

No. 625,541.

Patented May 23, 1899.

E. S. COLE.
SELF RECORDING MANOMETER.

(Application filed Feb. 2, 1898.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 2.

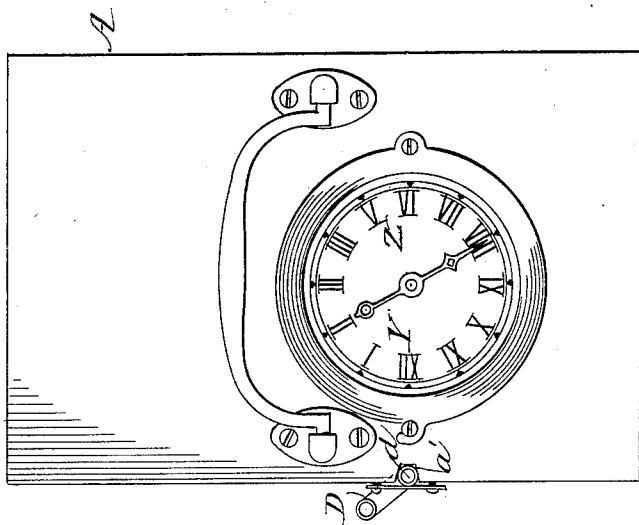


Fig. 3.

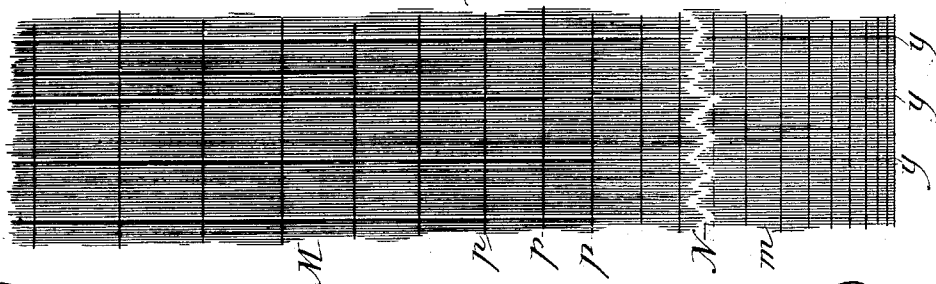
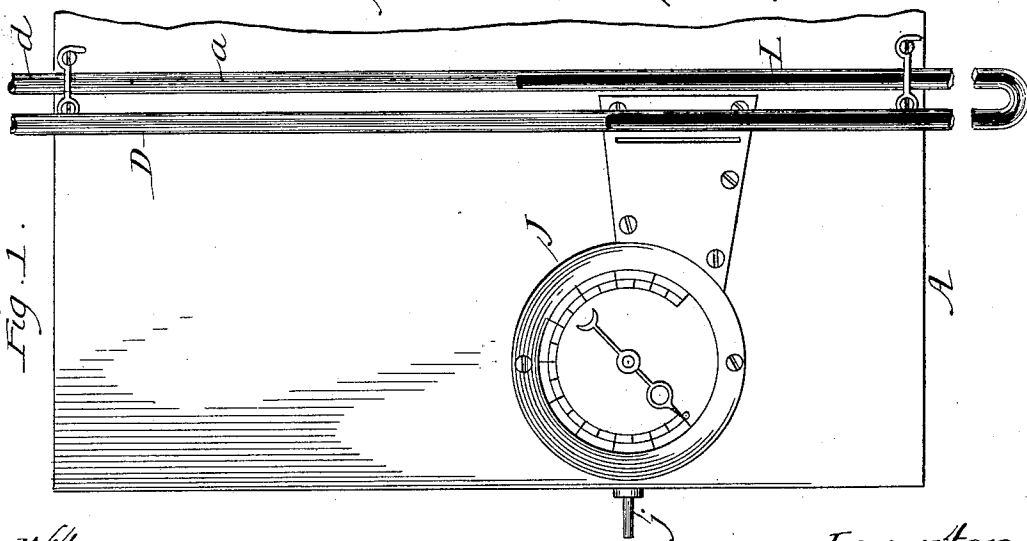


Fig. 1.



Witnesses:

Frank S. Blanchard
Josephine S. McGregor.

Inventor:

Edward S. Cole
By Attorneys
Dixon & Fletcher.

No. 625,541.

