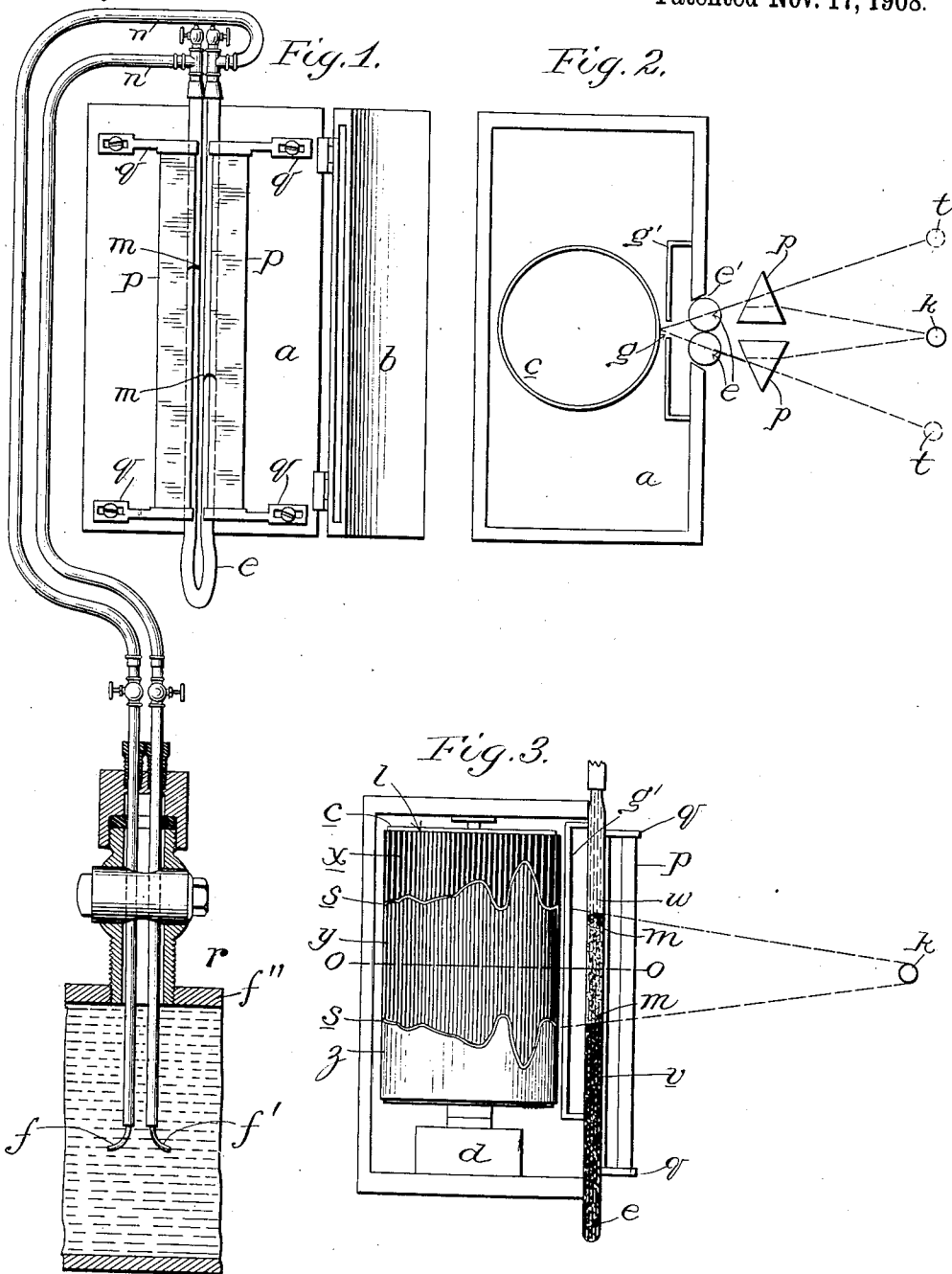


E. S. COLE.
 FLUID RECORDER.
 APPLICATION FILED MAY 2, 1907.

904,310.

Patented Nov. 17, 1908.



