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AUTOMATIC RECORDING APPARATUS FOR MEASURING GASEOUS FLUIDS.

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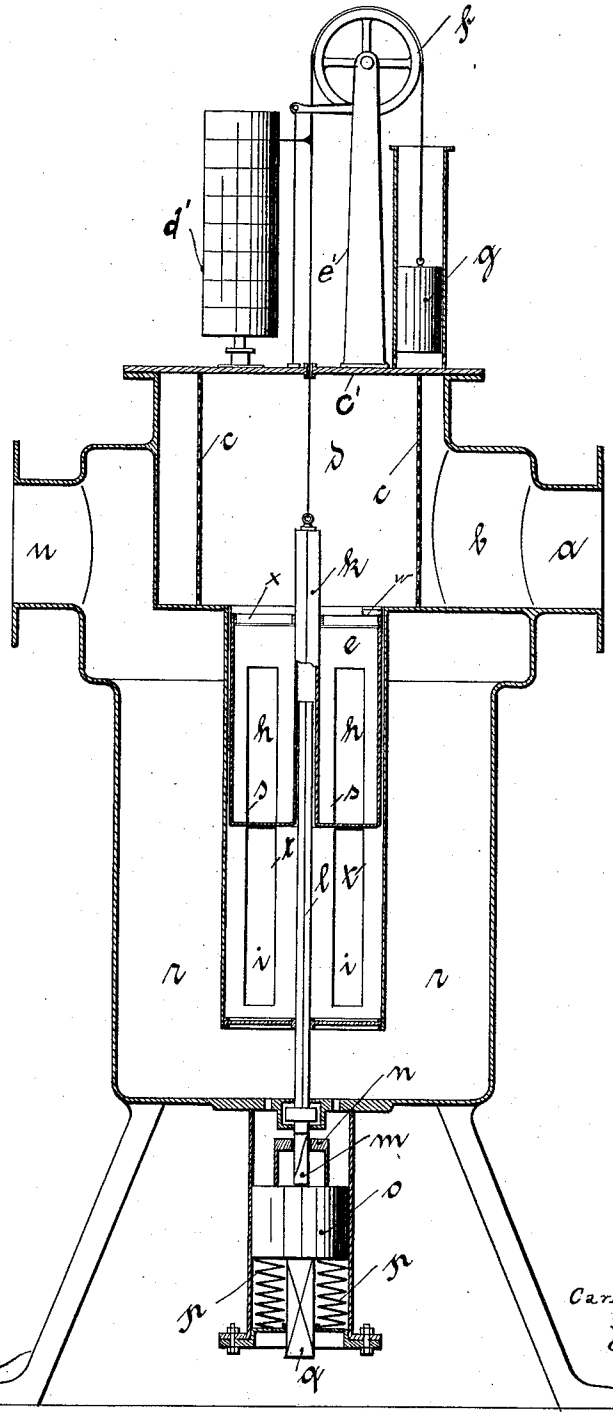
1,009,448. Patented Nov. 21, 1911.



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AUTOMATIC RECORDING APPARATUS FOR MEASURING GASEOUS FLUIDS.

1,009,448. Specification of Letters Patent. **Patented Nov. 21, 1911.**

Application filed October 6, 1909. Serial No. 521,347.

To all whom it may concern:

Be it known that I, CARL FRIEDRICH SIMON, a subject of the German Emperor, and residing at Stolberg, Rhineland, Germany, have invented certain new and useful Improvements in an Automatic Recording Apparatus for Measuring Gaseous Fluids, of which the following is a full and clear specification.

This invention relates to an improved automatic recording apparatus for measuring gaseous fluids.

For every producer as well as for every consumer of gas or steam it is important to be able at any moment to ascertain the exact quantity of gas or steam produced, or consumed, without having to make extended calculations or trials. Apparatus for this purpose have been heretofore provided and these have been found to be insufficient and too complicated or delicate for constant use.

The improved automatic recording apparatus for measuring gaseous fluids according to this invention is shown in front-elevation partly in section in the accompanying drawing to which reference is made in the following description of parts.

The apparatus will be best understood by setting forth its working for indicating weight in kilograms per second. The gaseous fluid, which may be gas or steam, enters by the inlet *a* into a chamber *b* and passes through the perforated inner wall *c* into a central cylinder *d* which extends downwardly and is at the lower end fitted with an internal gas tight sliding vessel *e* which is closed at the bottom. The vessel *e* is suspended by a wire *e'* passing gas tight through the cover *c'* of the apparatus and guided over a pulley *f* so as to carry weight *g* at the outer end. The vessel *e* has several rectangular openings *h*, and the lower portion of the cylinder *d* has corresponding openings *i*. In the middle of the bottom of the inner vessel *e* is secured a polygonal guide tube *k* braced at the top by means of a spider *x* in which tube engages a polygonal rod *l* which on being turned, causes the vessel *e* to turn also without preventing the latter from moving up and down.