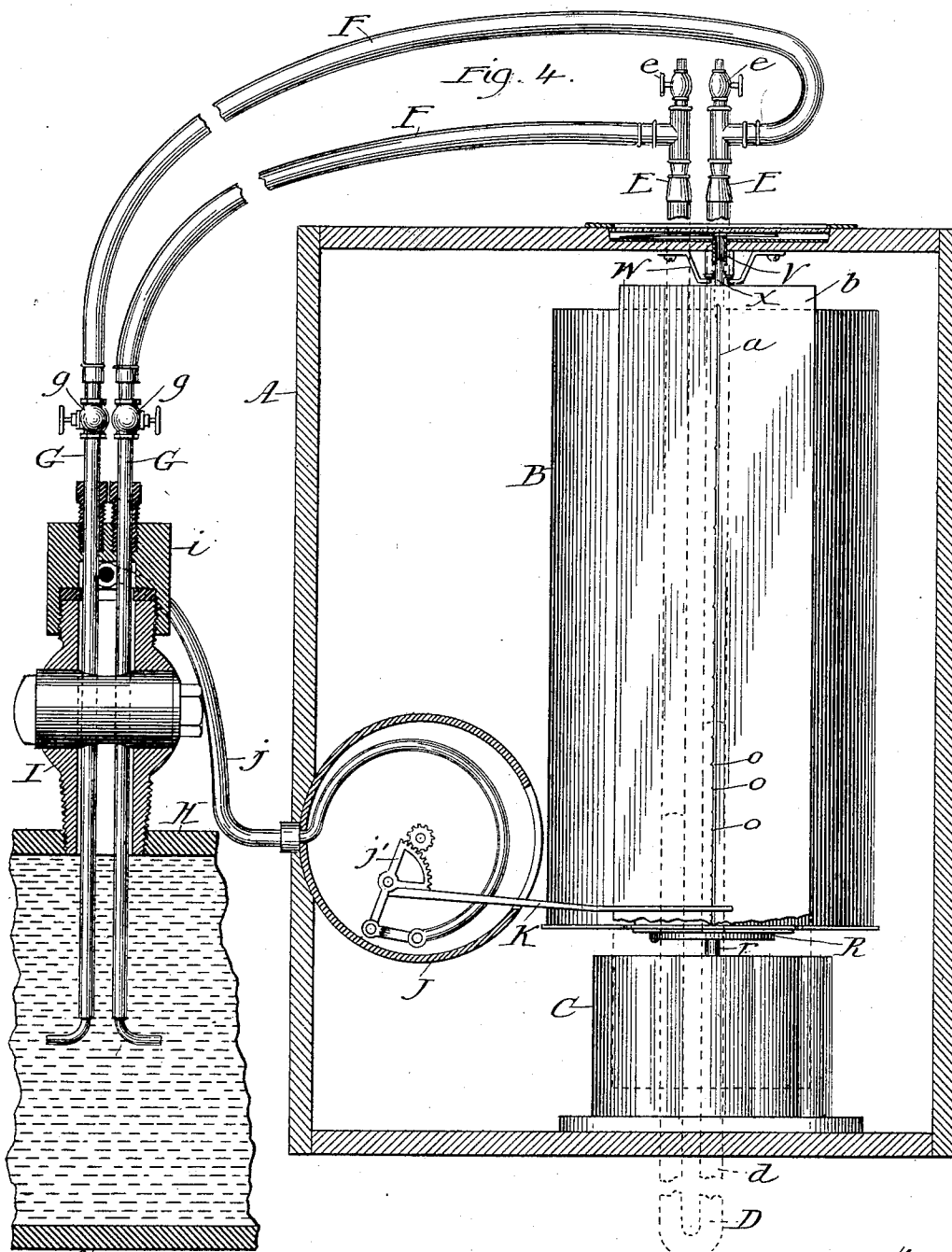
Patented May 23, 1899.

E. S. COLE.
SELF RECORDING MANOMETER.

(Application filed Feb. 2, 1898.)

(No Model.)

3 Sheets—Sheet 2.



Witnesses:

Frank S. Blanchard
Josephine S. McGregor.

Inventor:

Edward S. Cole
By Attorneys
Dixon & Fletcher.

No. 625,541.

