

A. H. NEULAND.
IGNITION AND LIGHTING DEVICE.
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1,338,324.

Patented Apr. 27, 1920.

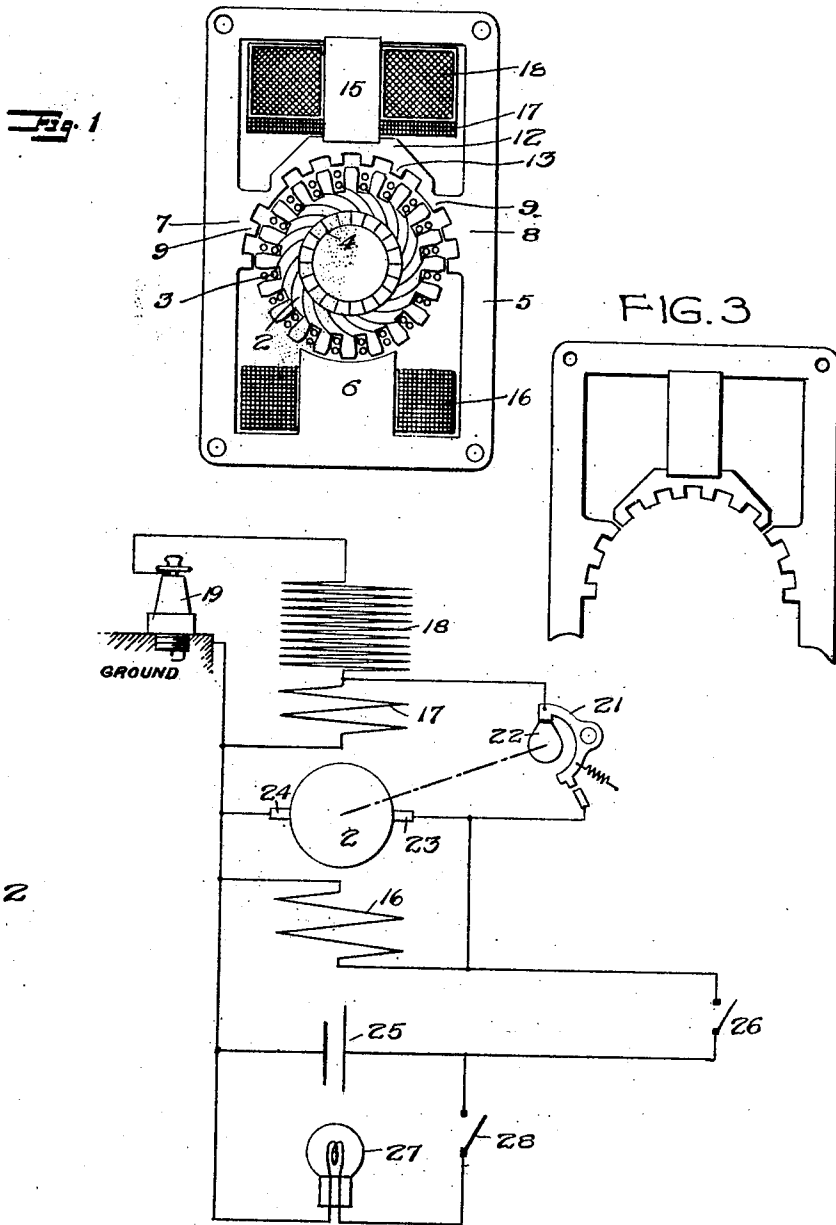


Fig. 2

FIG. 3

WITNESSES:

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INVENTOR

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UNITED STATES PATENT OFFICE.

ALFONS H. NEULAND, OF SAN FRANCISCO, CALIFORNIA.

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To all whom it may concern:

Be it known that I, ALFONS H. NEULAND, a subject of the Czar of Russia, and a resident of the city and county of San Francisco, State of California, have invented a certain new and useful Ignition and Lighting Device, of which the following is a specification.

The invention relates to electrical devices and preferably to combined ignition and lighting systems for internal combustion engine driven vehicles and other installations.

An object of the invention is to provide an improved ignition device for an internal combustion engine combining the advantages of both battery and magneto ignition.

Another object of the invention is to provide a simple and improved ignition and battery charging unit which is adapted to motor vehicles and particularly to motorcycles.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth at length in the following description where I shall outline in full that form of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings I have shown one specific form of my generic invention but it is to be understood that I do not limit myself to such form, since the invention may be embodied in a multiplicity of forms, each comprising a species of the invention as set forth in the succeeding claims.

