E. A. GUYOT.

SELF STARTER.

APPLICATION FILED AUG. 11, 1913.

1,128,442.

Patented Feb. 16, 19

2 SHEETS—SHEET 1

Fig. 2.

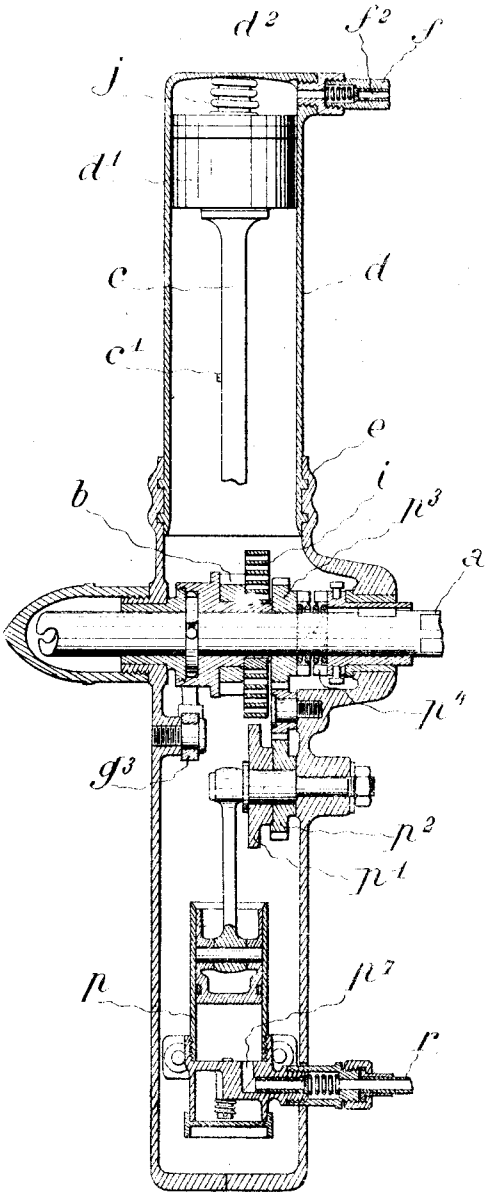
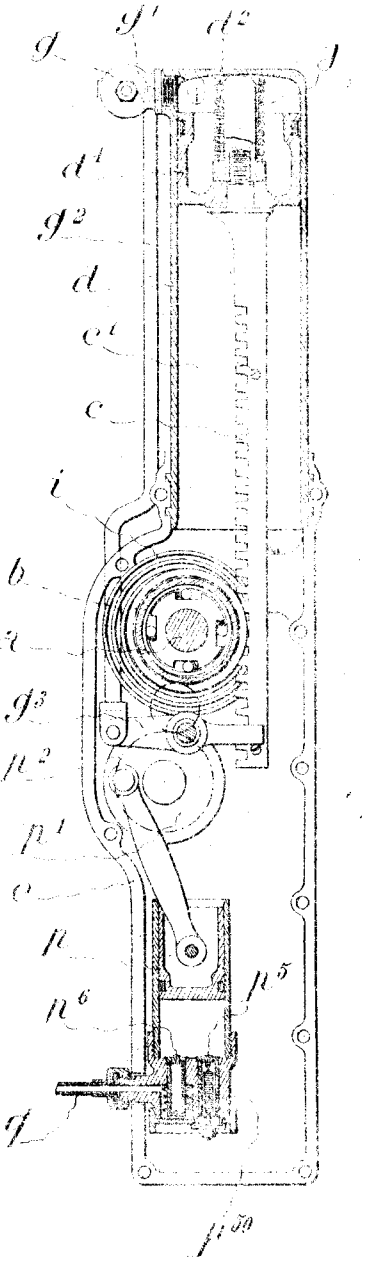


Fig. 1.



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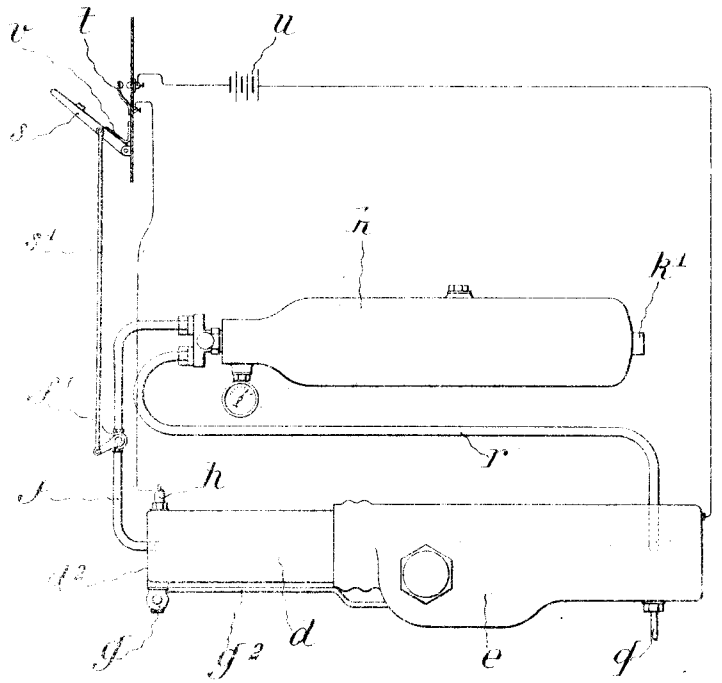
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2 SHEETS—SHEET 2.

