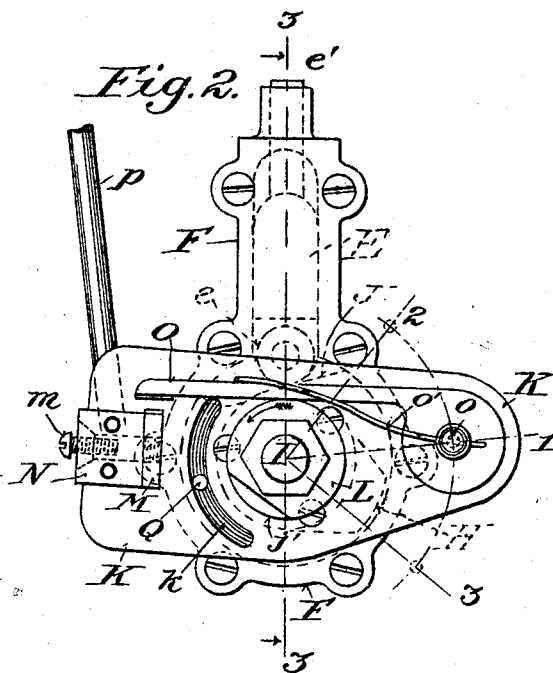
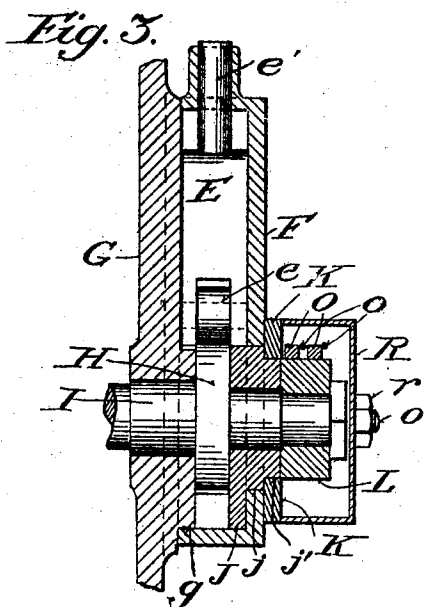
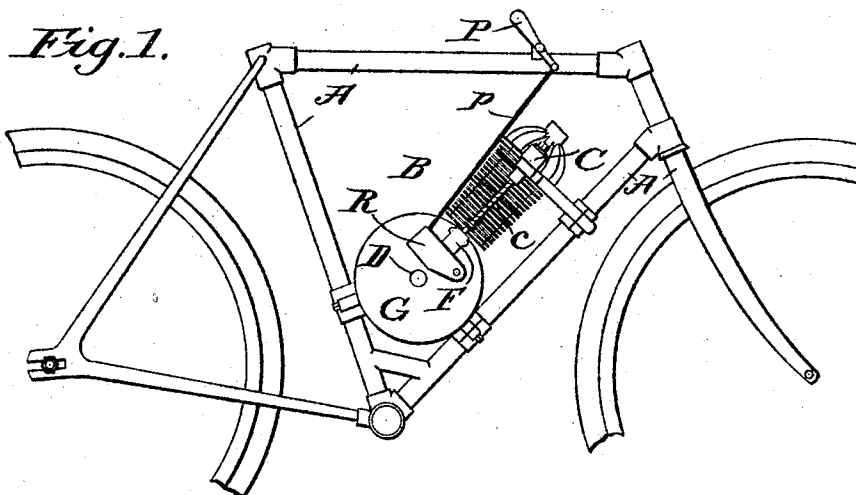


J. F. MERKEL.

CONTROLLING MECHANISM FOR EXPLOSIVE ENGINES.

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Witnesses
 Chas. L. Goss.
 Bernard C. Roloff

Inventor:
 Joseph F. Merkel,
 By Nickles Flanders Smith William Vilas,
 Attorneys.

UNITED STATES PATENT OFFICE.

JOSEPH F. MERKEL, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO MERKEL MOTOR COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

CONTROLLING MECHANISM FOR EXPLOSIVE-ENGINES.

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To all whom it may concern:

Be it known that I, JOSEPH F. MERKEL, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Controlling Mechanism for Explosive-Engines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The main objects of this invention are to facilitate starting the engine, particularly when applied to a motor-cycle, by holding the exhaust-valve open; to vary the speed of the engine by varying the time of the igniting spark with relation to the stroke of the piston; to prevent contact of the sparking points or electrodes and depletion of battery when the engine is not running; to accomplish the foregoing ends by the manipulation of a single lever, and generally to improve the construction and operation of devices of the class to which the invention pertains.

