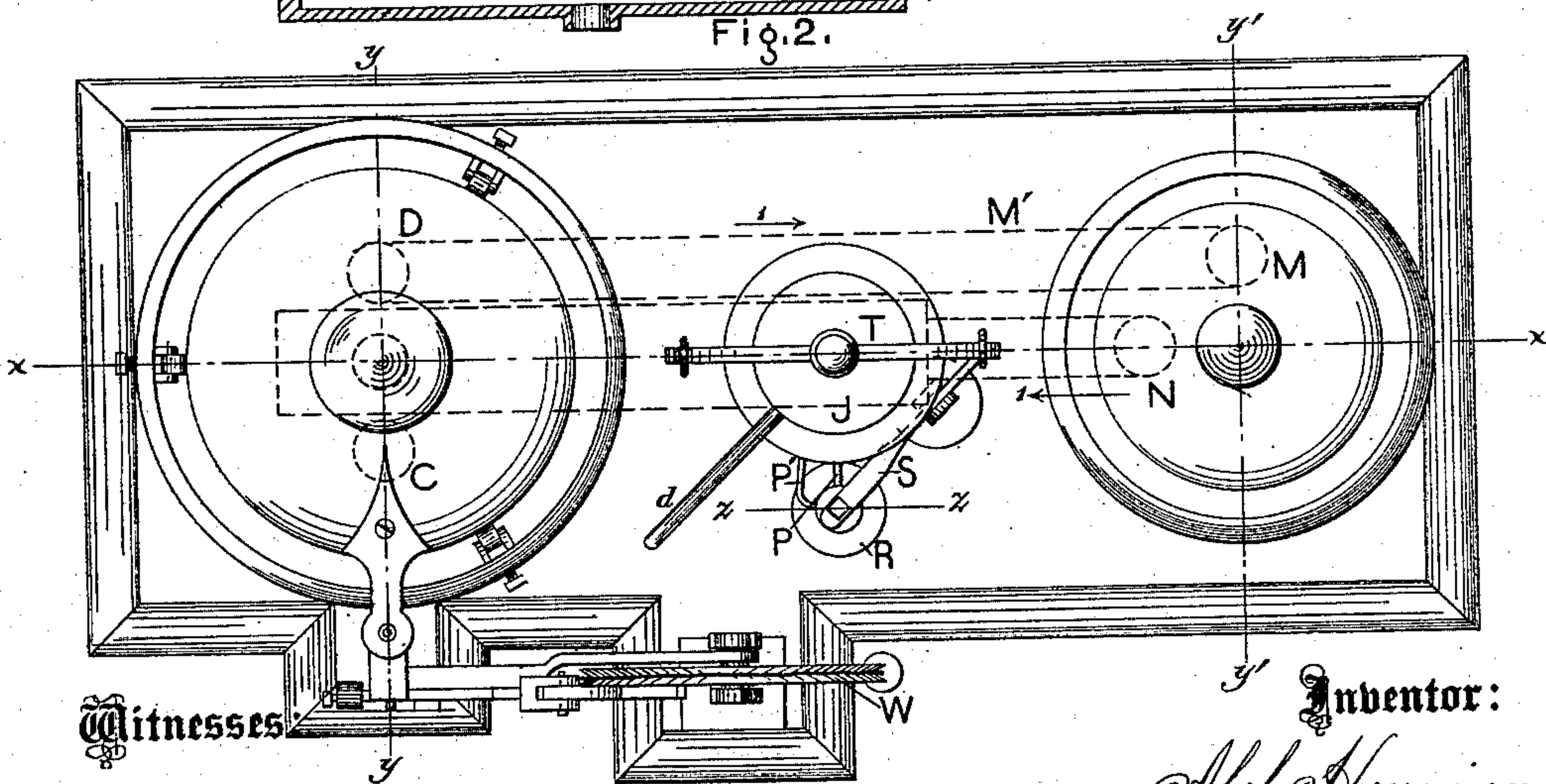
