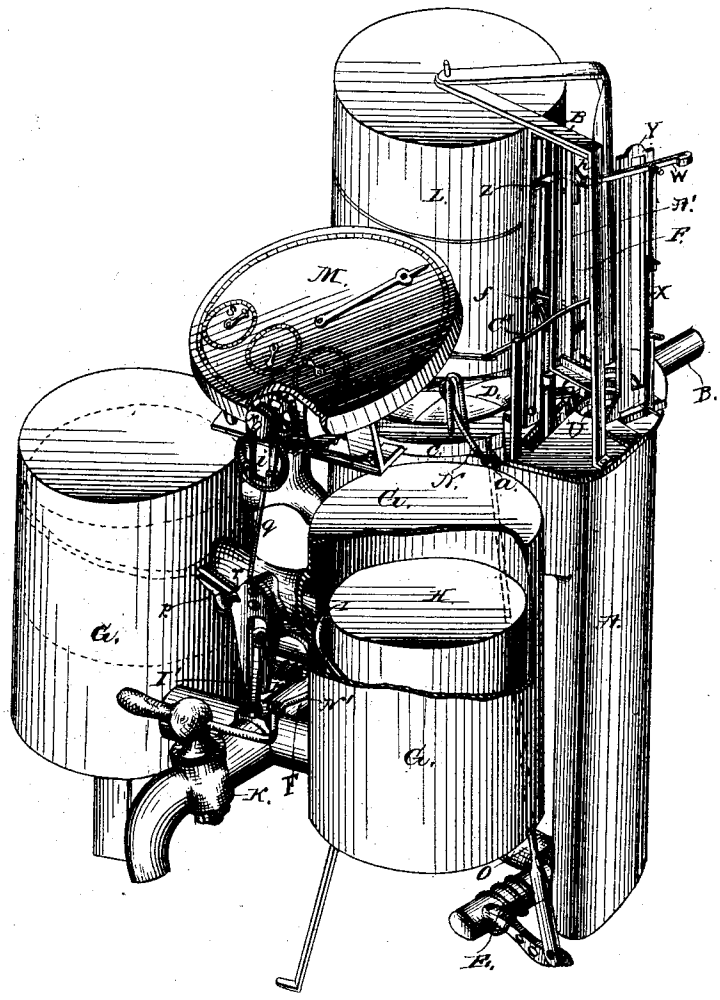
3 Sheets—Sheet 1.

J. M. CAYCE.

Recording Apparatus for Spirit-Meters.

No. 224,147. **Patented Feb. 3, 1880.**

FIG. 1.



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3 Sheets—Sheet 2.

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FIG. 3.

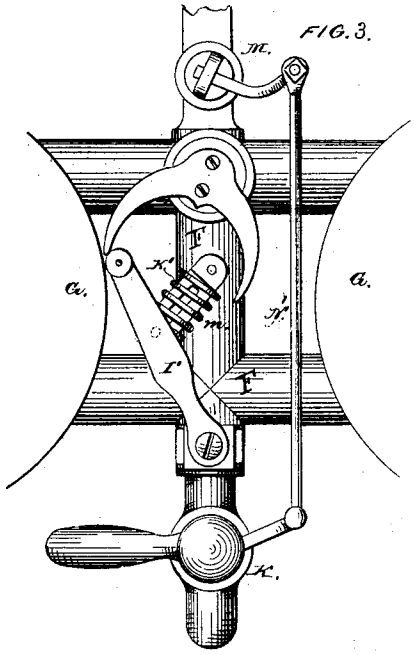


FIG. 2.

