

J. R. REILLY.
VISCOSIMETER.

(Application filed Dec. 8, 1900.)

(No Model.)

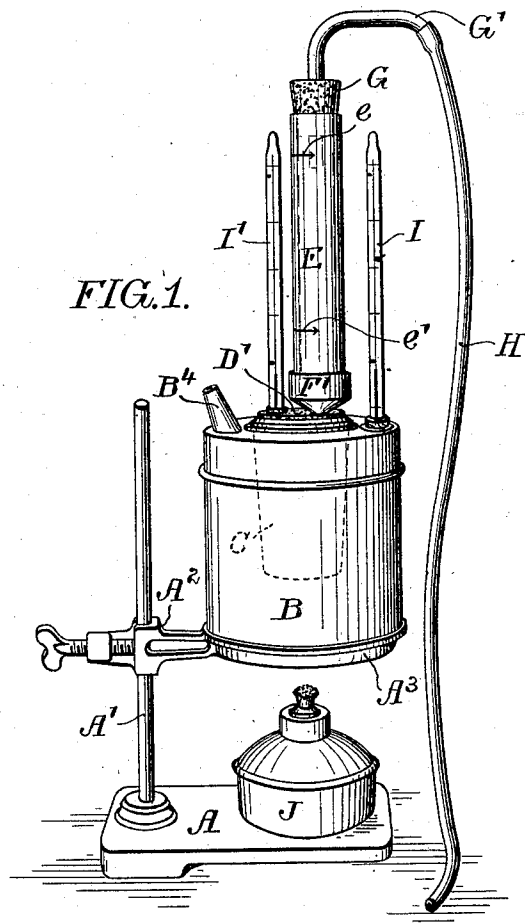


FIG. 5.

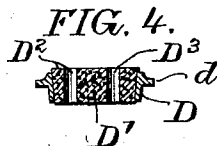
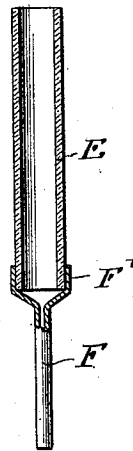


FIG. 3.

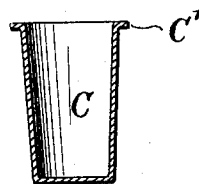


FIG. 2.

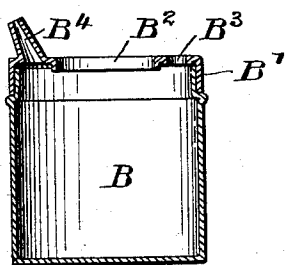
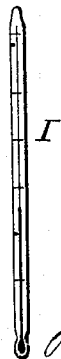


FIG. 6.



Witnesses:

Wm. H. Williams

Inventor:

Joy Reigway Reilly
by his atty.
James T. Chambers

UNITED STATES PATENT OFFICE.

JOY RIDGWAY REILLY, OF PHILADELPHIA, PENNSYLVANIA.

VISCOSIMETER.

SPECIFICATION forming part of Letters Patent No. 671,658, dated April 9, 1901.

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To all whom it may concern:

Be it known that I, JOY RIDGWAY REILLY, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Viscosimeters, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to the construction of viscosimeters for measuring the viscosity of oils, my object being to provide an apparatus for this purpose which will be at once very accurate and very simple both in construction and in mode of operation.

The viscosity of an oil is ascertained by the time in which a measured sample of the oil of known temperature will pass through a measured aperture; and my invention consists in providing the simple and efficient devices hereinafter described for bringing the oil to a desired temperature, drawing it into a measured space adapted to contain a determined volume, and providing means for ascertaining the time which said volume of oil requires to escape from said measured space through a small pipe or orifice, also in various details of construction having chiefly in view the easy separation of and assemblage of parts.

Reference being now had to the drawings in which my invention is illustrated, Figure 1 is a perspective view of my apparatus in what I believe to be its best form; Fig. 2, a sectional elevation of the bath; Fig. 3, a sectional elevation of the oil-receptacle; Fig. 4, a sectional elevation of the closure for said receptacle; Fig. 5, an elevation, partly in section, of the measuring-pipe and transparent receptacle connected with its top; and Fig. 6, an elevation of a suitable thermometer for use in connection with my apparatus.

A indicates a stand, from which extends upward a standard A', a bracket A² sliding and clamping on said standard and supporting a holding-ring, (indicated at A³,) upon which rests the bath, (indicated at B.) This bath is open at the top and is covered by a lid (indicated at B') having a central opening B², through which the oil-receptacle is inserted into the bath, a lateral opening B³, through which a thermometer is inserted into the bath, and the steam-escape pipe B⁴.