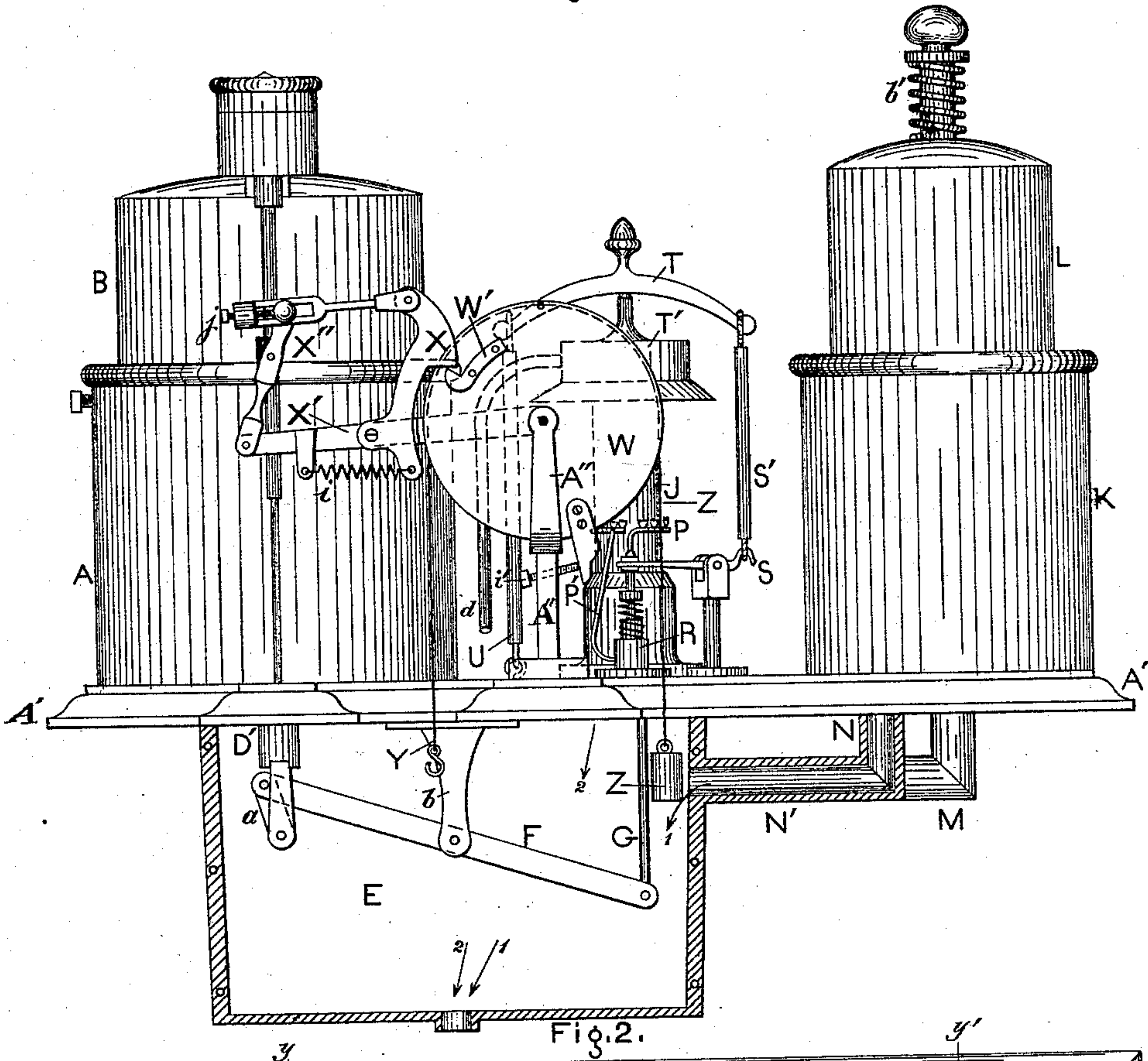


