

(No Model.)

J. D. BOWMAN.

COMBINED PRESSURE GAGE AND SAFETY VALVE.

No. 406,990.

Patented July 16, 1889.

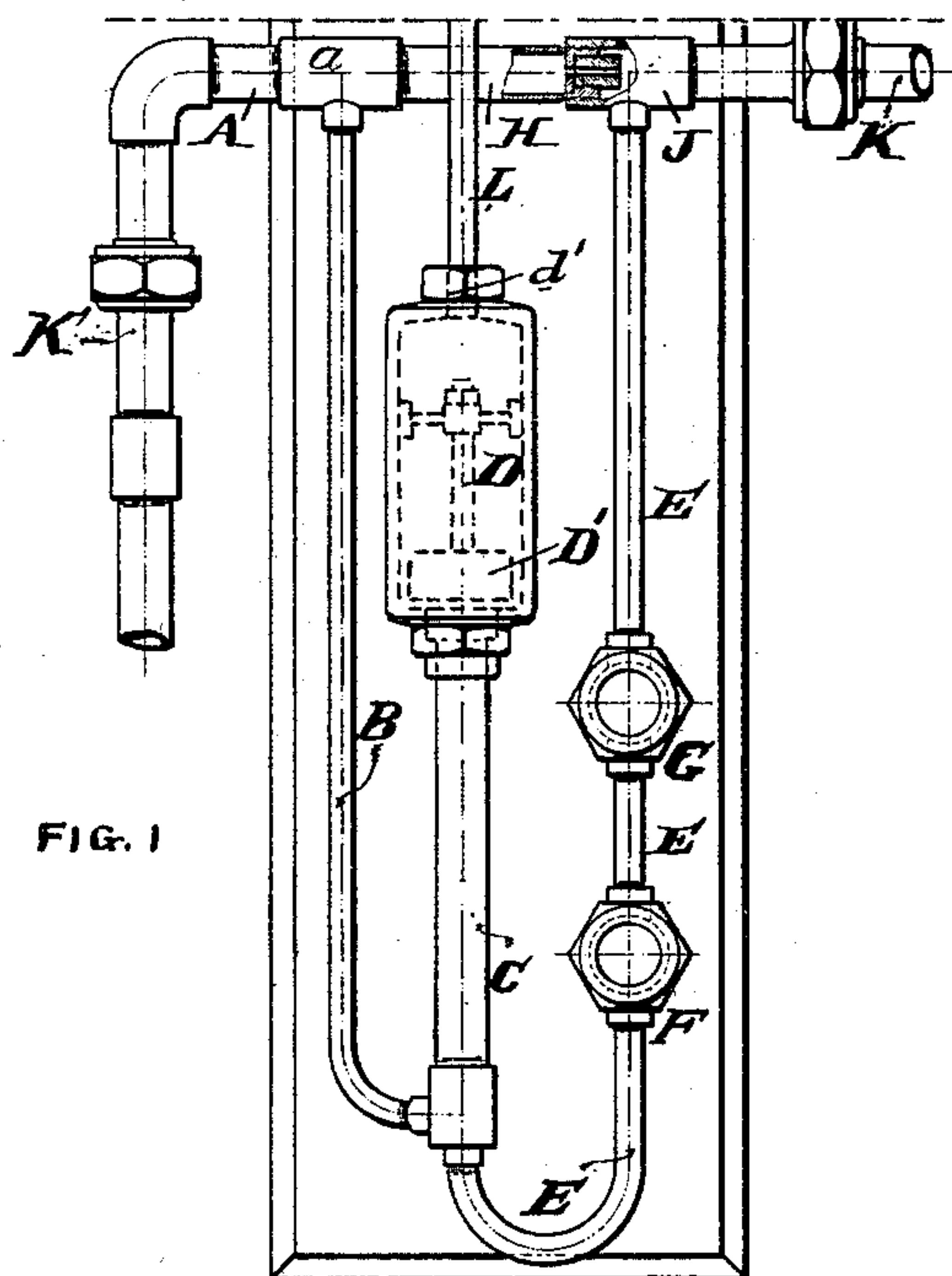


FIG. 1

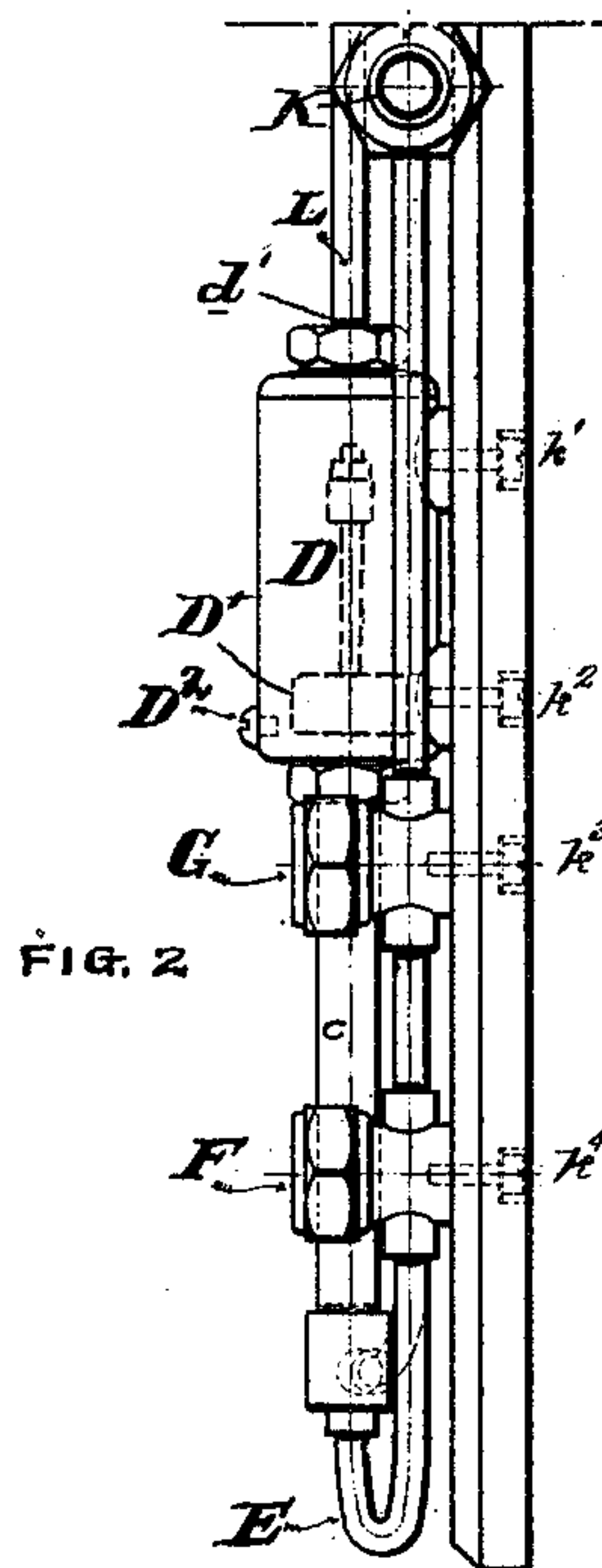


FIG. 2

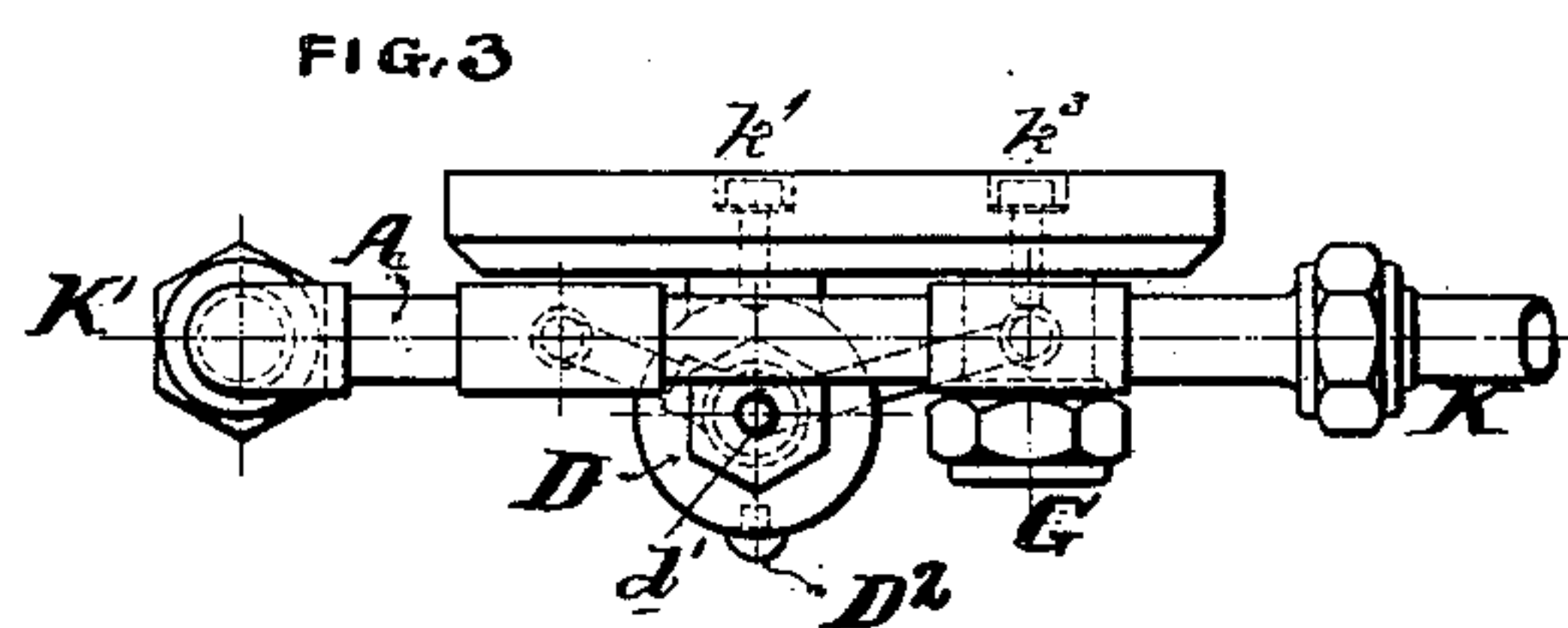


FIG. 3

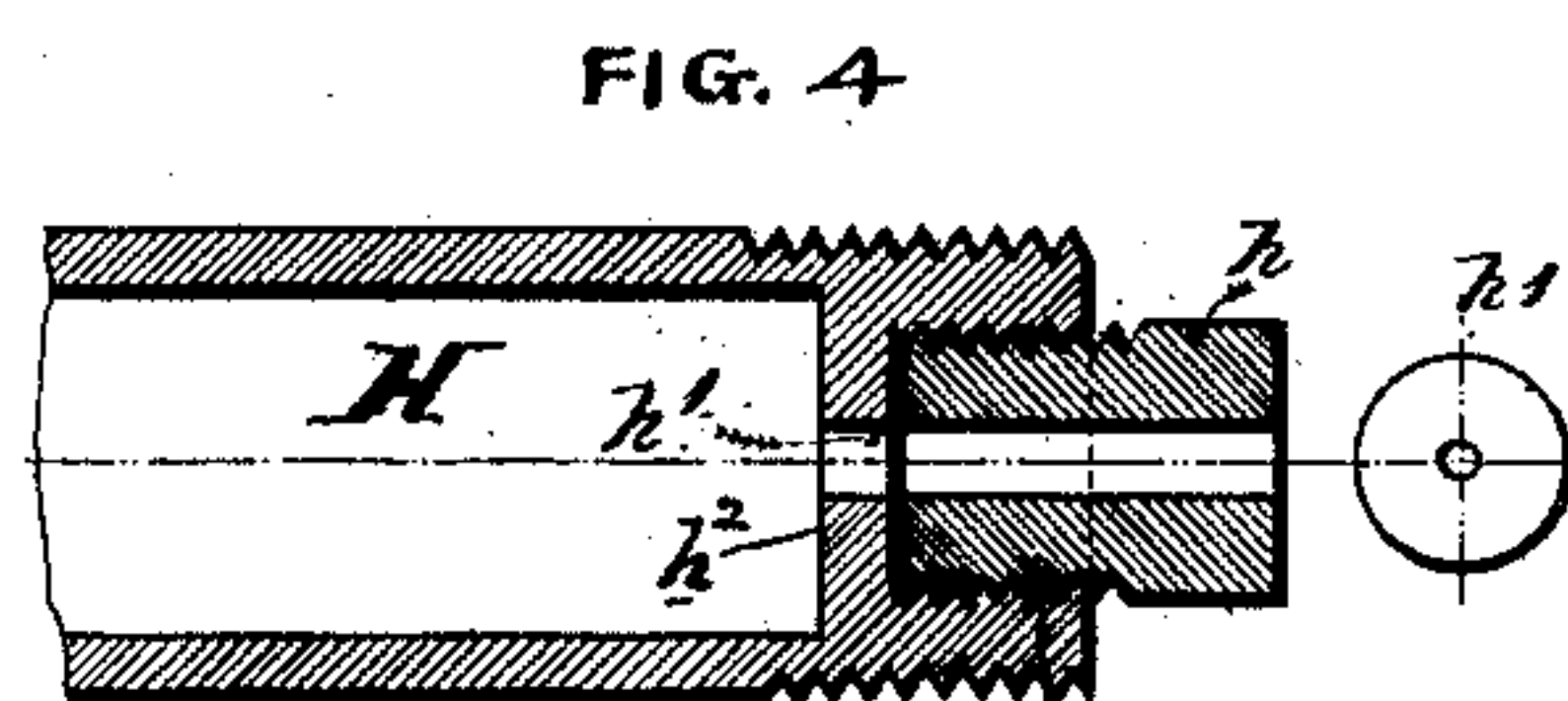


FIG. 4

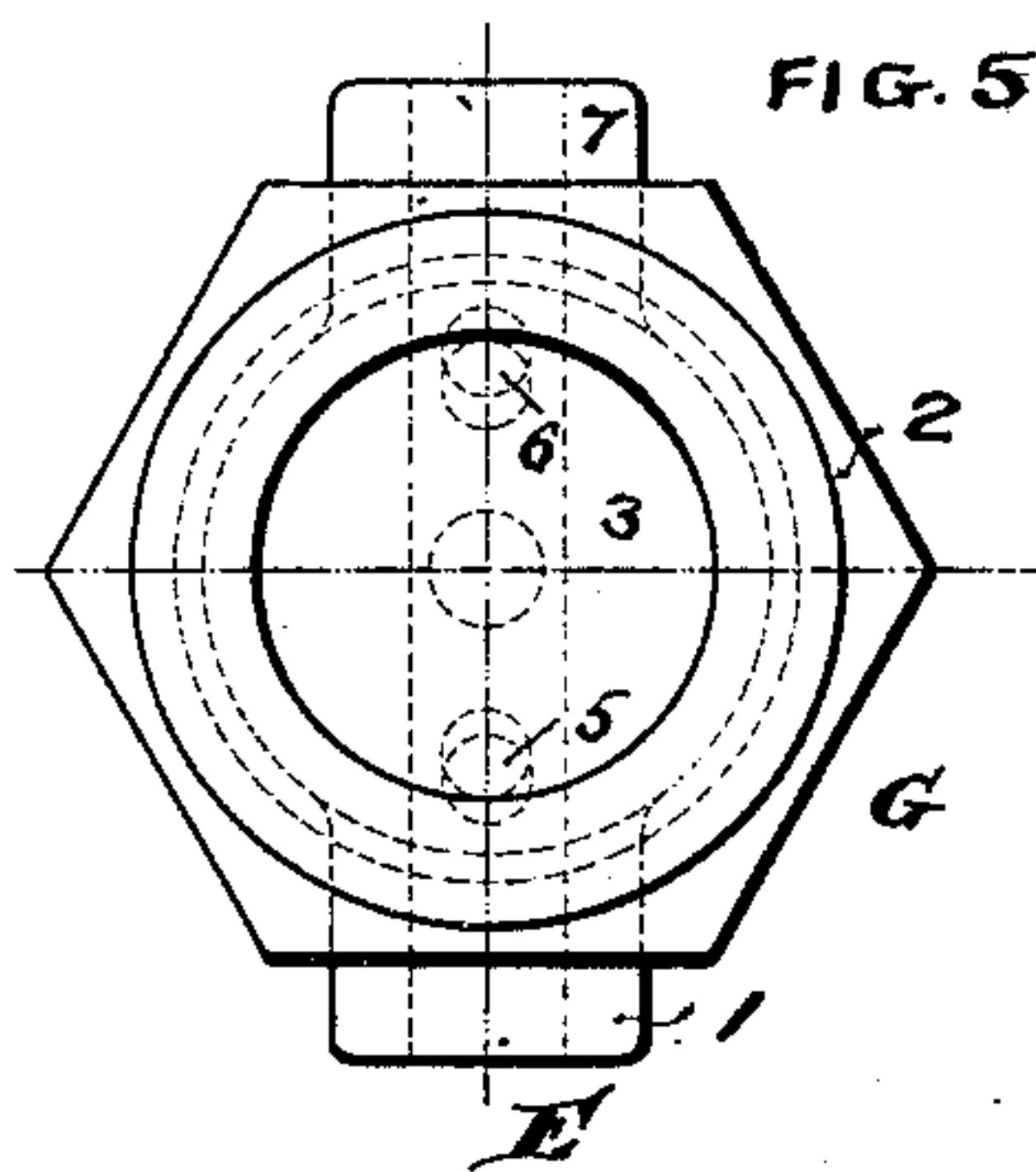


FIG. 5

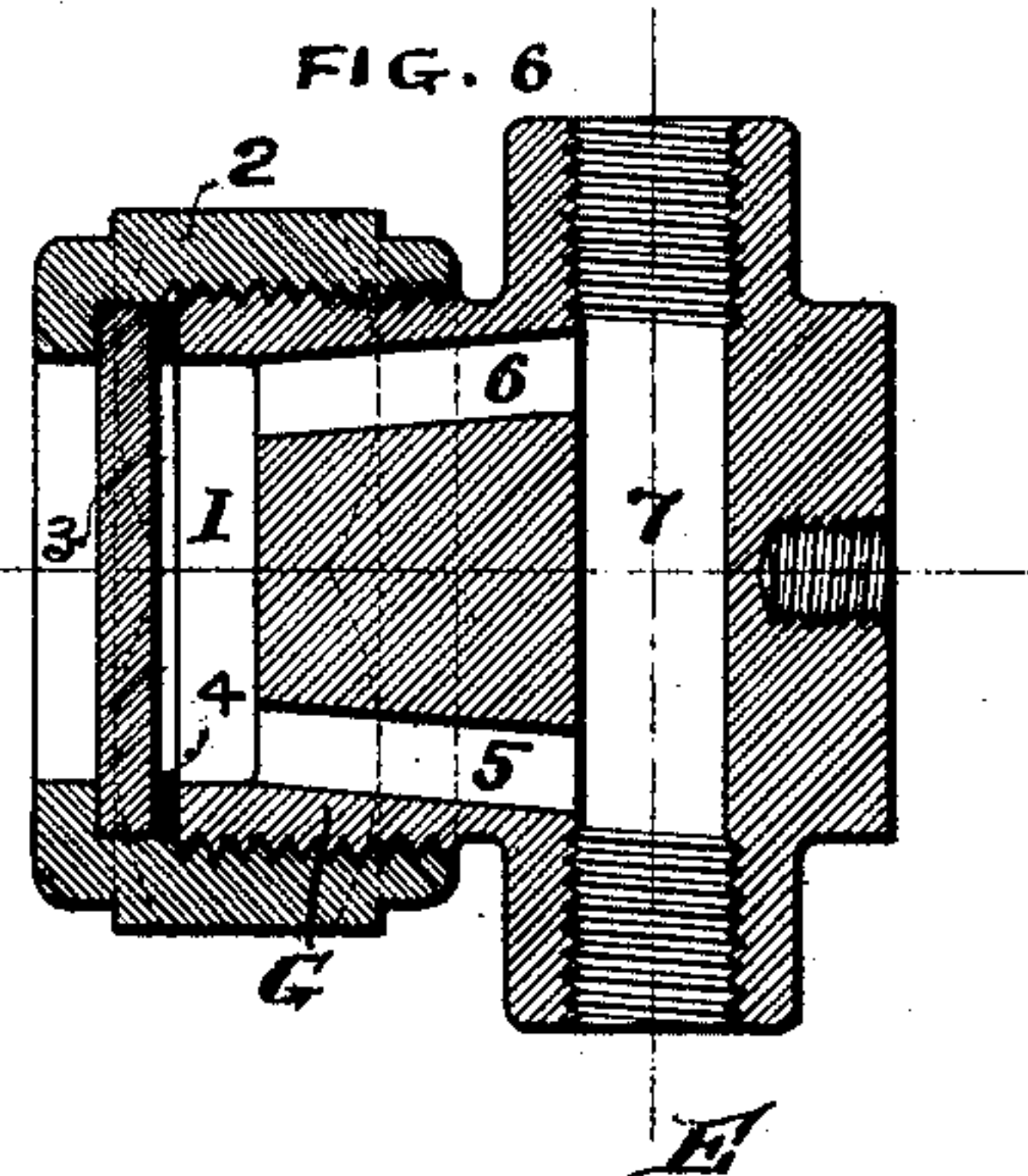


FIG. 6

WITNESSES:

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# UNITED STATES PATENT OFFICE.

JOHN D. BOWMAN, OF ALTOONA, PENNSYLVANIA.

## COMBINED PRESSURE-GAGE AND SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 406,990, dated July 16, 1889.

Application filed December 13, 1888. Serial No. 293,421. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN D. BOWMAN, of Altoona, county of Blair, State of Pennsylvania, have invented a new and useful Combined Safety-Valve and Indicator for Carbureting Systems, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention resembles the indicator described in Charles B. Dudley's patent, No. 375,054, dated December 20, 1887, in depending for its operation upon the fact that gases in passing through conduits will, if a thin perforated diaphragm is placed in the conduit, decrease in pressure on the side of the diaphragm to which they pass in a degree dependent on the rapidity of flow. My improved device is also intended for use under similar conditions to that of Dudley, and should be used with gas or air of substantially uniform pressure and varying velocity.

The chief feature of my invention consists in combining with a gas-conduit, first, a diaphragm closing said conduit with the exception of a small orifice in the diaphragm, and, second, a U-tube secured to the conduit on the side of the diaphragm to which the gas flows and extending down from it, so as to contain mercury in its bend, said tube being open to the atmosphere at its other end. The pressure on the other side of the diaphragm being substantially constant, the varying pressure on the side to which the U-tube is attached will evidently cause the mercury to fall in one arm of the U and rise in the other open end to a degree dependent on the varying pressure incident to the varying rate of flow in the conduit. By noting the position of the mercury the same observations may be made as in Dudley's patent aforesaid, and my device serves the additional function of a safety-valve, for by making the mercury column of proper height the air or gas will escape from the U-tube whenever it exceeds a regulated pressure, bubbling through the mercury, which it forces into the free leg of the U, and escaping into the air.

Other details of my invention are also shown, and will be described, and specifically pointed out in the claims.

Reference being now had to the drawings,

which illustrate an indicator embodying my invention, Figure 1 is a front elevation of my improved device; Fig. 2, a side elevation thereof; Fig. 3, a plan view thereof; Fig. 4, an enlarged view of the device for holding the perforated