O. THIELBEULE.

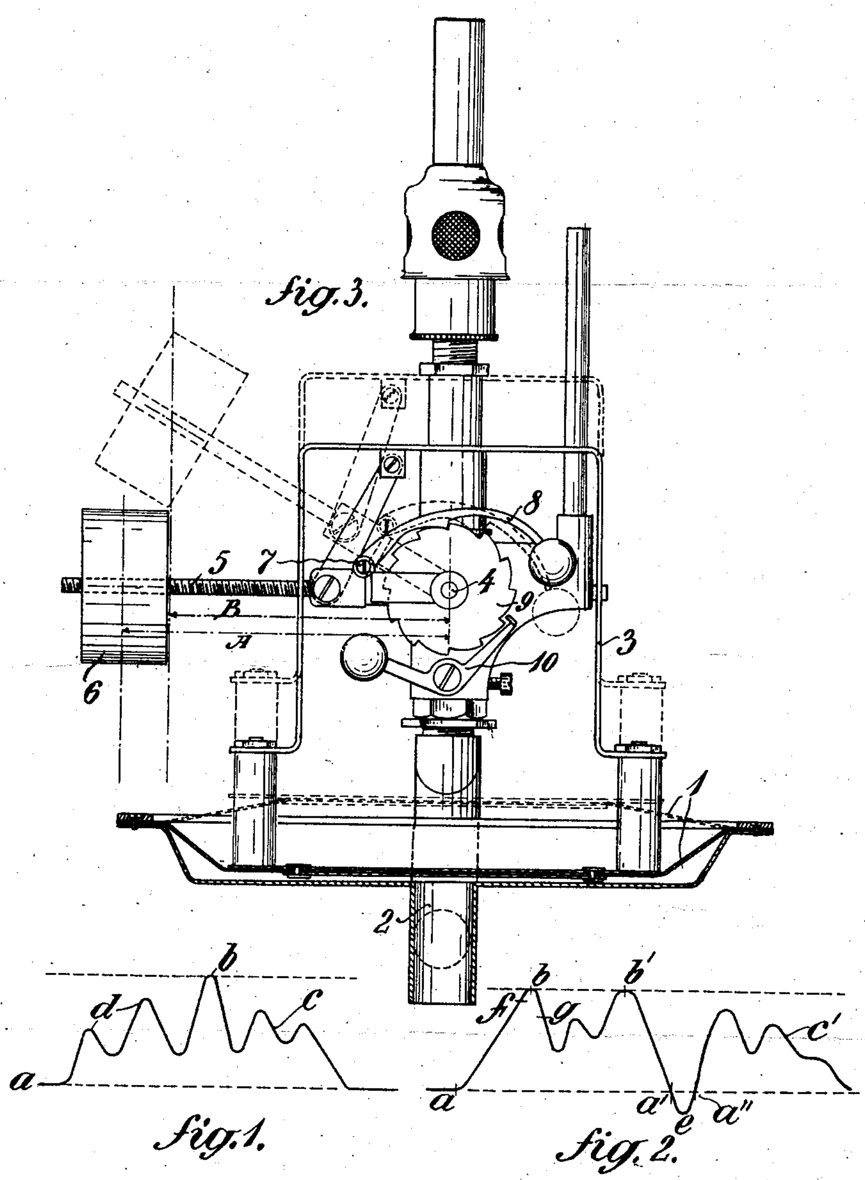
GAS IGNITER.

APPLICATION FILED NOV. 2, 1909.

997,341.

Patented July 11, 1911.