A. HENNING.
Gas Machine.

No. 232,715.

Patented Sept. 28, 1880.

Fig. 1.



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A. HENNING.
Gas Machine.

No. 232,715.

Patented Sept. 28, 1880.

Fig. 3.

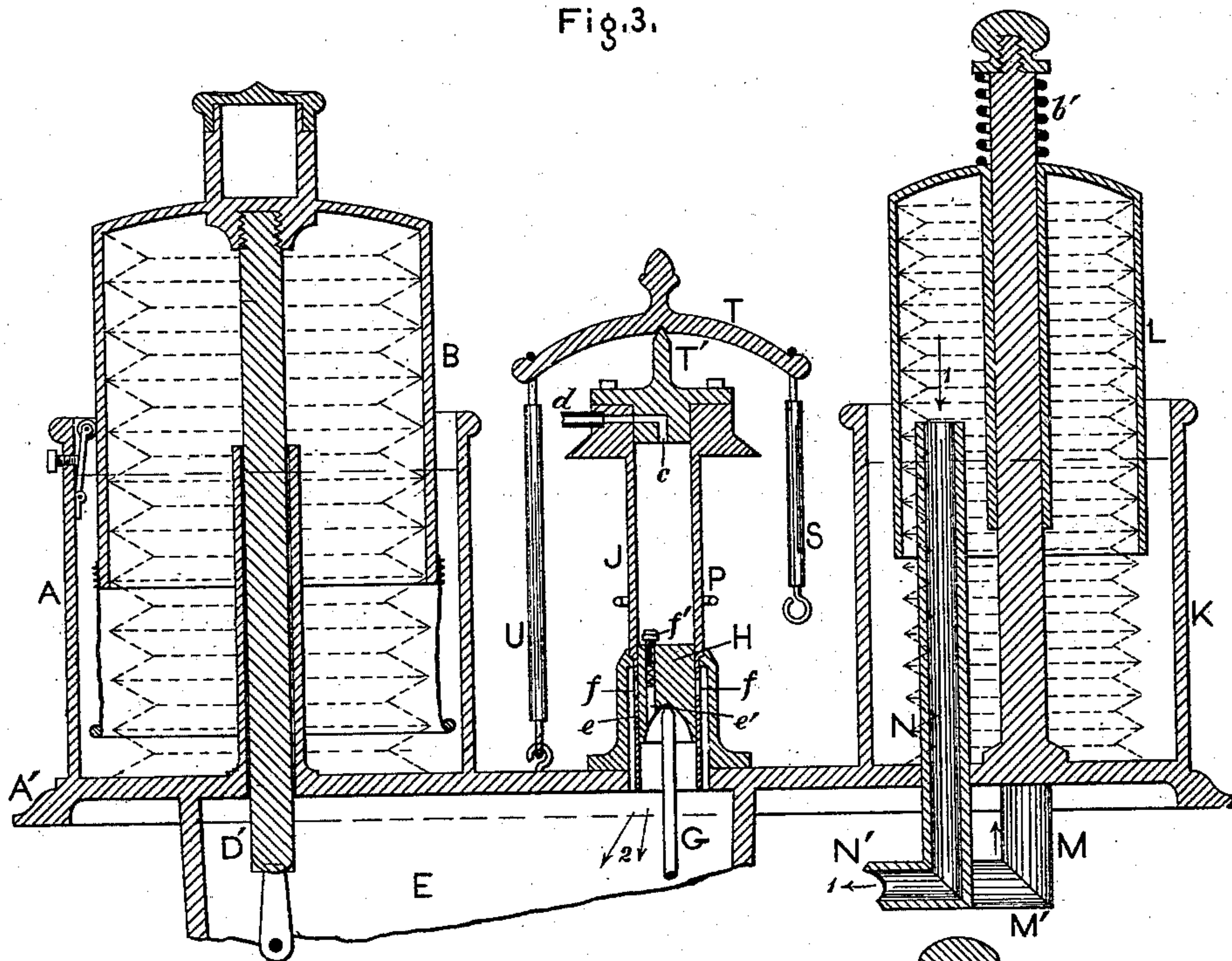


Fig. 4.