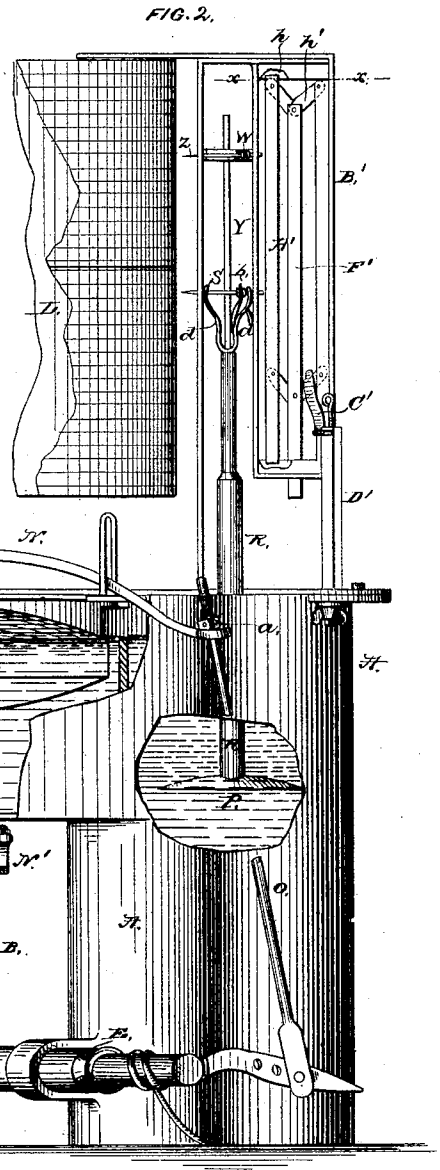
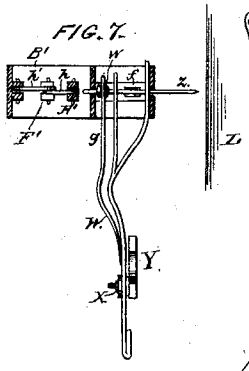


FIG. 7.



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3 Sheets—Sheet 3.

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Recording Apparatus for Spirit-Meters.

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FIG. 4.

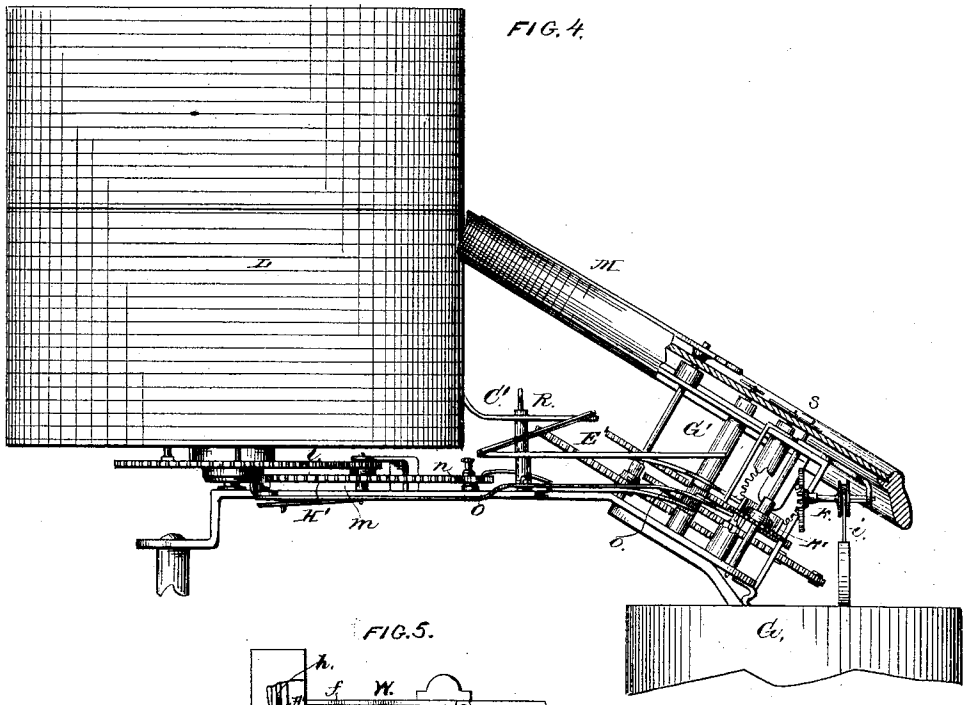


FIG. 5.