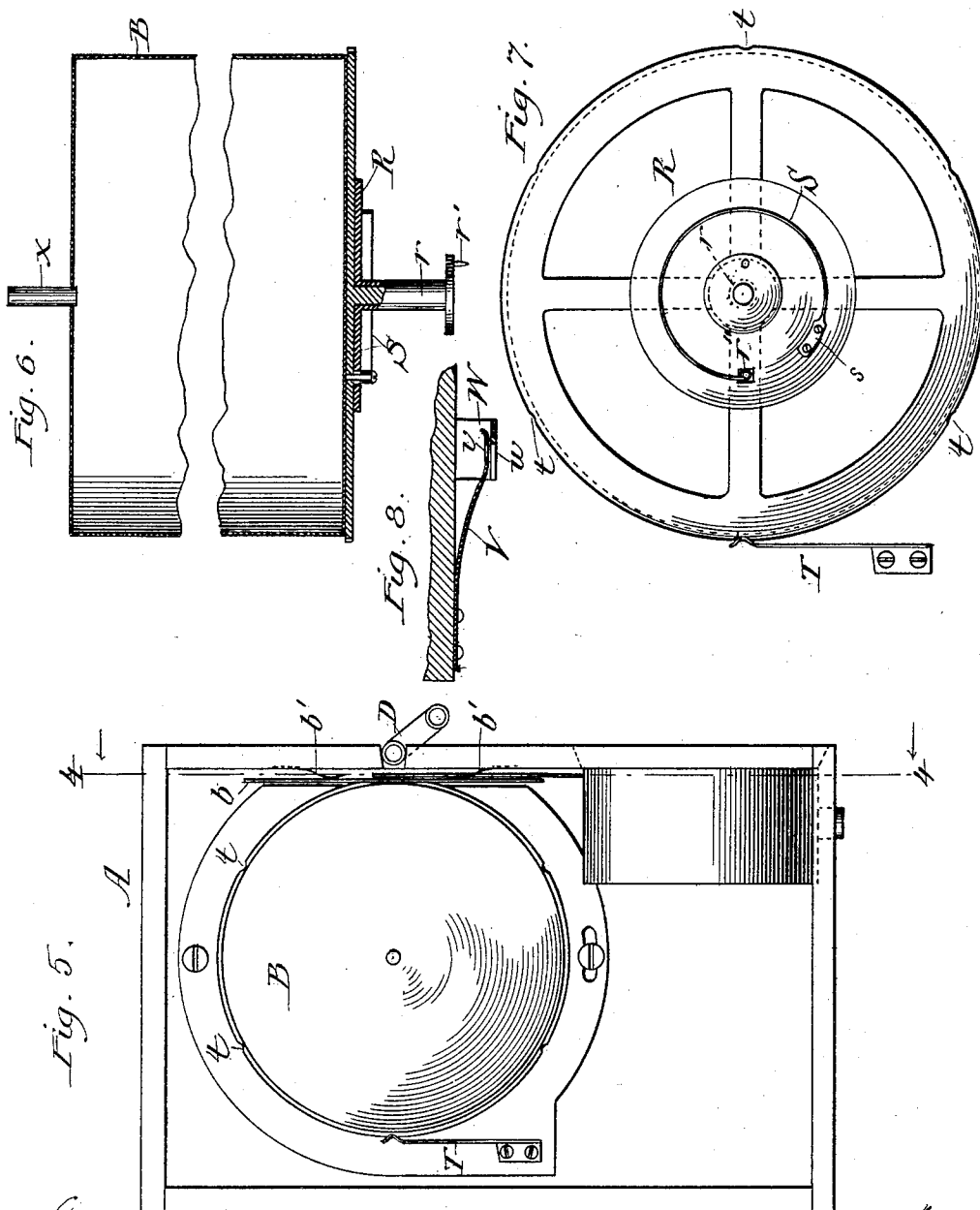
Patented May 23, 1899.

E. S. COLE.
SELF RECORDING MANOMETER.

(Application filed Feb. 2, 1898.)

(No Model.)

3 Sheets—Sheet 3.



Witnesses:
Frank S. Blanchard
Josephine S. McGregor.

Inventor
Edward S. Cole.
By Attorneys.
Dixon & Fletcher.

UNITED STATES PATENT OFFICE.

EDWARD S. COLE, OF CHICAGO, ILLINOIS.

SELF-RECORDING MANOMETER.

SPECIFICATION forming part of Letters Patent No. 625,541, dated May 23, 1899.

Application filed February 2, 1898. Serial No. 668,834. (No model.)

To all whom it may concern:

Be it known that I, EDWARD S. COLE, of the city of Chicago and State of Illinois, have invented certain new and useful Improvements in Self-Recording Manometers, of which the following is a specification, reference being had to the accompanying drawings, forming a part of this specification, in which corresponding letters indicate like parts.

The object of my invention is the improvement of self-recording manometers in both efficiency and accuracy; and to this end it consists in the several improvements herein-after described, and particularly pointed out in the claims, and which may be used conjointly, or one or more may be omitted in actual construction.

