and the opening of the valve may be so timed as to allow the force of the explosion to act on the piston at any desired point of its stroke regardless of the exact time when the explosion takes place.



It includes a cylinder, a piston therein, a crank-chamber, a crank-shaft therein, a suitable connection between the piston and the crank-shaft, the cylinder being provided with suitable inlet and exhaust passages, the said passages being both open during the rearward movement of the piston and both closed during the forward movement thereof, two auxiliary chambers located in suitable proximity to the cylinder, each auxiliary chamber having a passage leading from each of its extremities to the corresponding extremities of the



cylinder, one of these passages for each auxiliary chamber being an inlet-passage, and the other passage being an outletpassage, normally-closed valves mounted at one end of the auxiliary chambers to control the inlet passages to said chambers, and valves located at the opposite extremities of the auxiliary chambers for controlling the exit-passages, a lever for controlling each pair of valves, a cam-gear actuated from the crank-shaft, and suitable connections between the cam-gear and the valve-operating levers whereby the inletvalve of either auxiliary chamber and the exit-valve of the other auxiliary chamber are open at the same time, the other two valves in the meantime remaining closed.

Dynamo-Motor.—Edward W. Fahl, Shirley, Ind.—824,-922.—This invention relates to a dynamo or electric generator or a motor therefor, which motor is so constructed that the greater mass of the motor and the dynamo or generator is concentrated in the revolving mass, and said motor and generator are so connected and the weights or masses thereof distributed to render the running of the motor steady and uniform. The object of this invention is to construct a compact electric generator and its motor to form practically a single self-contained machine and connect them in such a manner that a minimum space will be occupied by the ele-



mentary machines thus combined to form a single machine, also to construct the motor itself in such a way that the mass of the motor will be approximately concentrated in that portion of the motor corresponding to the fly-wheel thereof, also to provide a compact cheap, self-contained, directly-connected and driven electric generator particularly adapted to produce electricity for smaller plants or domestic purposes. I obtain these objects by means of the combined electric generator and motor illustrated in the accompanying drawings, in which similar numerals of reference designate like views throughout the several parts.



It consists of a fixed or non-revoluble crank-shaft, the crank thereof, a crank-shaft-supporting frame, a crank-inclosing casing revolubly mounted on said shaft, a series of cylinders equally spaced around said crank-shaft casing, and extending radially therefrom, and an integral exterior rim connecting the outer ends of each of said cylinders, and each of said cylinders connected to said fixed crank-inclosing casing of an armature secured to said motor to revolve therewith, and a fixed magnet situated within said armature and carried by said shaft.