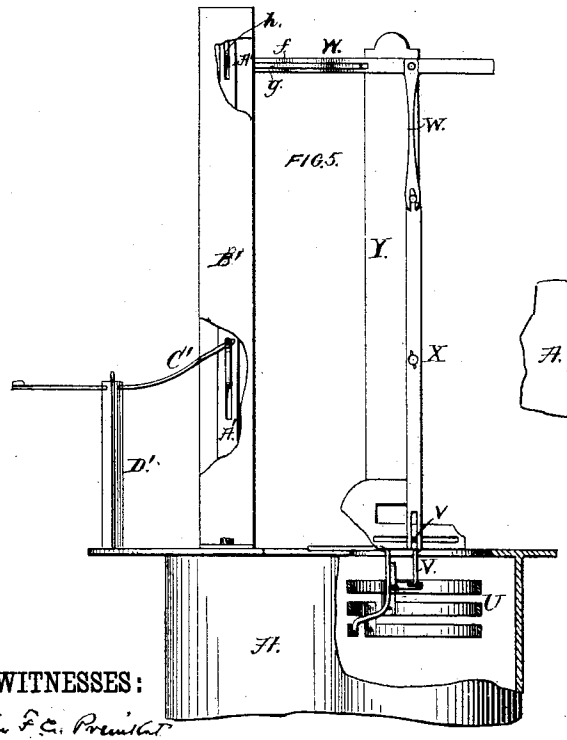
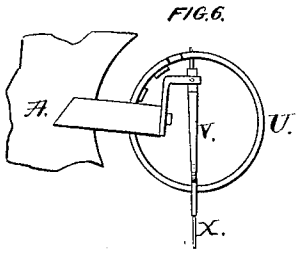


FIG. 5.

FIG. 6.



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UNITED STATES PATENT OFFICE.

JOHN M. CAYCE, OF THOMPSON'S STATION, TENNESSEE.

RECORDING APPARATUS FOR SPIRIT-METERS.

SPECIFICATION forming part of Letters Patent No. 224,147, dated February 3, 1880.

Application filed October 11, 1879.

To all whom it may concern:

Be it known that I, JOHN M. CAYCE, of Thompson's Station, in the county of Williamson and State of Tennessee, have invented a new and Improved Hydrometer and Liquid-Meter; and I do hereby declare that the following is a full, clear, and exact description of the same.

Letters Patent of the United States No. 211,554 were granted to me January 21, 1879, for a combined hydrometer and liquid-meter designed for use of distillers and the Government, for the purpose of automatically ascertaining and recording the specific gravity of spirits or alcoholic liquors.

My present invention is mainly an improvement upon that. In the following description, therefore, my aforesaid patent is had in view, and reference is continually made thereto, either expressly or by implication, for the purpose of enabling the construction and operation of this improved apparatus to be fully understood.

Referring to accompanying drawings, forming part of this specification, Figure 1 is a perspective view of the apparatus, part being broken away to show the interior construction. Fig. 2 is a side elevation, with part broken away, of the hydrometric cylinder, the revolving mechanism, the drum, and the governor. Fig. 3 is a detail plan view of devices which control the admission of liquid to the meter-cylinders and its discharge therefrom. Fig. 4 is a side view of the drum, the dial with part broken away, and the mechanism through which the movement of the meter-floats (not seen) is caused to operate the indexes of the dial, the drum, and the hammer which acts on the recording-styluses. (Not seen.) Fig. 5 is a side view, with parts broken out, of a fragment of the thermometric cylinder and the thermometric attachment. Fig. 6 is a plan view of the thermometer and lever connected therewith. Fig. 7 is a cross-section on line *x x*, Fig. 2.