Fig. 3.



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SELF-STARTER.

1,128,442. Specification of Letters Patent. Patented Feb. 16, 1915.

Application filed August 11, 1913. Serial No. 784,165.

To all whom it may concern:

Be it known that I, EUGÈNE AUGUSTE GUYOT, a citizen of the French Republic, residing in Issy-les-Moulineaux, Seine, France, have invented certain new and useful Improvements in Self-Starters, of which the following is a specification.

This invention relates to a device for self or automatic starting of explosion engines or similar apparatus, and it relates more particularly, among the devices of the kind in question, to those in which the starting is insured by acting on the engine shaft.

In the devices of the kind in question, known up to the present, the ones acting on the engine shaft are operated either by the expansion of a spring, or by a previously compressed fluid. Such devices have serious disadvantages. Those in which the expansion of a spring is used, require a very powerful spring and a comparatively complicated and delicate mechanism for cocking the said spring, and therefore they are not very practical. The action of those in which the expansion of a previously compressed fluid is used, is too gradual and they produce with difficulty the sudden impulse required for insuring the starting. Moreover, the compressed fluid must be under a comparatively high pressure (about 30 atmospheres) which requires a very strong tank, and in the case when the fluid in question, for instance air, is compressed by means of a pump driven by the engine, the said pump must be built with great precision and requires for its working a great portion of the power of the engine.

The invention has for its main object to enable devices of the kind in question to be constructed in such a manner that they shall be free from the above mentioned defects, that their operation should be better, and their construction simpler than hitherto.

It chiefly consists in using, in devices of the kind in question, for driving the arrangement which acts on the engine shaft, the sudden increase of volume due to the explosion of an explosive mixture.

It consists, apart from this chief arrangement, in certain other arrangements which will be more explicitly referred to hereinafter.

It relates more particularly to certain methods of carrying out the said arrangements, and still more particularly, by way of new industrial products, to systems of the kind in question comprising the application of the said constructions, and to special elements suitable for building such systems.

It will be, in any case, clearly understood from the following description, as well as from the accompanying drawing which however is merely given by way of example.

Figure 1 of the said drawing shows in vertical section a device for starting, designed according to this invention. Fig. 2 shows in horizontal cross-section the same system. Fig. 3 shows finally diagrammatically the same device provided with parts and an apparatus suitable for driving it.

According to this invention, or more accurately, according to that of methods of carrying it out, to which relates more particularly the drawing, when it is desired to build a device for automatic starting of explosion engines, the proceeding is as follows, or in a similar manner: And first of all, and as already known, a toothed pinion b is mounted by means of a ratchet gear, either, as shown on the shaft a of the engine, or unlike shown in the drawing, on an auxiliary spindle engaging with the shaft of the engine in such a manner that the rotation of the said pinion b in the normal direction of rotation of the engine, should drive the said shaft, while its rotation in the opposite direction, should have no action on it, and a toothed rack c is used for driving the said pinion. And afterward, according to this invention, for insuring the movement of the said toothed rack c in the desired direction for rotating the said pinion in the normal direction of rotation of the engine, for the purpose of starting the said engine, is used the sudden increase of volume due to the explosion of an explosive mixture; for which reason a cylinder d with a piston d^1 is used which is mounted on a supporting frame e in such a manner relatively to the said shaft a that its axis is in a plane normal to the axis of the said shaft, that the said toothed rack c should be able to constitute the rod of the said piston d^1 and finally that the single cover d^2 with which the said cylinder is provided, should be at the end of the said cylinder which is farther away from the said shaft. One of the ends of the toothed rack c is secured, for instance by screwing, to the said piston d^1, and in the said cylinder, either near its cover or in the cover, is provided, on the one