The present practice in internal combustion engine ignition is to employ either battery or magneto ignition and frequently both. Battery ignition is capable of producing a good spark at very low engine speeds, but at higher speeds difficulty is encountered in maintaining the spark. Magneto ignition is capable of producing a good spark at moderate and high speeds, but it is ineffective at low speeds. The device herein described possesses the advantages of battery ignition at very low speeds and the advantages of magneto ignition at high speeds. This is accomplished by providing a magnetic circuit which includes both a generator and a transformer. At low speeds, a strong spark is obtained by the transformer action while the generator action is weak, and an increasing speed weakens the trans-

former action and serves to strengthen the generator action, thereby maintaining a strong spark at all speeds. Further, the construction of the device is such that in addition to obtaining these ignition characteristics, provision is made for generating a direct current for energizing the device and for charging a battery.

Referring to the accompanying drawings: Figure 1 is a cross-section, partly diagrammatic, of one form of the device of my invention.

Fig. 2 is a diagrammatic representation of the electrical circuits of the ignition and lighting system including the device of my invention.

Fig. 3 is a cross section of a portion of the device showing a modified form of pole-piece construction.

The device comprises a toothed armature 2 provided with a winding 3 and a commutator 4, surrounded by a frame 5 of magnetic material, preferably laminated, which is provided at one end with a projecting pole piece 6, preferably having a smooth face and partly encircling the armature 2. On opposite sides of the frame are two toothed pole pieces 7—8 also partly encircling the armature, the teeth 9 being of the same angular pitch as the armature teeth. Arranged between the pole-pieces 7—8 and also partly encircling the armature is a toothed pole-shoe 12, having teeth 13 of the same pitch, the teeth 13 being so disposed that when the teeth 9 on pole pieces 7 and 8 are aligned with those on the armature, the teeth 13 are unaligned or staggered with respect to the armature teeth. To facilitate the support of the central pole shoe 12 the ends thereof are joined to the ends of the side pole-pieces 7 and 8 and this arrangement enables the integral stamping of the frame and all the pole-pieces and while the junction of the ends at the pole pieces permits some flux to leak across, it has been found to be negligible and does not materially detract from the efficiency of the device for reasons which will hereinafter appear. If desired, however, the central pole shoe 12 may be separated from the side pole-pieces 7 and 8 as shown in Fig. 3.

The top of the frame 5 is magnetically connected to the central pole shoe 12 by means of a laminated core 15 which serves as a pole-piece. The bottom pole-piece 6 is provided with a magnetizing coil 16 con-

nected preferably in shunt with the armature 2, while the upper central pole-piece 15 carries a low tension winding 17 and a high tension winding 18 for ignition purposes.

5 Rotation of the armature 2 will cause its teeth to aline first with the teeth of the side poles 7 and 8 and then with the teeth 13 of the upper pole piece 15, resulting in a rapid variation of the flux through the upper pole-piece 15 and the windings 17 and 18 thereon.

The low tension and high tension ignition windings 17 and 18 are connected in series and the extreme end of the high tension winding is connected to the spark plug 19 or other ignition device. The junction of the windings 17 and 18 is connected to one side of a breaker mechanism 21, the cam 22 of the breaker mechanism being preferably mounted on the armature shaft, and the other side of the breaker mechanism is connected to the armature brush 23. I have illustrated the device as applied to one spark plug, but if a multicylinder engine is employed, the breaker mechanism will be constructed to fulfil the necessary requirements. Connected across the armature brushes 23—24 is a storage battery 25, the circuit of which is provided with a switch 26 and connected to the battery is a circuit including lamp 27 or other current consuming device, this circuit being also provided with a switch 28. The armature brush 24, the free end of the low tension winding 17, one side of the shunt field coil 16 and one side of the battery are connected together and to the ground.

When the engine is to be started the switch 26 is closed and current from the battery 25 flows through the shunt field 16 through the armature 2 and through the low tension winding 17 when the breaker mechanism is closed. A slight rotation of the armature opens the breaker and interrupts the flow of current through the low tension winding thus causing the windings 17 and 18 to act as a transformer and to produce a spark at the plug 19. As the engine speed increases the transformer action gradually diminishes on account of the rapid action of the breaker, but the increase in speed however produces a rapidly varying flux through the central pole-piece 15 and the windings 17 and 18 thereon and so generates a very high potential and serves to maintain a strong spark.