2 SHEETS—SHEET 1.



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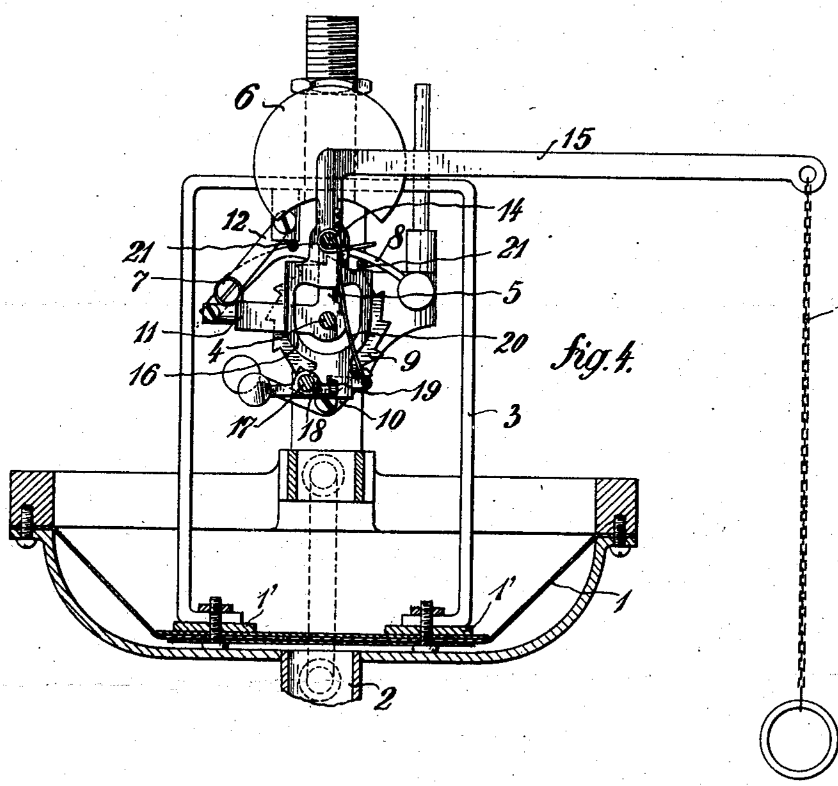

fig.4.

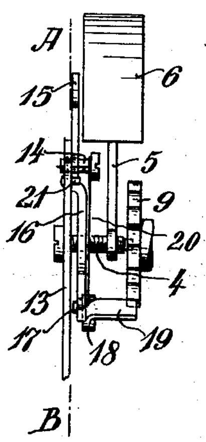

fig.5.

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UNITED STATES PATENT OFFICE.

OTTO THIELBEULE, OF BERLIN, GERMANY, ASSIGNOR TO GAS-LATERNENFERNZUENDUNG SYSTEM DR. ROSTIN G. M. B. H., OF BERLIN, GERMANY, A CORPORATION OF GERMANY.

GAS-IGNITER.

997,341. Specification of Letters Patent. Patented July 11, 1911.

Application filed November 2, 1909. Serial No. 525,927.

To all whom it may concern:

Be it known that I, OTTO THIELBEULE, a subject of the German Emperor, and residing at Berlin, Germany, have invented certain new and useful Improvements in Gas-Igniters, of which the following is a specification.

My invention relates to igniters for lighting gas from a distance, and a primary object is to provide improved igniters of the type operated by an impulse caused by a sudden difference of pressure.

Several embodiments of my invention are represented by way of example in the accompanying drawings wherein:—

Figures 1 and 2 are pressure diagrams, Fig. 3 is a side elevation, partly in section, showing one form of my improved igniter, whereas Fig. 4 is a section in the plane A—B in Fig. 5 showing a modified form, and Fig. 5 is an end elevation showing part of the latter form.

It is well-known to construct impulsively-operated igniters in combination with steadying-valves so that the pipe closure-member is opened or closed only when the gas-pipe pressure has first completely returned from the last maximum deviation of pressure to the starting pressure and has subsequently again changed completely to the maximum deviation. The circumstance that in this known type of igniters the operation of the pipe closure-member is dependent on two conditions, viz: firstly, the gas pressure must completely return to the starting pressure, and, secondly, the gas pressure must subsequently rise to a quite definite maximum deviation from the starting pressure, necessitates that the degree of sensitiveness of the controlling member of the gas-pipe closure-member be very small as compared with the manifold and not inconsiderable fluctuations of pressure occurring in the piping. Heretofore it was difficult to apply such a sensitive mode of operation to apparatuses operating with steadying-valves because the limits to be adjusted, at which the gas-pipe closure-member might or might not be actuated could not be kept constant with the desired exactitude. The reasons for this were due particularly to the variation of the frictional resistance of the closure-member in consequence of the separation of solid constituents from the gas, influences of temperature, shaking, wear and tear, and so on. The consequence of these influences makes itself felt, for example, by the closure-member not being actuated at the previously-adjusted maximum deviation from the normal pressure, but at a later point of time, in consequence of the frictional resistance of the pipe closure-member increasing for the above mentioned reasons. The variation of the frictional resistances of the gas-pipe closure-member and of the driving mechanism of the same becomes all the more disadvantageously noticeable when the pipe-pressure must be increased by such an amount above that pressure at which this actuation of the closure-member is to begin that the entire resistances of the closure-member until the same is completely opened or closed are to be overcome. Consequently, with the previously known igniting apparatuses actuated from a distance, so far as the same operate without the above mentioned steadying-valves the gas pressure which, referring to the diagram Fig. 1, has risen for example from the starting pressure a to the maximum deviation b and on attaining the latter pressure opened the pipe closure-member as desired, could be prevented from again unintentionally influencing the closure-member during fluctuations according to the curve c. Similarly, referring again to Fig. 1, it was possible to arrange that, when the pipe-pressure changed from the starting pressure a to the maximum deviation b, the closure-member did not open at the commencement of the rise of pressure and when relatively small deviations d occurred, but only when the maximum deviation b occurred or shortly before the same.