hand, an admission part which is connected to a source of explosive mixture by a pipe f on which is mounted an obturator or closing part f^1 by means of which it is possible to establish or to shut off at will communication between the said source and the inner chamber of the said cylinder, and a check valve f^2 at the inlet of the said cylinder, and on the other hand an exhaust port which is connected to an exhaust pipe g on which is mounted an obturator or closing part g^1 by means of which the exhaust can be closed or opened at will, and finally a tapped hole into which is screwed a sparking plug h. Owing to this piston d^1 being in the position nearest to the cover d^2 of the cylinder, and the closing parts f^1 and g^1 being closed, it will be only necessary for starting the engine, to open the inlet closing part f^1 so as to admit into the chamber of the cylinder d a charge of explosive mixture, to close again the said part and to insure the production of a spark between the poles of the sparking plug h in order that an explosion should take place in the said cylinder, suddenly pushing back the piston d^1 and consequently the toothed rack c in the desired direction for starting the engine. Afterward, in order to enable the toothed rack and the piston to return to their initial position, as soon as the explosion has taken place, so that the apparatus should be ready to be utilized for a new starting operation, use is made of: means for insuring automatically the opening of the closing part g^1 as soon as the piston arrives at the end of the explosion stroke (in order to allow the explosion products to be discharged) and the closing of the said part as soon as the said piston has returned to its normal position; which means are preferably constituted by a connecting rod g^2 pivoted with one of its ends to the control handle of the said closing device or obturator, and with its other end to one of the branches of a lever g^3 with two branches, which is pivoted in such a manner on the supporting frame e that two pins c^1 c^2 secured to the toothed rack c at suitable points, could strike the other branch of the said lever g^3 and swing it so that, the first c^1 when the piston arrives at the end of the explosion stroke, that it insures the opening of the obturator or closing part g^1, and the second c^2 when the piston arrives at the end of the return stroke, that it should insure the closing of the said part; means for automatically returning the piston to its normal position as soon as the closing part g^1 is opened and allows the products of explosion to escape, which means are constituted, for instance by means of a spring i acting in such a manner either, unlike shown, direct on the toothed rack c or as shown on the pinion b, that when the toothed rack c is moved by the action of the explosion, it should set the said spring i which subsequently, in expanding, will return the toothed rack and the piston to their initial position; means such as for instance a helical spring j interposed between the cover of the cylinder d and its piston d^1 for deadening the shock of the piston against the said cover when the said piston is returned by the spring i to its initial position.

It is obvious that the explosive mixture to be admitted into the cylinder d, must be under a certain pressure (which need not exceed 4 kg.) in order that the quantity of explosive mixture required for insuring the operation, should be able to pass into the said cylinder owing to the simple opening of the closing part f^1; to that end is used a tank k in which the explosive mixture is compressed; and the said tank is provided with a pressure gage enabling the pressure of the explosive mixture contained therein to be ascertained at any moment, and with a safety valve k^1 preventing the mixture in the said tank from being compressed beyond a given maximum.

For compressing the explosive mixture in the said tank is preferably used a pump p driven by the engine itself. To that end, the said pump is preferably secured to the supporting frame e, and its crank shaft p^1 is driven by means of a set of toothed wheels p^2, p^3, one of which p^4 is mounted loose on the shaft a of the engine and can be secured to it when desired by means of a clutch p^4. The said pump is preferably built in such a manner that when it is desired to use as an explosive mixture carbureted air, the explosive mixture should be formed directly in the interior of the said pump, and that the air and the carbureting medium should become mixed in the said pump in a perfect manner so that the mixture could be preserved in the tank k without the carbureting medium settling on the bottom of the latter. To that end, in the cover of the said pump are arranged two inlet valves p^5, p^6, one for the air, and the other for the carbureting medium, each of the said valves being provided with a tubular cylindrical extension acting as their spindle and provided on the whole of its circumference near the valve with a large number of small holes forming orifices for the return of the air for the valve p^5, and with sprayers for the valve p^6 (the extension of the latter dipping constantly into the carbureting medium coming from a suitable tank by means of a pipe q) so that the air and the carbureting medium can pass into the inner chamber of the pump during the suction stroke of the piston of the latter, only through the said small holes; owing to which, the air and the carbureting medium admitted through a large number of jets into the pump, become mixed in a thorough

manner. The spring p^{50} used for returning the air inlet valve to its seat, is moreover made adjustable, so as to enable the carbureting to be regulated. In the cover of the said pump is also provided an exhaust port p^7 with exhaust valve which is connected to the tank k by means of a pipe r. Finally, the control for the opening and closing of the obturator f^1, and that producing a spark between the poles of the sparking plug h, is arranged so that it is sufficient simply to operate a lever or pedal in order to insure first of all the opening of the closing part f^1, and then the closing of the said part, and at the same time the establishment of the current supplying the plug h. For instance, to that end is used a control lever s acting, by means of a connecting rod s^1 on the handle of the closing part f, the said lever, when it is brought back to the position in which it insures the closing of the said part, and when the said position is slightly exceeded, closing at t a contact insuring the closing of an electric circuit (the body, contact t, battery u, sparking plug g) sending an electric current into the plug, a spring r pushing back slightly the said lever, as soon as it is no longer operated, so as to break the said circuit at t.

It is obvious that the invention is not in any way limited to that of its methods of carrying it out which has been more particularly indicated, but comprises on the contrary any modifications within the scope of the claim.

What I claim as my invention, and desire to secure by Letters Patent is:—

In a starting device for internal combustion engines, in combination, a starting shaft, a cylinder, a piston therein, a piston rod connected to said piston and operatively connected to said starting shaft, an inlet valve for said cylinder, a spark plug in said cylinder, a normally open electric circuit connected to said spark plug, means for opening and closing said valve, means controlled by said first mentioned means after the valve is closed thereby for closing said normally open electric circuit, a pump operatively connected to and actuated by said starting shaft, suction valves for controlling the admission of air and gasolene into said pump, an outlet valve for said pump, a reservoir, a conduit communicating with said reservoir and with said outlet valve, and a conduit communicating with said reservoir and with the inlet valve of said cylinder.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EUGÈNE AUGUSTE GUYOT.

Witnesses:
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