diaphragm in the air-conduit; Fig. 5, an enlarged front view of the sight-holes of the indicator, and Fig. 6 a central cross-section of said sight-holes.

A indicates a pipe-section united at K' to a conduit leading from an air or gas reservoir. (Not shown.)

a is a T uniting pipe-sections A, H, and B.

B is a pipe extending downward from the T a, and connected at its bottom with the pipes C and E.

C is a pipe forming one leg of a U, made up of pipes C and E, as shown, the pipe E being connected with the gas-conduit, as shown, on the side of the interposed diaphragm to which the gas is flowing. At the top of pipe C is secured what I will call the "blow-off chamber" D, consisting of an enlarged chamber, preferably having secured in it devices for preventing an ascending current of air from carrying with it through the blow-off chamber particles of mercury or other liquid.

I have indicated in dotted lines an inverted cup D', situated in chamber D, so that its mouth will extend over the top of pipe C and prevent the air from rushing through chamber D in a straight line. This device I consider of especial value in the blow-off chamber, and it may be used either alone or in connection with other devices to coact with it in preventing the escape of mercury. At the top of the blow-off chamber D an opening d' is made, in which is secured a pipe L, open to the atmosphere.

D<sup>2</sup> is an outflow-hole in the side of blow-off chamber D for the purpose of showing when mercury enough has been put in the instrument.