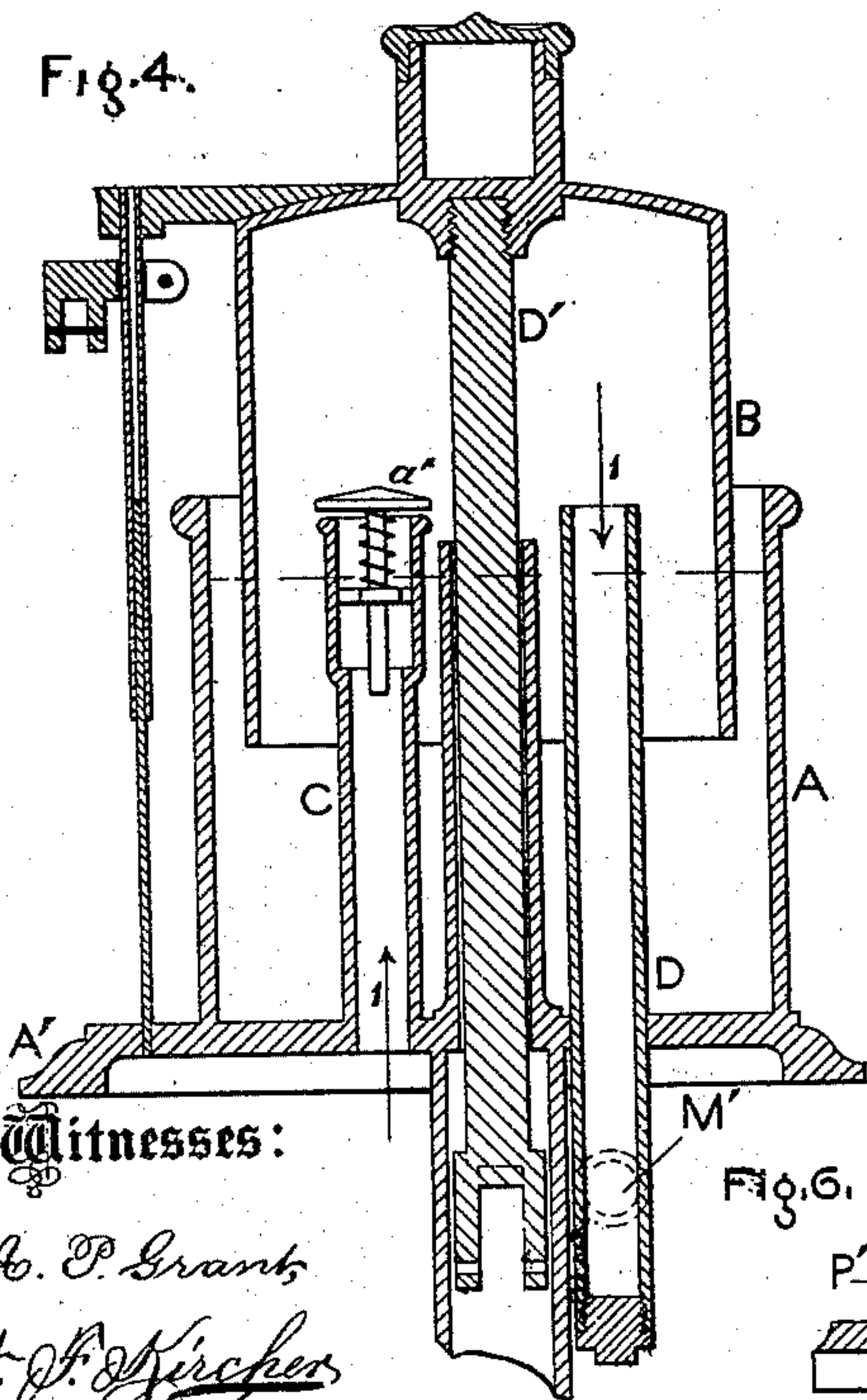


Fig. 5.