Now a primary object of my invention is to provide an apparatus which operates so exactly that when, referring to the curve in Fig. 2, the gas-pipe closure-member has been opened when the pressure rose to b, it cannot be influenced again when the same maximum pressure b' obtains again if the pressure has not previously fallen to the starting pressure a. Similarly, according to my invention the closure-member cannot possibly be actuated again if, referring again to Fig. 2, the pressure falls to starting pressure at a' and on to a less pressure e and then rises, so that the starting pressure ob-

tains again at a''. Lastly, according to my invention the closure-member is not influenced when the fluctuations of pressure, after reaching point a'', again approximate say in the form c' to the maximum deviation b without reaching the same. I attain these ends by providing that at that moment when the closure-member is to be actuated, *i. e.* opened or closed, a force which is latent until this moment is liberated and acts in the sense of supporting the pressure of the gas and hereby assists in overcoming the friction connected with the operation of the gas-pipe closure-member. This supplementary force may be obtained, for example, by securing a counterweight known in itself on a rocking lever arm so arranged that the difference of the effective leverage between the initial and final positions of the lever can be utilized; namely, when the lever carrying the counterweight is located, for example, horizontally, the counter-force exercised by the weight against the gas pressure is greatest, but when the lever is rocked, in its final vertical position the counter-force is least. Accordingly, both the weight and the angle of oscillation of the same from its normal position into its other final position must be selected so large that when the lever arm is horizontal, *i. e.* when the operative leverage is greatest, when the pressure rises from the starting pressure, for example, to a pressure directly before the maximum deviation, the counter action exercised by the weight by the gas pressure cannot be overcome by the gas pressure, so that the weighted lever remains in its horizontal position. Only when this pressure is exceeded does the gas pressure become greater than the counterforce exercised by the weight; the lever carrying the counterweight now rocks, its operative leverage is lessened, whereby the closure-member is actuated, *i. e.* opened or closed, by a well-known mechanism being thrown into gear.

Owing to the diminution of the counterforce due to the lever rocking, a definite amount of force of the pipe-pressure is liberated which can be employed for overcoming frictional and other resistances of the closure-member, even if the pipe-pressure does not rise further. In consequence of this surplus force becoming available it is possible to adjust with great exactitude and sensitiveness the moment at which the closure-member is actuated.

In its initial or preparatory position corresponding to the emission pressure of the gas, the counterweight may be either horizontal or vertical or in another position so that, owing to the lever rocking from this position at the desired moment, the gas-pipe pressure is relieved and may be employed for overcoming the resistances of the closure-member.

If the rocking lever be located vertically in its initial position, its operative leverage is zero, so that when rocked its leverage is increased. This constructional form also admits of the principle of my invention being employed; for when the gas pressure causes the weighted lever arm to rock at the desired moment, the weight assists the gas pressure when the oscillatory motion of the lever from the initial position is in the direction of rotation of the ratchet wheel controlling the closure-member.