J is a T uniting pipe E with the pipes H and K of the conduit. H is the pipe uniting the T's a and J, and K the pipe leading from the T J to the carburetor (not shown) or other point of use.

F and G are sight-holes situated at regulated points in the pipe E, and constructed as shown in Figs. 5 and 6. These sight-holes consist of sections 7, into which the sections



of pipe E screw. These sections 7 have holes 5 and 6 formed in them, the one above the other, entering a recess 1, at the end of which a glass plate 3 is secured by means of a recessed nut 2, a tight joint being formed between the glass and the end of the sectional casting 7 by means of a washer 4.

$h'$  indicates a thin perforated diaphragm held in position between a shoulder  $h^2$  of pipe-section H and a perforated plug  $h$ , screwing into the end of pipe-section H, as shown in Fig. 4.

$k^1, k^2, k^3$ , and  $k^4$  indicate bolts by which the device is secured in place.

In practice, before pressure is admitted, the U formed by the pipes E and C is filled, as is also a portion of pipe B, with mercury to a level somewhat above that of the sight-hole G—as, for instance, that of overflow-hole D<sup>2</sup>.

The operation of my device is as follows:

The air or gas coming from the reservoir connected with pipe K' passes through pipe A, the T-section  $a$ , pipe-section H, the diaphragm  $h'$ , the T J, and the pipe K to the carburetor or other point of use. The U, made up of pipes E and C, is connected with this gas-conduit on the exit side of the diaphragm, the other side of the U being open to the blow-off chamber and atmosphere, and the pressure on the mercury in pipe E will be greater than that on the mercury in pipe C, the difference in pressure being a function of the speed with which the gases are passing through the main conduit and the diaphragm  $h'$ . As is explained in the patent to Dudley aforesaid, the quantity of air which it is necessary to pass through a carburetor varies with the amount of carbureting material contained in it, much less being required when the carburetor is freshly charged with hydrocarbon fluid than when it is partly exhausted, and the quantity of air required as the saturation of the carburetor diminishes is greater. In this way the difference in pressure on the two surfaces of the mercury in the U varies with the saturation of the carburetor, and by observing the height of the column of mercury in the pipe E the condition of the carburetor can at all times be ascertained with sufficient accuracy for practical purposes. The sight-holes F and G are placed so as to enable the height of the mercury column in pipe E to be observed at critical points, and as they are very strong and not liable to be broken they are preferable to a continuous tube of glass, although such a tube could be substituted for them, if desired. The pipe C is secured to the pipes B and E in

such a way that the opening at the bottom of pipe B shall be at the point where the column of mercury in it is depressed to what I may call the "danger-point," this point being that which the mercury column would reach when the quantity of air passing through the conduit and the pressure of this air were greater than the carburetor is intended to operate with. When the mercury is depressed at this point, the air will escape from pipe B into the pipe C and pass upward through it into the blow-off chamber D, and after passing through this chamber it escapes through the pipe L to the atmosphere. This is a safety device, and by its use on the entrance side of the diaphragm I prevent high-pressure gas from passing through the diaphragm in sufficient quantity to sensibly alter the pressure at the carburetor or other point of use. The pipe B forms no part of my indicating device proper.

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

1. In combination with a gas-conduit, a perforated diaphragm interposed in the same, an indicator consisting of a U-tube adapted to contain mercury, having one leg connected with and leading down from the conduit on the exit side of the diaphragm, and a blow-off chamber secured on the top of the other leg, substantially as and for the purpose specified.

2. In combination with a gas-conduit, a perforated diaphragm interposed in the same, an indicator consisting of a U-tube adapted to contain mercury, having one leg connected with and leading down from the conduit on the exit side of the diaphragm, a blow-off chamber secured on the top of the other leg, and an inverted cup sustained in the blow-off chamber over the mouth of the open leg of the U-pipe, substantially as and for the purpose specified.

3. In combination with a gas-conduit, a perforated diaphragm interposed in the same, a U-tube adapted to contain mercury, having one leg connected with and leading from the conduit on the exit side of the diaphragm, and the other leg open to the atmosphere, and a pipe connected to the conduit on the entrance side of the diaphragm and to the open leg of the U-pipe above its bottom, substantially as and for the purpose specified.

JOHN D. BOWMAN.

Witnesses:

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R. A. FRAKER.