The liquid enters the hydrometric cylinder A through pipe B, which will, in practice, be suitably connected with the still. (Not shown.) From the said cylinder A it overflows into the vessel or cylinder C, containing the governor-float D, which is connected with the arm of a cock, E, in the supply or inlet pipe B. From the governor-vessel C the liquid passes through pipe F, Figs. 1 and 3, into one or the other of the meter-cylinders G G, in which are placed floats H, connected by a vibrating lever, I. From such meter-vessel G the liquid is drawn off or allowed to escape by the cock K. During such passage of the liquid through the machine the hydrometric and the thermometric record are separately made on the drum L, to which a sheet having suitable numbered cross-lines is attached, and by comparison of the two records the true specific gravity of the liquid during the entire period of its flow or discharge from the cock K will be readily ascertained. While these records are being made the number of gallons is being also faithfully recorded on the dial M.

I will now proceed to describe mechanism not included in my former invention, and a portion of which I claim as new.

The pressure or head of the liquid passing through the machine is subject to greater or less variation, and the steadiness of the flow of liquid and the uniformity of action of the mechanism for recording quantity, specific gravity, &c., are affected by such variation.

The governor consists of vessel C, float D, lever N, rod O, and cock E, and serves to regulate the flow, and renders it as uniform as practicable.

In the hydrometric cylinder A, I arrange a float, P, having stem R, as in my first invention; but the recording-stylus S is differently attached to the stem R—that is to say, in place of being fixed in the stem so that the stem must be moved laterally with the stylus in order to cause it to puncture the record-sheet on drum L, it is attached to a delicate spring, *b*, and supported and sliding freely in the bifurcations or arms *d d* of the stem R. The stylus, however, guides the stem in its vertical movement, since it works in slotted guides. The said arms *d d* prevent vibration of the head of stem R when the stylus receives a blow and slides toward the drum L, and the spring *b* instantly retracts the stylus so soon as the puncture has been made.

This construction and arrangement of parts

renders the operation of the float P more steady and the record of specific gravity made by the stylus more accurate than before.

In the same cylinder A with the hydrometric float P is placed the circular bar-thermometer U, Fig. 5, which is fixed at one end, and attached at its free end to a pivoted horizontal lever, V, which is connected with a T-shaped horizontal weighted lever, W, through medium of the intermediate vertical lever X. Both levers W and X are pivoted to a standard, Y, and the lever W carries a stylus, Z, which makes the record on the drum of the variation of the temperature of the liquid. The said stylus Z is supported in arms *f f*, Fig. 7, and retracted by a spring, *g*, in the same manner as the stylus S of the hydrometer.

The two styluses may be caused to operate and record separately by disconnected mechanism; but it is obviously better, in point of accuracy of result, to have them record simultaneously. To this end I arrange a hammer-bar, A′, Fig. 2, to act on the two styluses at the same time. Said bar A′ is placed vertically in the frame or double standard B′, so as to move freely in guides toward or from the styluses which slide in the same slotted guides. It is moved suddenly by the lever C′, attached to a pivot-post, D′, and vibrated by a tappet-lever. The lever C′ does not, however, act directly on the hammer-bar A′, but on a parallel bar, F′, which is suspended freely by pivoted arms *h h′*, and also connected with the hammer by one pair, *h*, of said arms.

When the lever C′ moves the swinging bar F′ laterally and vertically the hammer A′ necessarily partakes of the same lateral movement, because it is not free to move vertically, and thus the styluses are simultaneously struck and caused to puncture the ruled record-sheet at the same instant and in the same vertical plane. Thus the temperature of the liquid and its specific gravity at such temperature are given in the same vertical columns, and afford a perfect index to the proof of the spirits passing through the machine. The hammer-bar A′ is retracted after the blow by the gravity of the swinging bar F′ and resumes the position shown.

The mechanism G′ for operating the tappet-lever E′, and through it the above-described recording mechanism, I do not show nor propose to describe in detail in this patent, since it is in most respects such as illustrated and described in my former patent—that is to say, the vibrations of the meter-floats or float-lever T are communicated to the mechanism G′, Fig. 4, by means of pull-and-push pawls *i* acting on a ratchet, *k*, whose shaft communicates motion to a tappet or cam wheel, *k′*, and thereby to the tappet-lever E′, substantially as before; but the special means H′ for rotating the drum L is somewhat different, the same consisting of a gear, *l*, a pinion, *m*, a ratchet-wheel, *n*, and double pawl-lever *o*, which actuates the latter, being itself vibrated by the cam-wheel *k′*.