It consists in certain novel features of construction and in the arrangement and combinations of component parts of the mechanism hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings like characters designate the same parts in the several figures.

Figure 1 is a side elevation of a portion of a motor-cycle to which my invention is applied. Fig. 2 is an enlarged side elevation of a portion of the controlling mechanism, and Fig. 3 is a section on the line 3 3, Fig. 2.

Referring to Fig. 1, A designates the frame, and B the engine, of the motor-cycle. In the present case, for the purpose of illustration, a four-cycle gas or oil engine is shown. C designates the exhaust-valve of the engine, which is normally closed by a spring *c* on the valve-stem, which projects from the valve-case toward the crank-shaft D of the engine, terminating adjacent to the controlling mechanism.

Referring to Figs. 2 and 3, E is a slide fitted to reciprocate in a casing F, which is

attached to the crank-case G of the engine. H is a cam fixed on a shaft I, which is parallel with the crank-shaft D and connected therewith by gears (not shown) by which the cam-shaft is caused to make one revolution to every two revolutions of the crank-shaft. The cam H is inclosed in a cylindrical enlargement of the casing F and bears at its periphery against a roller *e*, journaled in the adjacent end of the slide E, which is arranged radially with relation to the cam-shaft and is provided at its upper or outer end with a stem *e'*, projecting through an opening in said casing F and abutting against the end of the valve-stem, the spring *c* serving to hold the roller *e* against or in operative relation to the cam H, as well as to close the exhaust-valve of the engine. The crank-case G is formed on the outside with a circular boss *g*, which fits into the cylindrical portion of the casing F. J is a cam loosely mounted on the shaft I within the casing F next to the cam H. It is formed on the outside with a circular boss *j*, which is fitted to turn in a circular opening in the casing F. It is also formed on the outside with a smaller boss *j'*, on which is fitted and secured a plate K, outside and next to the casing F. On the outer end of the shaft I next to the boss *j'* of cam J a cam L is fixed for operating the circuit interrupter or controller, hereinafter explained. M is a contact-piece or electrode attached to an insulating-block N, which is mounted on the plate K at one side of the cam L. *m* is a binding-screw for connecting one terminal of the battery-circuit with the contact-piece M. O O are contact levers or arms pivoted on a pin *o*, which is secured in and projects outwardly from the plate K at the opposite side of the cam L. These levers are held by springs *o'* in engagement or in operative relation to cam L and extend over the contact-piece M. Both the contact-levers and the relatively fixed contact-piece M are preferably faced or provided, as shown in Fig. 2, with opposing contact points or plates of silver, platinum, or other suitable non-corrosive metal. The remaining terminal of the bat-

tery is electrically connected, through the metallic frame of the motor-cycle, the crank-case G of the engine, and the casing F of the controlling mechanism, with the contact-levers O. The plate K is connected at the end adjacent to the contact-piece M by a rod *p* with a hand-lever P on the frame A of the motor-cycle, as shown in Fig. 1, and is adapted to be turned by said lever around the cam-shaft I into different positions, as indicated on Fig. 2. The plate K, contact-piece M, and levers or arms O constitute what may be called an "interrupter" lever or device. Q is a pin secured in the casing F and projecting outwardly therefrom through a curved slot *k* in plate K into the path of the contact-levers O when said plate K is turned into position 2, Fig. 2.

The contact-piece M, the contact-levers O, and the cam L are inclosed and protected by a cover R, which may be conveniently made of sheet metal and secured in place on the plate K by a nut *r*, threaded on the pin *o*, as shown in Fig. 3.

My improved controlling mechanism operates as follows: For starting the motor-cycle the plate K is turned into position 2, in which the cam J by engagement with the slide E holds the exhaust-valve of the engine open, so that the engine-piston will work freely in the cylinder without compression of air until the motor-cycle has acquired sufficient momentum to compress the first charge for starting the engine. The plate K is then turned back to position 1, in which it is shown in Fig. 2. In this position of said plate the slide E is released by the cam J and the spring *c* is allowed to close the exhaust-valve. The cam H and the spring *c* cooperate to intermittently open and close the exhaust-valve, and the springs *o'* and the cam L cooperate to intermittently move the levers O into and out of engagement with the contact-piece M. Electric sparks are thus produced in the usual way at or near the end of alternate outward strokes of the piston, and the compressed charges of mingled oil, vapor, and air are ignited. The engine being thus set in operation will continue to run at a substantially uniform rate of speed while the conditions above explained and the position of the plate K, carrying the circuit-interrupter, remain unchanged. If it is desired to increase the speed of the engine, the plate K is turned by lever P from position 1 toward position 3. (Indicated on Fig. 2.) This changes the relation of the levers O and the contact-piece M to the cam L, which is turned in the direction indicated by the arrow on Fig. 2, so that the igniting sparks will be produced sooner with respect to the compressing stroke of the engine-piston. As is well known, igniting the charge of an explosive-engine earlier in respect to the compressing stroke of the pis-

ton will within certain limits increase the speed of the engine.

