June 10, 1952 P. L. BOUCHER ET AL 2,599,742

FILTRABILITY RECORDER

Filed Aug. 13, 1949 2 SHEETS—SHEET 1

FIG. 1

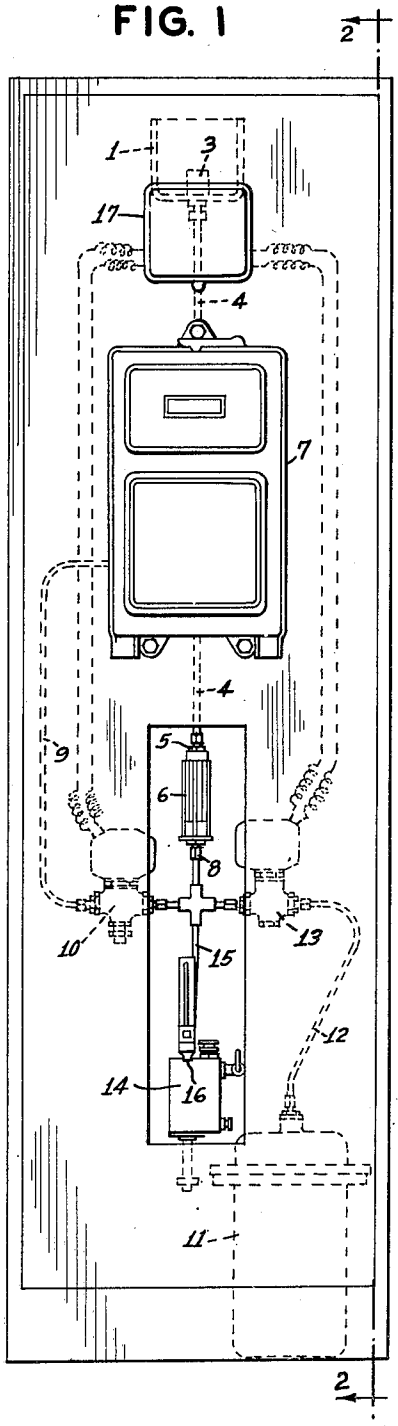
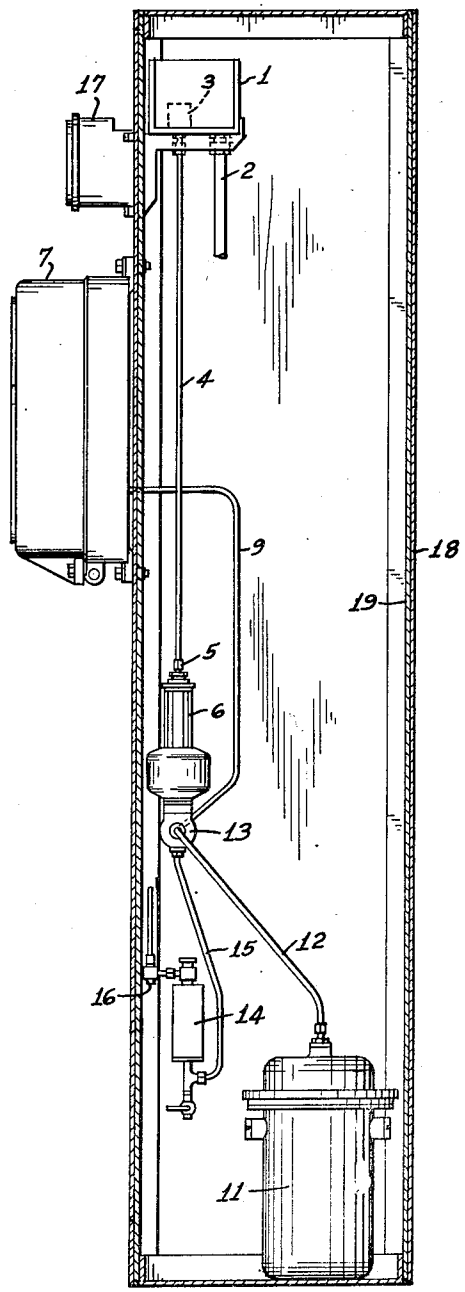