I use the word "manometer" in its broadest meaning, as embracing the great variety of instruments for indicating pressures or differences of pressure in their manifold applications and to which my several improvements are applicable. In the illustrative form shown in the drawings they are embodied in an apparatus for indicating and recording both the velocity and the static pressure of a fluid flowing through a pipe or tube.

In the drawings, Figure 1 is a front view of the apparatus, and Fig. 2 is a top view showing a clock face and hand to set the apparatus. Fig. 3 illustrates the appearance of the sensitive paper bearing the record made. Fig. 4 is a sectional view on the line 4 4 of Fig. 5, including a longitudinal section of a water-pipe and connections extending therein. Fig. 5 is a plan view of the apparatus with the top removed. Fig. 6 is a central sectional view of the cylinder on which the sensitive paper is placed. Fig. 7 is a bottom plan of the cylinder, showing means for temporarily arresting its movement; and Fig. 8 is a detail view of the spring for engaging the axle of the cylinder.

A is a case of any suitable form and construction.

B is an upright cylinder inclosed within the case A and forming a support for a sheet of "sensitive paper" placed around it. It is caused to revolve by suitable clockwork inclosed in the case C beneath it.

The case A is provided with a narrow slit *a*, preferably cut in a thin plate *b*, placed be-

tween the cylinder B and the side of the case A, before an aperture *a'* in said case, and held against the cylinder B by light springs *b'*.

A glass tube D, bent into U form, is attached to the case A, with one arm *d* inserted in the aperture *a'*. The extremities of the tube D are inserted in hollow sockets E, having valves *e* at their upper ends and also side sockets to which flexible tubes F are attached. The tubes F are connected at their outer ends with long slender metallic tubes G, provided with valves *g*.

H is a water-pipe provided with the "corporation-cock" I, through which the tubes G are inserted and held in place by a suitable coupling *i*. The lower ends of the tubes G are curved outward, as shown in the drawings, and in opposite directions, but in a line parallel with the direction of the pipe H.

J is an ordinary pressure-gage attached to the case A and provided with a flexible supply-tube *j*, which is attached to the coupling *i* and opens into the corporation-cock I.

K is an indicator-finger attached to the operating-segment *j'* of the gage J. The outer end of the finger K plays up and down before the slit *a* as the pressure rises or falls in the gage.

In the operation of the form of apparatus here described the tube D is partially filled with a liquid L, (see Fig. 1,) heavier than water and insoluble in it and likewise having less capacity for transmitting the actinic rays. I have found that "carbon tetrachlorid" mixed with gasolene is an excellent liquid for this purpose. The two arms of the tube D are then filled up with water and also the tubes F and G, care being taken to let out any air remaining through the valves *e*. The tubes G are then inserted in the cock I, with a stream of water flowing through the pipe H. Its relative velocity is indicated by the movements of the fluids in the tube D under the varying pressures exerted upon them, the velocity of the water moving in the pipe H causing it to rise in the tube curved toward the stream, while the tendency is outward through the tube curved in the opposite direction. At the same time the static pressure of the water in the pipe H is indicated by the movements of the finger K of the gage J. The cylinder B, carrying a

sheet of sensitive paper, being given a uniform movement by the clockwork, both the movements of the fluids in the tube and of the indicator-finger K will be photographed through the slit *a* upon the sensitive paper, thus making a permanent record of the same. A sheet of sensitive paper thus marked and properly developed is illustrated in Fig. 3, the division between the darker portion M and the lighter portion *m* indicating the movements of the fluids in the tube D, while the light streak N indicates the movements of the indicator-finger K, thus automatically recording on the same sheet both the variations in velocity and of static pressure of the stream of water flowing through the pipe H.

While the sheet of sensitive paper might be ruled in advance, it is difficult to thus secure accuracy, owing to changes in the condition of the paper, and it also requires great nicety in adjusting the paper upon the cylinder B. I have overcome these difficulties by further improvements, whereby lines, both longitudinal and transverse, are automatically photographed upon the paper by the action of the apparatus itself. I cut short notches *o* in the slit *a* at the required intervals, and as the cylinder revolves before the slit those parts of the sensitive paper passing before the notches are given a longer exposure to the light, thus forming the longitudinal lines *p* upon the paper at corresponding intervals. To rule the transverse lines, I effect a longer exposure of the paper before the slit *a* by providing suitable means for briefly arresting the movement of the cylinder B at the required intervals, which produces the lines desired. A variety of apparatus may be employed for this purpose, of which an illustrative form is shown in the drawings. The cylinder B at its lower end is loosely journaled in the center of the disk R, provided with the central boss *r*, projecting downward and having the prong *r'* for attachment to the clockwork, which gives it a uniform motion. A curved spring S is attached at one end to the disk R beneath it at *s*. The other end of the spring is bent upward, the upright portion passing freely through the short slit *r''* in the disk R, and thence into the bottom of the cylinder B, to which it is rigidly attached, the movement of the disk thus carrying the cylinder with it.