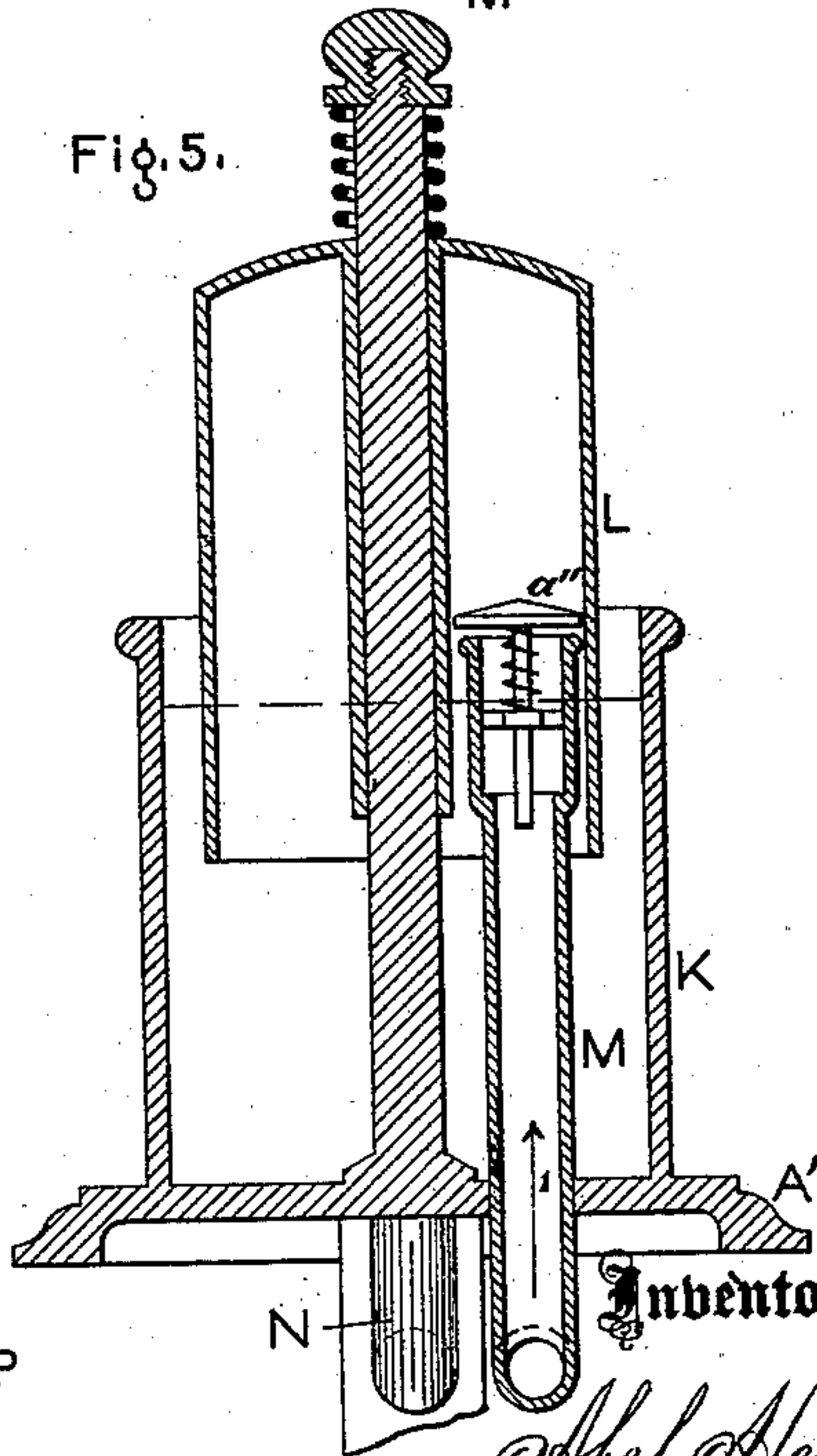
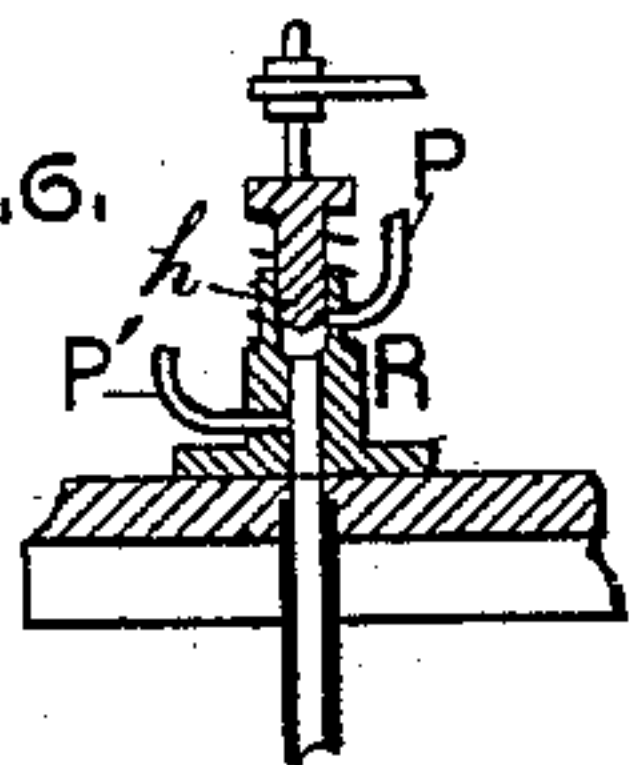