In place of the pull-and-push pawls *i* having a fixed connection with the axis or journal of the meter-float lever T, as heretofore, I connect them adjustably. The special construction may vary; but that which I prefer and show in the drawings, Fig. 1, is a slotted arm, *p*, that extends laterally from the journal of the lever, and to which the pawl-stem *q* is attached by a clamp-screw, *r*. This means enables the throw or vertical range of movement of the pawls *i* to be adjusted and regulated as required to establish the proper relation of action between the meter-floats H and the index *s* of the dial, so that the exact quantity of spirits passed through the meter-cylinders shall be indicated by the index *s*. The latter is attached to the shaft of cam-wheel *k′*, and hence its movement is according to the rotation of the shaft on which the ratchet is fixed. If the clamp-screw be set a certain distance from the journal, the vertical range of movement of the pawls will correspond, and the ratchet will be rotated and the index *s* will record a certain quantity correspondingly. If now the clamp-screw *r* be moved nearer the journal of the float-lever T, the pawls *i* will move a less distance and the index be moved a less distance, so that a less quantity will be recorded. Thus the movement of the floats H and the index can be brought into the exact relation required for entirely accurate measurement of the quantity of spirits discharged from the machine.

The lever of the four-way cock is held fixed in either position by means of the pivoted slotted bar K′ and its encircling-spring *m*.

The flow of liquid is cut off from the cylinder C by means of a cock, M; at the same time it is cut off from the meter-cylinders by cock K, the two cocks being for this operation connected by a bar, N′, as shown in Fig. 3. By cutting off the supply to the meter-cylinders at the same time with the supply to the hydrometer-cylinder the vibrating movement of the floats is arrested, so that the recording mechanism is stopped simultaneously with the supply.

As indicated in my previous patent, the dial and its recording apparatus, together with the floats and their cylinders, may be used separately, or without any other parts, as a liquid-meter.

Taken as a whole, the apparatus will of itself very accurately ascertain and record the specific gravity and temperature, as well as quantity, of spirits passed through it without requiring frequent inspection, attention, or any kind of regulation, and is thus adapted to so far take the place of and perform the daily duties of an inspector in distilleries, &c. It will alike protect the Government from fraud by the distiller, and the distiller from imposition or false return by the inspector.

In practice the apparatus will be inclosed, save the discharge-cock, in a metal case, to

which the Government inspector will alone have access, and which he will open to take the record at stated intervals of days or weeks, as he may find convenient.

What I claim is—

1. The combination, with the drum and hydrometer-float, of a recording-stylus having a spring attached, and supported in the head of the float-stem so as to slide freely, and a hammer or device for moving said stylus, substantially as shown and described.

2. The combination, with the slotted guide-frame B′ and the recording-stylus, of the hydrometer float and stem, the latter having the diverging arms *d*, which support the stylus and prevent a lateral movement of the float-stem toward or from the drum, as shown and described.

3. The lever W and stylus Z carried thereby, the levers X and V, and the bar-thermometer U, in combination with the vessel A and drum L, as shown and described.

4. The combination, with the vertical hammer-bar, arranged to slide horizontally, of the suspended swinging bar F′ and arms or bars which connect them, substantially as shown and described, so that the movement of the swinging bar is communicated to the hammer-bar.

5. The combination of the swinging bar F′ and arms *h h′* with the hammer-bar and slotted standard B′, and the recording-styluses of the hydrometer and thermometer, and tappet-lever arranged to act on said bar F′, as and for the purpose specified.

6. The combination of the slotted arm *p* and the float-lever journal, to which it is affixed, the clamp-screw *r*, the pawl-stem *q*, ratchet and pawls, the dial-index *s*, and mechanism for connecting said ratchet and index, substantially as shown and described.

JOHN M. CAYCE.

Witnesses:
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SOLON C. KEMON.