FIG. 2



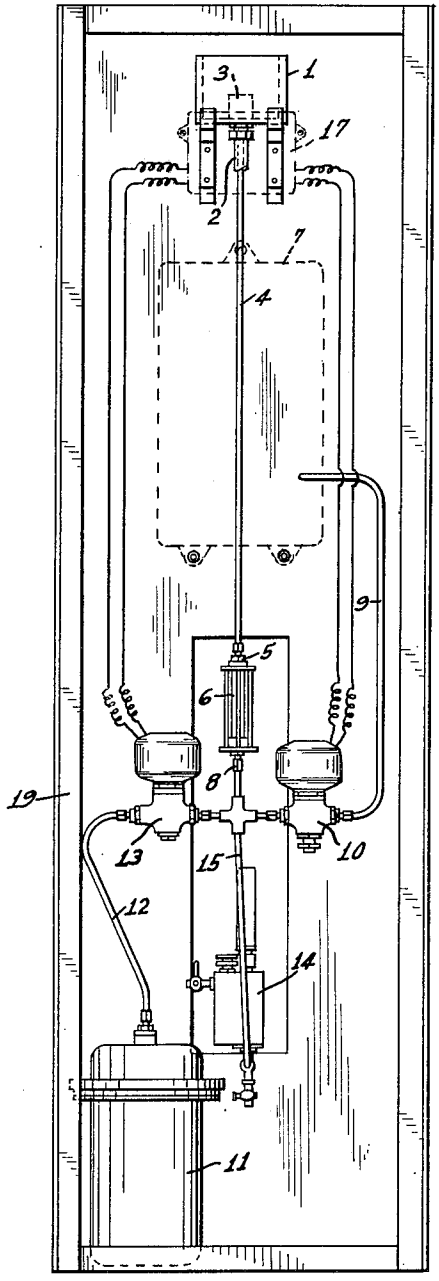
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FIG. 3



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2,599,742

FILTRABILITY RECORDER

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Application August 13, 1949, Serial No. 110,104

3 Claims. (Cl. 73—53)

1

The subject of this invention is a filtrability recorder for measuring the property of a fluid referred to as its filtrability as defined in the specification of our co-pending application Serial No. 676,084, now Patent No. 2,572,436.

For the purpose of what follows, the filtrability of a fluid is taken as a mathematical function of the rate of increase of the loss of head with respect to the volume filtered at constant rate of flow when flowing through a particular filter.

A filtrability recorder according to the invention comprises a tank having a drain opening and containing an inner vessel having an open top, an outlet pipe leading from the inner vessel to the inlet of a filtering unit, a flow controller or module connected to the outlet of the filtering unit, a pressure recorder connected to the outlet of the filtering unit through the intermediary of valve means, the outlet of the filtering unit being connectible to a source of supply of cleaning fluid through the intermediary of second valve means, and a time cycle controller adapted to operate the valve means at predetermined intervals.

The pressure recorder may be a known type of strip chart or other recorder with means for automatic pen adjustment through a bellows mechanism adapted to record the instantaneous value of the pressure at the outlet of the filtering unit.

The filtering unit may be of any known type. The flow controller or module is of known type and may consist essentially of a piston-operated needle valve, the piston operating in a cylinder having a vertical axis, the submerged weight of the piston with its attached needle being balanced by the differential pressure set up by the flow between the piston and the cylinder and through an adjustable by-pass in hydraulic parallel with the piston clearance.

The two valves may be solenoid-actuated stop valves of known type.

The time cycle controller may include an electric clock adapted to operate mercury switches electrically connected to the solenoids.

A practical embodiment of the invention is illustrated in the accompanying drawings in which Fig. 1 is a view looking on the front of a recorder installation, Fig. 2 is a section through 2—2 in Fig. 1, and Fig. 3 is a view of the rear of the recorder installation illustrated in Fig. 1 with the back panel removed.

In the drawings, 1 denotes a tank having a drain pipe 2: 3 denotes an inner vessel disposed

2

within the tank 1 and connectible to the source of supply of fluid to be filtered, and 4 denotes an outlet pipe leading from the inner vessel 3 to the inlet 5 of a filtering unit 6. 7 denotes a pressure recorder connected to the outlet 8 of the filtering unit 6 by a pipe 9 in which is intercalated a solenoid-actuated valve 10. 11 denotes a tank holding a supply of cleaning fluid and connected to the outlet 8 of the filtering unit 6 by a pipe 12 in which is intercalated a second solenoid-actuated valve 13. 14 denotes a flow controller or module connected to the outlet 8 of the filtering unit 6 by a pipe 15, said module 14 having a discharge orifice 16. 17 denotes a time cycle controller in electrical connection with the solenoids for actuating the valves 10 and 13. 18 denotes the back panel of a casing 19 housing the installation.