When the motor-cycle is not in use or the engine is not in active operation, to prevent depletion of battery the plate K is turned into position 2, in which the contact-levers O, engaging with the pin Q, are held out of engagement with the contact-piece M whatever the position of the cam L may be. The battery-circuit is thus broken and cannot be closed until the controlling mechanism is turned back to position 1.

To insure good electrical contact in closing the battery-circuit and to produce effective sparks for igniting the charges of the engine, two or more separate contact-levers O with separate contact points or plates are provided, so that as the contact-point of one lever and the opposing contact point or plate become oxidized and produce an imperfect electrical contact by reason of the rapid breaking and closing of the circuit and the electrical discharge or slight spark that takes place every time said points or plates are separated the passage of the current and the discharge or spark will shift from the contact-point of one lever to that of another which is in better condition, while the contact-point of the first-mentioned lever and its opposing contact will be worn bright by successive engagement with each other. The current and discharge or spark will thus shift from one lever to another, according to the condition of their contact-points, thereby affording an opportunity for one set of contact-points to wear bright while another is performing the function of the circuit-interrupter.

Various changes in the details of construction and in the arrangement of component parts of the mechanism may be made without materially affecting the result sought to be attained thereby and without departing from the spirit and intended scope of the invention.

I claim—

1. In controlling mechanism for explosive-engines the combination of a rotary cam, a pivoted plate provided with a contact-piece, a contact-lever fulcrumed to said plate, a spring tending to hold said lever in engagement with said cam and with said contact-piece, and a relatively stationary projection adapted when said plate is turned into a certain position, to hold said contact-lever out of engagement with the opposing contact-piece, substantially as described.

2. In controlling mechanism for explosive-engines the combination with the exhaust-valve, of a rotary cam for intermittently opening said valve at regular intervals, a pivoted plate adapted to turn about the axis of said cam and provided with a contact-piece and with a cam which is adapted to turn therewith independently of the first-mentioned cam, and to open and hold open said valve

when said plate is turned into a certain position, a contact-lever fulcrumed to said plate, a spring tending to hold said lever in engagement with said contact-piece, a circuit-interrupting cam for intermittently moving said lever against the tension of said spring out of engagement with said contact-piece, and a relatively stationary projection for holding said lever out of engagement with said contact-piece when said plate is in position to prevent the closing of said valve and the circuit-interrupting cam stops in position to permit such engagement, substantially as described.

15 3. In controlling mechanism for explosive-engines the combination with the exhaust-valve, of a cam for intermittently opening said valve, a plate adapted to turn about the axis of said cam and provided with a cam for preventing the closing of said valve and with a contact-piece, a contact-lever fulcrumed to said plate, a spring tending to hold said contact-lever in engagement with said contact-piece, a cam for intermittently separating said contact-lever from said contact-piece, and means for turning said plate to vary the time of separation of said lever from said contact-piece with relation to the stroke of the engine-piston and to prevent the closing of said valve, substantially as described.

30 4. In controlling mechanism for explosive-engines the combination with the exhaust-valve of a cam for intermittently opening said valve, a pivoted plate provided with a cam

for preventing the closing of said valve and with a contact-piece, a contact-lever fulcrumed to said plate, a spring tending to hold said lever in engagement with said contact-piece, a cam for intermittently separating said lever from said contact-piece, a relatively fixed projection arranged to prevent engagement of said lever with said contact-piece when said plate is in position to prevent the closing of said valve, and a lever arranged to turn said plate into position for preventing the closing of said valve and the engagement of said lever with said contact-piece and into different positions to vary the time of separation of said lever from said contact-piece by the lever-operating cam with relation to the stroke of the engine-piston, substantially as described.

5. In controlling mechanism for explosive-engines, a circuit-interrupter consisting of a relatively fixed contact-piece, a number of contact levers or arms, means tending to hold said levers or arms in engagement with said contact-piece, and automatic means for intermittently separating said levers or arms at certain intervals from said contact-piece, said levers or arms being connected with the circuit in multiple substantially as described.

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

JOSEPH F. MERKEL.

Witnesses:

CHAS. L. GOSS,
ALICE E. GOSS.