected for concurrent descent with said screening vessel, and means for conducting the overflow from said chamber to a point of collection.

5 5. Pulp-testing apparatus comprising a pulp container, a screening vessel vertically movable therein, a liquid-overflow displacement chamber concentrically surrounding said container, and an annular displacer vertically movable in said chamber and connected for concurrent descent with said screening vessel.

15 6. Pulp-testing apparatus comprising a pulp container, means movable therein for straining liquid from the pulp, a liquid-overflow displacement chamber having a discharge passage, a displacer in said chamber connected for concurrent operation with the straining means, and means controlled by the movement of said straining means for automatically opening said passage.

20 7. Pulp-testing apparatus comprising a pulp container, a screening vessel adapted to descend by gravity therein, a liquid displacer connected for concurrent movement with said vessel, a liquid-overflow chamber adapted to receive said displacer and having a discharge passage with an orifice of predetermined capacity, a valve controlling said passage, and trip mechanism operated by the descent of said vessel for automatically opening said valve.

35 8. Pulp-testing apparatus comprising an upright cylindrical pulp container, a gravity screening cylinder having a telescopic sliding fit in said container, a pulp screen forming the bottom of said vessel, and means for measuring the resistance offered by the pulp to the descent of said screening vessel.

40 9. Pulp-testing apparatus comprising an upright pulp container, a liquid-overflow displacement chamber concentrically surrounding the same and having a discharge passage, a valve controlling said passage, a gravity screening and displacer unit including a screening vessel movable in said container and an annular displacer movable in said chamber and connected by its upper portion with said vessel, and trip mechanism operated by the descent of said unit for automatically opening said valve.

50 10. Pulp-testing apparatus comprising a pulp container, a screening vessel adapted to descend by gravity therein, a liquid displacement chamber having a discharge passage controlled by a valve, a displacer movable in said chamber concurrently with the movement of said vessel, an overhead trip-lever mounted for operation by said vessel, a rod connecting said lever with said valve, and a spring connected with the lever for opening said valve when the lever is tripped.

65 11. Pulp-testing apparatus comprising a supporting frame, a stationary unit supported thereon and including a pulp container

and a liquid displacement chamber, the latter having a horizontal overflow lip, a gravity unit including a screening vessel movable in said container and a displacer connected with said vessel and movable in said chamber, and adjustable means for leveling the stationary unit on said frame.

In witness whereof I have hereunto set my hand this eighth day of April, 1929.

ARTHUR B. GREEN.

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