The vertical polygonal guide-rod *l* which is rotatable in the bottom portion of the apparatus, has a lower square end *m* twisted after the manner of a screw-thread and engaged in a corresponding guide *n*. The guide *n* is rigidly connected with an air-tight fitted plunger *o* which is evenly pressed upwardly by helical springs *p* suitably adjusted to an even pressure so that all become uniformly compressed through increasing pressure of the gaseous fluid. By this arrangement the rod *l* is capable of rotary movement relative to the plunger *o*. To the lower end of the plunger is fixed a square rod *q* which is guided in the bottom cover of the plunger cylinder so as to prevent said plunger from turning around. When no consumption of gas, or steam, takes place, the vessel *e* will remain in its uppermost position, against a suitable stop *w*, by reason of the weight *g*. The upper edges *t* of the rectangular apertures *i* of the cylinder *d* are approximately level with the corresponding lower edges *s* of the same sized apertures of the inner vessel *e* so that there is no free passage for the gaseous fluid. As however, the pressure in the external vessel *r* is nearly the same as that in the chamber *b* and inner vessel *e* it is evident that the plunger *o* by reason of the fluid pressure upon it, will compress the springs *p* and in thus descending will cause the square rod *m* to be turned by the guide *n*, the plunger being prevented from turning also owing to the guided square rod *q*. The square rod *m* will at the same time turn the vessel *e*. The extent of the turning movement is predetermined in such a manner as to insure that the product of the prevailing specific weight *w* of the gaseous fluid and the corresponding velocity *v* of the fluid passing through the registering portions of the rectangular apertures and the horizontal distance *x* between the vertical edges of the said registering portions shall always be constant. When now gaseous fluid is taken from the outlet *u* at the rear of the meter the slight fall of pressure in the outlet end as compared with that at the inlet of the meter will make its influence felt. The fall of pressure acting on the bottom of the vessel *e* causes the latter to descend and raise the weight *g* so that the rectangular apertures of the two cylindrical vessels *e* and *d* partly overlap and provide a more or less extended passage varying in its vertical length according to the quantity in weight or kilograms per second consumed.

The vertical motion of the inner vessel *e*

is translated by a stylus connected with the suspension wire of said vessel onto the ruled sheet of a rotated indicator drum *d* so that the consumption of the gaseous fluid in kilograms per second can be immediately ascertained.

The principle embodied in this apparatus can be mathematically expressed as follows:—G is the total weight expressed in kilograms per second of the gaseous fluid measured. *v* is the velocity in meters per second of the gaseous fluid passing through the registering portions of the rectangular apertures *h* and *i*. *x y* represent the area in square meters of the openings in the overlapping portions of the apertures, *y* being the vertical distance and *x* the width of such openings. *w* is the weight in kilograms per cubic meter of the gaseous fluid under the prevailing pressure. Therefore $G=v.x.y.w$. If *x*. *w*. *v*. is rendered constant by varying the length of the ground line *i*. *e*. the width of the rectangular apertures, then with equal consumption notwithstanding the variations in density of the gaseous fluid, no alteration in the vertical opening of the rectangular aperture will take place. As applied to this apparatus, it means that the inner vessel *e* will not move in the vertical direction and the stylus on the indicator drum will continuously record the equal consumption in kilograms per second. The moment, however, when G alters *i*. *e*. when the consumption either increases or decreases, the inner vessel will ascend or descend and correspondingly increase, or decrease, the vertical distance and consequently the opening of the apertures with the result that the variation is recorded by the stylus on the indicator drum.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare what I claim is:—

1. A meter for gaseous fluids comprising a container having inlet and outlet openings, a valve and valve casing between said openings having coöperating ports forming a rectangular aperture through which the fluid may pass, means responsive to the rate at which fluid is drawn from said outlet opening for varying one dimension of said rectangular aperture, means for indicating such variations, and means for automatically adjusting the other dimension of said aperture in such manner as to render said variations proportional to the quantity by weight of fluid per second passing through the meter.

2. A meter for gaseous fluids comprising inner and outer vessels, said inner vessel being provided with an opening, and constituting a valve casing, a hollow valve member slidably mounted for vertical movement in said casing and provided with a corresponding opening, means including a counterweight for normally sustaining said valve member, said valve member being arranged to move so as to bring said openings more or less into registry in accordance with the amount of fluid passing through the apparatus, and an indicator operatively connected with said valve member.

3. A meter for gaseous fluids comprising inner and outer vessels, said inner vessel being provided with an opening, and constituting a valve casing, a hollow valve member slidably mounted in said casing and provided with a corresponding opening, said openings being adapted to be brought into registry so as to constitute a passage for said fluid, means responsive to changes in the density of the fluid being measured for varying the width of such passage, said valve member being arranged to be moved by the flow of the fluid so as to vary the length of such passage in accordance with the quantity by weight of fluid per second passing through the apparatus, and means for indicating the last mentioned variations.

In testimony whereof I affix my signature in presence of two witnesses.

CARL FRIEDRICH SIMON.

Witnesses:

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