T is a light spring attached to the interior of the case A, with its curved free end lightly pressing upon the periphery of the cylinder B. In the latter notches or light depressions *t* are cut at regular intervals, into which the spring T falls, briefly arresting the movement of the cylinder B, for the stronger spring S, under its increased tension, quickly overcomes the effect of the spring T, forcing it out of the depression *t*, when the cylinder B bounds forward, recovering its lost motion. This brief arrest of the movement of the cylinder causes a longer exposure of the sensitive paper under the slit A, producing there-

on the transverse lines *q*, (shown in Fig. 3,) which indicate periods of time.

A spring V is attached within the case *a* at its upper end and is provided at its free end with a hole or aperture *v*, which rests over an opening *w* in an angle-iron W, attached to the case, as shown in Figs. 4 and 8. In inserting the cylinder B in the case A its lower end is first brought into connection with the clockwork and its upper axle *x* is then pressed along the spring V, elevating its free end until the axle *x* enters the hole *v*, when the spring closes down, holding the axle in place in the opening *w* in the angle-iron W, in which it freely turns. A detachable hand or pointer Y is then inserted upon the upper end of the cylinder-axle *x* through the center of the dial Z and in a position pointing toward the desired numeral upon the dial, which becomes the starting-point of the registration.

I prefer to use what is known to the trade as "Velox" developing-paper, though any suitable sensitive paper may be employed, and it may be attached to the cylinder in any appropriate manner.

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

1. In a self-registering manometer, the combination of a revoluble cylinder for supporting a sheet of sensitive paper, means for rotating said cylinder at a uniform rate of speed, a stationary inclosing case provided with a narrow vertical slit for the admission of light, and a series of laterally-extended notches formed in said slit whereby an increased exposure may be given to said paper at predetermined intervals, resulting in the automatic formation of longitudinal lines as the cylinder is rotated, substantially as described.

2. In a self-registering manometer, the combination of a support for a sheet of sensitive paper, with means for giving the same a uniform movement before a slit in an inclosing case, and means for briefly arresting said movement at intervals, whereby, through the increased time of exposure, transverse lines are formed upon said paper at corresponding intervals, substantially as described.

3. In a self-registering manometer, the combination of a support for a sheet of sensitive paper, with means for giving the same a uniform movement before a slit in an inclosing case, and means for briefly arresting said movement at intervals, said slit being provided at intervals with notches, whereby through the increased times of exposure, both longitudinal and transverse lines are formed upon said paper at respectively corresponding intervals, substantially as described.

4. In a self-registering manometer, the combination of a support for a sheet of sensitive paper with means for giving the same a uniform movement before a slit in an inclosing case, means for briefly arresting said movement at intervals, said slit being provided

with a series of laterally-extended notches to permit of an increased exposure of said sensitive paper in the respective lines of said notches, a tube held before said slit and containing a fluid whose movements are photographed through said slit upon said paper, a pressure-gage in operative communication with the fluid the velocity of which is to be measured, said pressure-gage having an indicator-finger extended across said slit in the inclosing case whereby both longitudinal and transverse lines may be formed upon said paper and the movements of said indicating-finger may be simultaneously photographed thereon in proper relation to said lines, substantially as described.

5. In a self-registering manometer, the combination with a photographic apparatus of the bent transparent tube D, flexible tubes F and metallic tubes D with their lower ends bent

in opposite directions, substantially as and for the purpose set forth.

6. In a self-registering manometer, the combination of the case A, the inclosed cylinder B, moved by clockwork, the retaining-spring V and the angle-iron W, substantially as and for the purpose set forth.

7. In a self-registering manometer, the combination of the case A, the inclosed cylinder B, moved by clockwork, the detachable pointer Y and the dial Z, substantially as and for the purpose set forth.

In testimony whereof I have signed this specification, in the presence of two subscribing witnesses, this 31st day of January, 1898.

EDWARD S. COLE.

Witnesses:

D. H. FLETCHER,
EDNA B. JOHNSON.