Witnesses:
l. B. Schneider
l. B. Schneider

Inventor:
 Edward S. Cole
 By his Attorney
Theresa G. D. Boig

UNITED STATES PATENT OFFICE.

EDWARD S. COLE, OF MONTCLAIR, NEW JERSEY.

FLUID-RECORDER.

No. 904,310.

Specification of Letters Patent.

Patented Nov. 17, 1908.

Application filed May 2, 1907. Serial No. 371,414.

To all whom it may concern:

Be it known that I, EDWARD S. COLE, a citizen of the United States, residing at Montclair, New Jersey, have invented new and useful Improvements in Fluid-Recorders, of which the following is a specification.

This invention relates to those self-recording manometers used generally in connection with a pitometer for measuring the velocity of a flowing stream of water, principally in water mains, and it consists in the method of and apparatus for simultaneously recording the fluctuations of superposed images or the menisci in both legs or ducts of the tube in which the indicating fluid is placed, thereby obviating the necessity of first finding a zero or starting point, and at the same time recording a full-deflection instead of a half-deflection of the indicating fluid, all of which will be more fully described hereinafter and pointed out in the claims.

In the accompanying drawings Figure 1, represents a front elevation of a manometer mounted on a portable photo-recording cabinet. Fig. 2, a top view, partly in section, of my device, and Fig. 3, a side elevation thereof, the casing being removed to show the mechanism within.

Heretofore, to obtain a photographic record in self-recording manometers, the colored fluid and its meniscus were photographed in one leg only, thereby making it necessary for the operator to first adjust the U-tube until the zero or starting point of the indicating liquid was found, before the automatic machinery could be set in motion.

Owing to the difficult conditions, such as darkness and cramped quarters, under which an operator has to work, much valuable time was consumed, and such initial adjustment was liable to be inaccurate, small errors made at the starting point being doubled in the result.

A further difficulty in the former mode, in which only a half-deflection was recorded, was that the low deflections resulting from a very sluggish flow in the water main, were made hard to compute, the difficulties increasing in the ratio of the nearness of the meniscus line to the zero line. In my device both of the above mentioned difficulties are overcome by the method and apparatus now to be described.

In carrying out my invention I employ a

photo-recorder, comprising a portable cabinet having two sections, *a*, and *b*, hinged together. The section *a*, is a light-proof inclosure containing a drum *c*, adapted to carry a sheet of sensitized paper *l*, and rotated by clockwork *d*. A U-tube or manometer *e*, is set in a vertical recess *e'* in the side of inclosure *a*, and before a vertical slot or exposure opening *g*, in a plate *g'*. The two legs of the U-tube come closely together so that both legs and their contents will intercept and reduce the power of the light passing through the exposure slot *g*. A lamp *h*, projects its light upon the sheet of sensitized paper *l*, around the drum *c*. In order to concentrate and converge the light at the point where the exposure slot is located, two vertical prisms *p*, placed base to base, are disposed before the manometer or U-tube *e*. These prisms are supported in adjustable brackets *q*, by means of which the prisms can be moved toward and from each other for focusing purposes. The upper portion of the tube contains the water *w*, coming from a main through a pitometer *r*, and the lower portion contains an indicating liquid *v*, composed of colored tetrachlorid and gasolene. This liquid is preferably red in color. It is also heavier than water and will not mix with the water bearing down upon it, nor stick to the tube, but will allow part of the light from the lamp to pass through the body of it. The menisci or images *m*, *m*, are opaque and represent the dividing lines or terminals of the indicating liquid lying between the water and the tetrachlorid. While the water to be measured is flowing through the water-main *f''*, it acts on the photometer tubes *f* and *f'* and disturbs the equilibrium of the tetrachlorid *v* in the bottom of the tube, raising it in one leg and lowering it in the other. A rapid flow of water will cause a more pronounced deflection and spread the superposed images farther apart. A sluggish current will have a contrary effect, bringing the images closer together. When there is no current in the water-main *f''*, an equilibrium will be established, and the images will settle down to the same level, recording a horizontal line on the sheet. The rubber hose pipes *n*, convey the water from the pitometer *r* acted upon by the flow of the water to be measured. The pitometer *r* needs no detailed description to be readily understood by those skilled in the art, although it might be well here to

state that when the water in the water-main f'' is flowing, there will be impact upon the up-stream tube f , and suction upon the down-stream tube f' , whereby the tetrachlorid in the right-hand leg of the U-tube will be lowered and that in the left-hand leg will be raised, in which relatively raised and lowered positions the menisci or images are shown in Figs. 1 and 2.