Referring now to Fig. 3, in this illustrative embodiment a diaphragm 1, is under the action of the gas supplied through socket 2 and imparts its motion by means of a yoke 3 to a lever 5 revoluble around the pivot 4 of the turning plug. On said lever is secured by means of a screw thread a weight 6, and to said lever is pivoted at 7 a pawl 8 engaging in the teeth of a ratchet wheel 9. A detent 10 prevents the ratchet wheel being rotated backward unintentionally. The movements of the wheel are imparted to the turning plug connected therewith, so that the latter is alternately moved into its open and closed positions during the corresponding movements of wheel 9. The position of the individual parts of the device shown in full lines corresponds to the preparatory position for the next actuation of the closure-member. The position of weight 6 corresponds to the greatest operative leverage A, so that the counter load produced by the same is equal to a definite gas pressure. If this pressure is exceeded, lever arm 5 will then begin to rock until weight 6 has moved into the position shown in dotted lines when the maximum deviation of pressure has been reached; the operative leverage of weight 6 has now diminished to the amount B; when it moved, wheel 9 was rotated one tooth by pawl 8, actuated the turning plug and consequently, for example, opened the passage of gas to the burner. Now when the gas pressure under the diaphragm falls a certain amount, an equalization occurs between the gas pressure and weight 6 having leverage B, so that equilibrium still exists; only when the gas pressure falls lower does the counterweight 6 begin to overbalance it and cause arm 5 to rock downward; this deflection is not imparted to the ratchet wheel 9, however, because the pawl slides on the ratchet wheel. When the pressure has attained the normal amount again, pawl 8 falls into the next tooth without influencing the ratchet wheel; the latter is therefore again in the preparatory position. It will be understood from the above that the closure-member can be actuated again, *i. e.* closed or opened, after it has been previously opened or closed, independently of all fluctuations of pressure, only when the gas pressure has returned to the gas emission pressure, the ratchet mecha-

nism arriving into its preparatory position and then being deviated a maximum extent or to an amount approaching the same.

Referring now to the illustrative embodiment shown in Figs. 4 and 5, the lever arm 5 carrying weight 6 is arranged vertically and forms one arm of an angle lever revoluble around the pivot 4 of the turning plug; the horizontal arm 11 of this angle lever is pivotally connected by means of a link 12 to the yoke 3. The form shown in Figs. 4 and 5 operates in such manner that, in consequence of the well-known load, for example metal disks 1′, on the diaphragm, the latter is only raised by the gas pressure when this deviates a quite definite amount from the starting pressure. As the diaphragm rises yoke 3 is raised and rocks angle lever 11, 5 by means of link 12, so that arm 5 rocks out of the vertical position. The previously inoperative weight 6 now becomes operative and aids the gas pressure, since arm 5 rocks in the direction of rotation of ratchet wheel 9. The action of weight 6 consists in overcoming the frictional resistances of the closure-member without the gas-pipe pressure itself having to be increased further for this purpose. The illustrative embodiment shown in Figs. 4 and 5 has, in addition, a special manual adjusting device which, in contradistinction to well-known forms of igniters of the character described, is not connected with the bell, diaphragm or other member to be raised directly by the gas pressure, but with that member of the gearing, *e. g.* ratchet wheel, which first imparts the lift of the diaphragm or the like to the turning plug. In this manner it is possible that, in whatever position the bell, diaphragm or the like may be, the closure-member can be moved by hand without the bell, diaphragm or the like having to participate in this movement. This manual adjusting device for the turning plug comprises a two-armed lever 15, 16 revoluble around pivot 14 and having in its top, horizontal arm 15 an eye for receiving a chain 15′ which may be pulled by the attendant, whereas the bottom, vertical arm 16 is forked so that the oscillatory motion of the two-armed lever 15, 16 is not impaired by the fixed pivot 4 of the turning plug. Said pivot 4 is mounted in a vertical plate 13, as shown in Fig. 5, as also pivot 14 around which the two-armed lever 15, 16 rocks. To arm 16 is articularly connected by means of pivot 17 a loaded pawl 18, whose tooth 19 extends laterally so far that it comes within reach of the teeth of the ratchet wheel 9. Lever 15, 16 is under the action of a spring 20 holding the same positively in the position shown in Fig. 4, so that when the igniter is operated automatically under the influence of the variations of pressure in the piping, the teeth of ratchet wheel 9 slide over the tooth 19 of pawl 18 without lever 15, 16 moving. On the supporting plate 13 are arranged preferably at different heights two stops 21 against which the one or other side of the top end of fork 16 abuts according as lever 15, 16 occupies the position shown in Fig. 4 or is rocked by hand. The stops 21 may be adjustable in height so that the stroke of lever 15, 16 can be regulated exactly corresponding to the length of a tooth of the ratchet wheel 9.