In practice, the fluid under test is fed to the inner vessel 3, fills the inner vessel 3 and overflows into the tank 1, the overflow that enters the tank running out through the drain pipe 2. Fluid also flows from the inner vessel 3 to the filtering unit 6 and passes through said unit, the head remaining constant, since the depth of fluid in the inner vessel 3 remains constant. The valve 10 is open at this period and the pressure of the fluid leaving the filtering unit 6 is recorded on a chart by the pressure recorder 7. As the filtering unit 6 gradually becomes choked, the pressure at the outlet 8 drops and the reduced pressure is recorded on the chart of the pressure recorder 7. The quantity of fluid passing through the filter 6 is maintained constant, however, by the flow controller or module 14 which is arranged to open an orifice progressively as the cycle proceeds. At the end of a time interval predetermined by the time controller, the valve 10 leading to the pressure recorder is closed, and, after a brief pause, the valve 13 is opened to admit cleaning fluid. Cleaning fluid flows through the filtering unit 6, cleans said unit, and, entering the inner vessel 3, overflows into the tank 1 and escapes through the drain pipe 2. The flow controller or module 14 may also be flushed by cleaning fluid at the same time as the filtering unit is cleaned.

After a predetermined time interval the valve 13 that admits cleaning fluid is closed, and, after a brief pause, the valve 10 leading to the pressure recorder 7 is opened, and a new cycle commences.

The length of the line drawn on the chart of the recorder is proportional to the total reduction of pressure resulting during the progressive

blockage of the filtering unit. Since the rate of flow is maintained constant, the length of the line is a function of the filtrability index of the fluid, i. e., its logarithm (the filtrability index being the reciprocal of the filtrability). Thus, by using properly calibrated chart paper a record of the filtrability index of the fluid under test is made on the chart for each cycle of operations. Although during each cleaning cycle the cleaning fluid flows back into the inner vessel 3, the effect on the final result is negligible since the volumes of the inner vessel 3 and of the pipe 4 leading to the filtering unit 6 are small; also, in the interval between the closing of the valve 13 that admits cleaning fluid and the re-opening of the valve 10 to the pressure recorder 7, the influx of fluid under test clears out almost entirely cleaning fluid remaining in the inner vessel 3. In any case, since the quantity of cleaning fluid remaining in the pipe 4 connecting the inner vessel and the filtering unit is a constant, allowance can be made for its presence in the calibration of the pressure recorder 7. The effect of the presence of some cleaning fluid after each cleaning cycle can be still further reduced by lengthening the period of the filtering cycle.

What is claimed is:

1. Apparatus for measuring and recording the filtrability of a fluid comprising a tank having a drain opening, an inner vessel connectible to a source of supply of fluid to be filtered, said inner vessel having an open top and disposed within said tank, a filtering unit having an inlet and an outlet, an outlet pipe leading from said inner vessel to the inlet of said filtering unit, a flow controller connected to the outlet of said filtering unit, a pressure recorder, a pipe connecting the outlet of said filter unit to said pressure recorder, valve means intercalated in said last mentioned pipe, a source of supply of cleaning fluid, a pipe connecting said source of supply of cleaning fluid to the outlet of said filtering unit, valve means intercalated in said last mentioned pipe, and a time cycle controller adapted to bring about the operation of said valve means at predetermined intervals.

2. Apparatus for measuring and recording the filtrability of a fluid comprising a filtering unit having inlet and outlet connections through which the fluid to be measured is passed, means for supplying the fluid to be measured at a constant head to the inlet connection of the filtering unit, a flow controller connected into the outlet connection of the filtering unit and adapted to provide for a constant rate of flow of fluid through the unit, and a pressure recorder connected into the outlet connection of the filtering unit and responsive to changes in the pressure therein.

3. Apparatus for measuring and recording the filtrability of a fluid comprising a filtering unit having inlet and outlet connections through which the fluid to be measured is passed, means for supplying the fluid to be measured at a constant head to the inlet connection of the filter unit, a flow controller connected into the outlet connection of the filtering unit and adapted to provide for a constant rate of flow of fluid through the filtering unit, a recorder connected into the outlet connection of the filtering unit, said recorder being responsive to changes in the pressure in said outlet connection and adapted to record an indication of the filtrability of the fluid, and means for controlling the time during which a filtering operation is conducted.

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