From the foregoing description it will be seen that when the light from the lamp strikes the prisms it will be refracted and converged upon the two legs of the U-tube in such a manner as to record on the sensitized paper three shades of color as follows: first, the water which, being transparent, allows the greatest exposure and leaves a black zone x , at the top; second, the light which passing through a single column of translucent red fluid leaves a gray zone y , and third, the light which passing through two columns of red fluid, being still further obscured, leaves an almost white zone z . The opaque menisci or images m, m , will leave two white lines s, s , which form the top and bottom boundaries of the middle zone y , thereby recording two half-deflections, one above and one below the zero line O . These two half-deflections constitutes a full-deflection of the indicating fluid. This allows computations to be made from measurements taken of the distance lying between the two menisci lines, and hence with greater accuracy and ease, and avoiding the necessity of first finding the zero or starting point as before mentioned. It is possible to use tetrachlorid without color, in which case the meniscus or image thereof would still record a white line. It is apparent that two lamps, t, t , in place of the prisms and one lamp might be substituted for the purpose of converging the light upon the exposure slot. Such a modification is shown in dotted lines in Fig. 2.

Having thus described my invention what I claim as new, is:

1. The hereindescribed method of indicating the velocity of running fluids, which method consists of recording the fluctuations of the terminals of two columns of an indicating fluid having different specific gravity actuated by the passing fluid, by the action of a ray of light intercepted by devices in both columns of said fluid, substantially as described.

2. The hereindescribed method of indicating the velocity of running fluids, the same consisting in causing two columns of the fluid to be respectively acted upon simultaneously by the impact and suction of the stream, and recording the fluctuations of an indicating fluid of different specific gravity by the action of a ray of light on superposed

movable objects in both columns of said indicating fluid, substantially as described. 65

3. The hereindescribed method of indicating the velocity of running fluids, the same consisting in causing two columns of the fluid to be respectively acted upon simultaneously by the impact and suction of the stream, and simultaneously recording the relative positions of two separated objects carried by an indicating fluid of different specific gravity affected by the action of the running fluid through the medium of said columns, substantially as described. 75

4. In a manometer recording apparatus, a U-tube containing an indicating fluid affected by the velocity of the water to be recorded, in combination with a light, and a traveling sheet of sensitized paper located within an inclosure having an exposure opening, both legs of said tube being interposed between said light and exposure opening, to intercept the light and photograph on the paper a full deflection of the liquid in the tube, substantially as described. 85

5. In a recording manometer, a U-tube containing a colored indicating fluid, in combination with devices which simultaneously record the fluctuations of the menisci in both legs of the tube, substantially as described. 90

6. In a self-recording manometer, the combination with a photographic apparatus wherein a traveling sheet of sensitized paper is located within an inclosure having an exposure opening, of a U-tube containing an indicating fluid, and being located before the exposure opening, a pair of prisms, and means for projecting light simultaneously through said prisms and both legs of the tubes whereby both menisci are photographed, substantially as described. 100

7. In a recording manometer, a tube containing an indicating fluid, in combination with devices which simultaneously record the fluctuations of the menisci in both legs of the tube, substantially as described. 105

8. In a self-recording manometer, and in combination with a lamp and U-tube, a pair of deflecting prisms interposed between the lamp and tube, as and for the purposes set forth. 110

9. In a fluid recording apparatus, a self-recording manometer in combination with a lamp and a pair of prisms interposed between the lamp and manometer as described. 115

In testimony whereof, I EDWARD S. COLE have signed my name to this specification in the presence of two subscribing witnesses, this 29th day of April 1907. 120

EDWARD S. COLE.

Witnesses:

FRED B. NELSON,
FRED. A. MORRIS.