Fig. 6.



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UNITED STATES PATENT OFFICE.

ABEL HENNING, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE UNITED STATES AUTOMATIC GAS MACHINE COMPANY.

GAS-MACHINE.

SPECIFICATION forming part of Letters Patent No. 232,715, dated September 28, 1880.

Application filed January 15, 1880.

To all whom it may concern:

Be it known that I, ABEL HENNING, of the city and county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Gas Apparatus, which improvement is fully set forth in the following specification and accompanying drawings, in which—

Figure 1 is a side elevation, partly sectional, of the gas apparatus embodying my invention. Fig. 2 is a top or plan view thereof. Fig. 3 is a vertical section in line *x x*, Fig. 2. Fig. 4 is a transverse section in line *y y*, Fig. 2. Fig. 5 is a transverse section in line *y' y'*, Fig. 2. Fig. 6 is a vertical section in line *z z*, Fig. 2.

Similar letters of reference indicate corresponding parts in the several figures.

My invention consists of a generator adapted to be heated, and containing a plunger which is subjected to the pressure of the vapor created from the hydrocarbon fluid injected into the generator and thus moved, the effect whereof is to operate a pump which draws in a supply of air, the vapor entering a chamber and commingling with said air, which is directed by suitable means to said chamber, from whence the resultant gas is passed out to a place of service.

It also consists of a valve automatically operated by the expansion of the vaporizer when said vaporizer is overheated, and regulating the heating medium thereof.

It also consists of a burner for automatically igniting the heating medium of the vaporizer.

It also consists of the plunger having a valve for relieving it of pressure and permitting it to rise in the vaporizer.

It also consists of mechanism for operating the feed-pump of the vaporizer.

It also consists of a link-connection between the shaft of the air-pump and operating-lever, for preventing binding of the parts and causing said pump to move true.

Referring to the drawings, A represents a tank properly supported on a table or base, A'; and B represents an air-holder, of the form of a cylinder or bellows, fitted within said tank, and having an air-inlet pipe, C, and outlet-pipe D, and connected to its head a vertical shaft, D', which passes freely through the base A' and projects into a chamber, E, be-

neath said base, and has connected at its lower end, by a hinged link, *a*, a swinging lever, F, whose fulcrum is on a suitable hanger, standard, or bracket, *b*, properly secured.