C is the oil-receptacle, which is best made of copper and formed with an annular flange C' at its top, which rests on the edges of the opening B² of the lid B'. The top of the oil-receptacle C is covered, but not closed airtight, by means of a closure or lid, preferably such as is indicated at D D', D indicating an annular cone-shaped ring suitable to enter the mouth of the receptacle C and provided with an annular flange d, by which it rests upon the flange C' of the receptacle. The central part of the closure is made up of a cork disk D', having a perforation D² formed in it, through which is inserted a thermometer, as indicated at I', the disk also having another perforation D² formed through it, through which is inserted the measuring-pipe, (indicated at F.) This pipe is one having a smaller orifice, which should be of uniform section, and it is best made of metal, copper preferably being employed, or other hard substances, permitting the formation of the orifice through the pipe by drilling or boring to the desired standard or uniform caliber, the advantage of this material over glass or other material requiring the orifice to be blown being that the orifice may be accurately formed by the employment of drills or other tools of known caliber. The upper part of the pipe is expanded, as indicated at F', so as to connect with a tube or chamber, (indicated at E,) which is preferably of glass and which for my purposes must have a transparent wall, so that the level of the contents can be observed therethrough. Preferably this tube E is of cylindrical form, open at both ends, and in use its upper end is provided with a closure, such as the cork indicated at G, through which a pipe G' communicates with the inside of the tube, H indicating a rubber tube by which suction is applied to the top of the tube E, preferably by suction, as by putting the end of the tube H in the mouth and drawing the breath inward.

e e', Fig. 1, indicate marks formed on the transparent wall of the receptacle E, indicating that portion of the receptacle which contains a certain definite volume of the oil to be tested.

J, Fig. 1, indicates a lamp by which the bath B is heated.

Of course it will be understood that the stand and heating apparatus indicated can

be varied to any degree, those shown being simply illustrated as convenient devices for supporting and heating my apparatus. It will also be obvious that the bath B can be used not only for heating the receptacle C and its contents, but also for cooling it down in case the viscosity test is to be made at a low temperature.

In ordinary operation the bath is filled with a quantity of water, which when the oil-receptacle is in place will nearly but not quite fill the space beneath the lid, sufficient room being left for the expansion of the water and the free escape of steam. For accurate results the quantity of oil charged into the receptacle C should be very carefully measured, as although only a portion of the oil is actually drawn out of the receptacle for testing variations in the quantity of oil left in the receptacle will result in variations in the hydrostatic head, which in a test as delicate as that required in testing viscosity will result in variations in the showing of the apparatus. The receptacle C being charged, the closure D D', with the pipe F and thermometer I' extending through its perforation, is inserted into the mouth of the receptacle, closing it tightly, the pipe F and thermometer I' extending down toward the bottom of the receptacle. The bath B is then heated, the temperature of the water and also the temperature of the oil in the receptacle C being carefully noted by means of thermometers I and I', so that the oil may be carefully and gradually brought to the proper temperature, say 210° Fahrenheit. When the oil has reached the designed temperature, the operator, preferably by suction of the breath, draws the air out of the tube of the receptacle E, the vacuum formed therein drawing the oil upward through the pipe F into the receptacle E, the operator carefully observing the rise of the oil column until the meniscus is exactly level with the mark *e*, which point being attained and observed air is permitted to enter freely through the tubes H G' to the top of the receptacle E, and the oil in the receptacle flows downward through the pipe F into the receptacle C, the observer carefully noting the time elapsing during the movement of the top of the column of oil from the indicating-mark *e* to the indicating-mark *e'*, this time being that required by the determined volume of oil to pass through the pipe-section F, and said time indicating with great accuracy the viscosity of the oil.

It will be observed that the parts of my apparatus are readily removed one from the other, so that each part can be cleaned separately, a very important detail, as absolute cleanliness in the apparatus, particularly in the pipe F, is necessary to accurate measurements. While readily removable, the parts also are obviously easily put together.

The use of a rubber tube, such as indicated

at H, is especially useful not only because it enables the operator to form the vacuum by drawing in his breath while being at the same time free to move his head, but also because the elastic tube can be closed by pinching, holding the column of oil at the level of the indicating-point *e* until it is desired to make the observation.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a viscosimeter, a receptacle, as C, for the oil to be tested having a cover, as D D', in combination with a metal pipe, as F, supported by and extending through said lid into the oil-receptacle, a transparent receptacle, as E, of large diameter compared with that of pipe F connecting with the top of pipe F and having marks, as *e*, *e'*, indicating the portion of said receptacle filled by a known volume of oil and means whereby suction can be applied to the top of receptacle E and atmospheric pressure admitted freely thereto at will.

2. In a viscosimeter, a bath-receptacle B in combination with an oil-receptacle, as C, suspended in said bath, a cover, as D D', for said receptacle, a small pipe F supported by and extending through said closure and having an orifice therethrough, a receptacle E having transparent walls and marks, as *e*, *e'*, indicating the space therein filled by a known volume of oil, said receptacle being secured to the top of pipe F and means for applying suction and admitting atmospheric pressure to the top of receptacle E at will, the pipe F being formed of a material permitting its orifice to be accurately drilled or bored.

3. In a viscosimeter, a bath-receptacle B in combination with an oil-receptacle, as C, suspended in said bath, a cover, as D D', for said receptacle, a small pipe F extending through said closure, a receptacle E having transparent walls and marks, as *e*, *e'*, indicating the space therein filled by a known volume of oil, said receptacle being secured to the top of pipe F, means for applying suction and admitting atmospheric pressure to the top of receptacle E at will, a thermometer, as I, extending through closure D D' into receptacle C and a thermometer, as I', secured in bath B, all substantially as specified.

4. In a viscosimeter substantially as described the combination of the metal pipe F with enlarged upper portion F' with the glass cylindrical chamber E, said enlargement F' and the end of cylinder E being detachable, a removable closure G at the top of cylinder E and a flexible and compressible tube H connecting with the top of cylinder E through said closure.

JOY RIDGWAY REILLY.

Witnesses:

CHAS. F. MYERS,
D. STEWART.