As long as the igniter operates under the influence of the variations of pressure in the system of piping, ratchet wheel 9 is influenced, and, accordingly, the turning plug is rotated, by diaphragm 1 lifted by the variations of pressure raising arm 11 by means of yoke 3 and link 12, whereby pawl 8 rotates ratchet wheel 9 one tooth clockwise. That tooth which is just in engagement with the nose 19 of the pawl 18 now slides loosely over this nose 19, so that when the feeding motion has finished this nose engages with the following tooth, namely is again in the preparatory position, without the automatic action of the igniter being influenced, however, in any way. If a disturbance occur in this automatic action, or if it be necessary for any reason to adjust the turning plug by hand, a pull on the chain 15′ carried by arm 15 suffices to pull arm 15 downward when the forked arm 16 is swung to the left. Pawl 18 is now driven so that its nose 19 rotates ratchet wheel 9 one tooth. During this motion of ratchet wheel 9 that tooth of the wheel which is just in engagement with the nose of the pawl 8 slides loosely under the latter.

The amplitude of lever 15, 16 is so proportioned that the ratchet wheel moves one tooth each time the lever is rocked. As soon as the lever returns under the action of spring 20 into the normal position shown in Fig. 4 when chain 15′ is released, the nose of pawl 8 is likewise again in its preparatory position, so that when the next correspondingly large pressure-wave for ignition occurs the apparatus continues to act automatically in exactly the same manner as if no adjustment by hand had taken place in the meantime.

The principle of my invention is adapted not only for the employment of turning plugs as closure-members of pipes, but also for those forms of igniters of the character described in which other closure-members, as *e. g.* valves, are employed. The characteristic feature of my invention substantially is that the member of the gear, *i. e.* in the illustrative embodiments the ratchet wheel 9, directly influencing the closure-member in question, such as a turning plug, valve, and so on, can be driven both by the device influenced by the fluctuations of pressure in the system of pipes, and also by the manual adjusting device, and in such man-

ner that, when the latter is released, the means influenced by the gas-pipe pressure become automatically operative again without further ado.

I claim:—

1. In an impulsively lighted gas igniter of the character described, the combination with the gas-pipe having a closure member, and a pawl and ratchet mechanism for actuating said closure member, of means subjected to the pressure of gas in said pipe and adapted to be operated by pressure in the same, a lever adapted to be actuated by said means and adapted to operate said mechanism, and means associated with said lever for progressively reducing the amount of resistance to the means subjected to pressure, as the pressure increases.

2. In an impulsively-operated gas-igniter of the character described, the combination, with the gas-pipe having a closure-member, and pawl and ratchet mechanism for actuating said closure-member, of means subjected to the pressure of gas in said pipe and adapted to be operated by fluctuations of pressure in the same, and a loaded lever adapted to be rocked by said means and adapted to operate said mechanism and simultaneously influence said means in the sense of aiding said pressure thereon.

3. In an impulsively-operated gas-igniter of the character described, the combination, with the gas-pipe having a closure-member, and pawl and ratchet mechanism for actuating said closure-member, of means subjected to the pressure of gas in said pipe and adapted to be operated by fluctuations of pressure in the same, and a normally-vertical loaded lever adapted to be rocked by said means and adapted to operate said mechanism and simultaneously influence said means in the sense of aiding said pressure thereon.

4. In an impulsively operated gas igniter of the character described, the combination with the gas pipe having a closure member, and a pawl and ratchet mechanism for actuating the closure member, of means subjected to the pressure of the gas in said pipe and adapted to be operated by fluctuations of pressure in the same, a lever adapted to be operated by said means and adapted to operate said mechanism, and an additional and manually operated means separated from said lever and adapted to engage the ratchet of said mechanism, for actuating the closure member.

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

OTTO THIELBEULE.

Witnesses:

HENRY HASPER,

WOLDEMAR HAUPT.