To the other end of the lever F is pivoted an upright shaft, G, which passes freely through the base A' and supports a plunger, H, located within the vapor or gas generating chamber J, consisting of a cylinder or shell closed at top and open at bottom, and supported on the base A', and having an inlet, *c*, for hydrocarbon fluid, said inlet communicating with a pipe, *d*, leading to a pump or other suitable feeding mechanism.

The chamber has a seat, *e*, for the plunger H, consisting of an inner cylinder with perforations *f* communicating with the space between said seat and the cylinder, whereby there is a communication between the chambers J E.

The plunger H is adapted to rise and fall in the chamber J and cover and uncover the openings *f* of the seat *e*, and has a vertical duct or passage, *e'*, occupied in part by a valve, *f'*, having a winged stem, so that there is a communication between the top and bottom of the chamber J through said plunger H.

The valve *f'* is held open by means of a suitable spring properly applied within the duct *e'* or elsewhere, and closed by the pressure of gas, as hereinafter set forth.

K represents a tank supported on the base A', and containing an air-holder of the form of a cylinder or bellows, L, within which project an inlet-pipe, M, and outlet pipe N, the pipe M communicating with the pipe D of the holder B by means of a pipe, M', and the pipe N with the chamber E by means of a pipe, N'.

Surrounding the chamber or generator J is a gas-jet, P, and adjacent thereto a gas-burner, P', both pipes of the jet or burner being connected to the valve of a gas-supply, R, the valve-head *h* whereof is adapted to cover and uncover the communication of the pipe of the jet P without similarly affecting the communication of the pipe of the burner P', so that while the burner is constantly ignited the surrounding jet P may be shut off, the operation whereof is automatical, as will be hereinafter stated.

S represents a lever which is mounted on a

standard rising from the base A', and has one end bearing against the head of the valve R, its other end being jointed to a connection or arm, S', which is jointed to a cross-head, T, whose center rests freely on the pointed or rounded cap T' at the top of the chamber J. Freely attached to the end of said cross-head T, opposite to the arm S', is a connection or arm, U, whose lower end is jointed to the base A', said arm S' forming a fulcrum for the cross-head T.

From the base A', adjacent to the tank A, rises a standard, A'', on which is mounted, by a horizontal axis, a disk or pulley, W, having a grooved periphery for a weighted cord, Z, the object whereof is to rotate the pulley in one direction.

To the outer face of the pulley is secured a dog, W', whose head or nose is adapted to engage with the shoulder of a dog, X, whose lower end is pivoted to an arm, X', whose axis is on the standard A'', and which has its opposite end jointed to a toggle, X'', the lower arm of which is pivoted to the holder B, so as to rise and fall with it.

The upper end of the dog X is pivoted to the upper arm of the toggle X'', and a spring, i, is connected to the arm X' and the lower end of the dog X.

The pulley W has connected to it a cord, chain, or other connection, Y, of a pump-rod or other apparatus, for supplying the generator J with hydrocarbon fluid, the return motion of the pulley being limited by a set-screw or screw-bolt, i', on the standard A''.

The operation is as follows: The jet P is ignited and its flame heats the generator J, the burner P' also being lighted. A quantity of hydrocarbon fluid is injected into the generator J through the pipe d, which may be accomplished by rotation of the pulley W by hand and consequent operation of the pump. As soon as the fluid enters the hot generator J it is converted into hydrocarbon vapor, the pressure whereof is immediately exerted on the plunger H, thus causing descent of the latter, and by means of the shaft G, lever F, and shaft D' the ascent of the holder B. Air is drawn through the pipe C into said holder, the valve a' at the top of said pipe opening on the upward motion thereof.

The valve f' of the plunger is closed by the pressure of the vapor, and when the plunger descends below the openings f the vapor escapes through the latter into the chamber E. The valve f' then opens and the plunger, relieved of any remaining pressure, is free to rise, the descending holder B, which being no longer controlled by the plunger H and falling by gravity, then causing the elevation of the plunger. In this motion of the holder B the valve a' is closed and the air in said pump is forced through the pipe D into the pipes M' M, and thus into the holder L, the valve a'' of said pipe M opening and said holder L rising. When the holder B has made its ascent the dog X is in such position over the dog W'

that when the dog X begins to descend it is brought into engaging contact with said dog W'. When said holder B descends, and with it the toggle X'' and arm X', to which the dog X is pivoted, the dog W' follows the motion of the dog X, and rotation is thus imparted to the pulley W and motion in one direction to the connection Y of the pump-rod.

Owing to the movement imparted to the dog X by the action of the arm X' and toggle X'', when the holder reaches, or about reaches, its lowest point the dog X is drawn clear of the other dog, W', and the pulley W, owing to the weighted cord Z, returns to its first position, thus imparting an opposite motion to the connection Y of the pump-rod, whereby another supply of hydrocarbon fluid is injected into the generator J, which fluid is quickly converted into vapor, and the plunger H operated as before, thus again elevating the holder B. The valve a'' of pipe M now closes and the holder L falls, thus forcing the air therein into the pipe N, and thus through the pipe N' into the chamber E, where it unites with the hydrocarbon vapor, the result being a serviceable gas which flows through a proper outlet to the place of use. These operations are repeated and the supply of gas thus maintained.

The course of air is indicated by the arrows 1 and that of the hydrocarbon vapor by the arrows 2.

Should the metal of the generator P be heated to an injurious or improperly high temperature the generator expands and raises the cross-head T, thus elevating the arm S' and lever S and closing the valve R. The gas leading to the jet P is cut off without affecting the gas of the burner P'.

When the temperature of the generator is restored it contracts, the cross-head T and arm S' lower, and the valve R opens, thus again admitting gas to the jet P, which is ignited by the flame of the burner P', and thus the generator is again heated. Should the temperature of the generator be insufficient the contraction of the same will cause the valve R to be opened to a greater extent, and thus admit more gas to the jet until the temperature is restored.

The guiding-stem of the holder L is provided with a spring, b', which bears against the top of the holder and a suitable stop on the stem, so that the ascent of the pump is not abrupt, and irregularity of the flow of gas is prevented.

By means of the hinged link a, connecting the shaft D' and lever F, there is no binding between said parts, and the shaft D', and consequently the holder B, moves true at all times.

The arm X' may be connected to and operated by the holder L in order to rotate the disk; but the position of the dogs requires to be reversed for properly timing the action of the pump of the generator.

The joint of the toggle X'' consists of a yoke formed on one limb or arm and receiving a head on the other limb or arm. A screw, j, is

passed through the outer end of the yoke and bears against the aforesaid head, so that by the proper rotation of the screw the toggle may be lengthened or shortened relatively to the adjustments of the dogs X W'.

I am aware that it is not new to operate a cut-off valve by the expansive operation of steam acting on a part of a metallic vessel.

I am also aware that it is not new to operate a pump by means of the downward movement of a plunger in another vessel or cylinder and suitable mechanical connections between said plunger and said pump.

I am also aware that a generating-chamber for vaporizing hydrocarbon fluid has been provided with an internal plunger, an external series of heating devices, and inlet and outlet passages, and that the combination of generating-chambers with expansible reservoirs or holders is not broadly new. I do not claim the above devices.

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

1. The generator J, having inlet *c*, in com-

bination with plunger H, provided with valve *f'*, internal cylinder *e*, having openings *f f*, and a heating device acting on said generator.

2. The combination of holder B, having stem D', with generator J, plunger H, rod G, and lever F, substantially as set forth.

3. The holder B, with air inlet and outlet pipes C D, the holder L, with air inlet and outlet pipes M N; the connecting-pipe M', the chamber E, generator J, plunger H, and lever F, combined and operating substantially as and for the purpose set forth.

4. The air-holder B and pump-connection Y, in combination with the pulley W, having a dog, W', and the dog X, arm X', and toggle X'', substantially as and for the purpose set forth.

5. The plunger H and holder B, in combination with the lever F and shaft D', having the link-connection *a*, substantially as and for the purpose set forth.

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Witnesses:

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