The low tension winding 17, which acts as the primary of a transformer at start, serves as a means for choking out the high tension current when the spark is not needed, that is, during the period that the breaker is closed. The low tension winding 17, besides being short circuited through the armature, field and battery when the breaker is closed, has a current flowing through it which magnet-

izes the central pole-piece 15 in one direction and prevents the shifting of the flux therethrough and consequently the generation of the high tension current during such period.

The diagram of connections does not include an automatic switch for closing the armature when the proper battery potential has been reached and while obviously it may be employed if desired it has been found that for a small unit such as would be required on a motorcycle, it is not essential, for the reason that in such a unit the armature and brush resistances are comparatively high, drawing a current which is not objectionably great and then only while the regulating switch is closed and the engine not turning over. As soon as the engine is started a sufficient potential is immediately generated not only to stop the flow of current from the battery but to charge it.

It is to be noted that the rapidly changing flux in the upper part of the machine does not interfere with the generation of current in the armature, for the reason that the flux when not traversing the central pole-piece 15, divides between the pole-pieces 7 and 8 on either side, so that a potential generated in the armature at one point, due to the toothed pole-pieces, is opposed and neutralized by a generation at another point in the opposite direction. Neither does the transformer action interfere with the generation of a current in the armature since the flux through the lower field-pole 6 remains substantially constant irrespective of the changes taking place in the upper pole pieces. This is facilitated by the presence and action of the side poles 7 and 8. It is understood that permanent magnets may be employed for excitation, in which case the field coil 16 may be omitted.

I claim:

1. A dynamo electric machine comprising an armature, a pole piece partly encircling the armature, means for producing a magnetic flux through said pole piece, a second pole piece partly surrounding the armature, a winding surrounding said second pole piece and a pole piece arranged intermediate said first two pole pieces serving to intermittently shunt the flux from said second pole piece whereby a current is generated in the winding.

2. A dynamo electric machine comprising an armature having regularly spaced teeth, a pole piece partly encircling the armature and arranged to form a flux path of substantially constant reluctance with the armature, means for producing a flux through said pole-piece, a second pole piece partly encircling the armature and provided with regularly spaced teeth of substantially the

same angular pitch as the armature teeth, a winding surrounding said toothed pole piece and means including the armature for varying the flux in said toothed pole piece.

5 3. A dynamo electric machine comprising an armature having regularly spaced teeth, a pole piece partly encircling the armature and arranged to form a flux path of substantially constant reluctance with
10 the armature, means for producing a flux through said pole-piece, a second pole piece partly encircling the armature and provided with regularly spaced teeth of substantially the same angular pitch as the armature
15 teeth, a winding surrounding said toothed pole piece and a third pole piece arranged intermediate said first two pole pieces and provided with regularly spaced teeth of substantially the same angular pitch as the
20 armature teeth, the toothed pole pieces being arranged so that when the armature teeth are alined with the teeth on one pole piece they are unalined with the teeth on the other pole piece.

25 4. A dynamo electric machine comprising a toothed armature, a pole piece partly encircling the armature and arranged to form a flux path of substantially constant reluctance with the armature, means for
30 producing a flux through said pole piece, a toothed pole piece partly encircling the armature, and a high tension winding on said toothed pole piece, rotation of the armature serving to vary the flux through
35 said toothed pole piece.

5. A dynamo electric machine comprising an armature, a pole piece partly encircling the armature and arranged to form a flux path of substantially constant reluctance with the armature, means for producing a flux through said pole-piece, a
40 second pole piece partly encircling the armature, a high tension winding surrounding said second pole piece and a third pole piece arranged intermediate said first two pole pieces serving to intermittently shunt the flux from said second pole piece.

6. In a dynamo electric machine, an ar-

mature in which a current is generated, a pole piece partly encircling the armature, 50 means for varying the flux through said pole piece, primary and secondary transformer windings arranged on said pole piece, said primary windings being connected to said armature, and means for in- 55 terrupting the flow of current through said primary winding.

7. In a dynamo electric machine, an armature, a pole piece partly encircling the armature, means including the armature for 60 varying the flux through said pole piece, primary and secondary transformer windings surrounding said pole piece, the primary winding being connected to the armature and means for interrupting the circuit through the armature and the primary 65 winding.

8. A dynamo electric machine comprising an armature, having regularly spaced teeth, a pole piece partly encircling the armature, means for producing a substantially constant flux through said pole piece, a second pole piece partly encircling the armature and having regularly spaced teeth of substantially the same angular pitch as the armature teeth, a third pole piece arranged intermediate said first two pole pieces and provided with regularly spaced teeth of substantially the same angular pitch as the armature teeth, the toothed 80 pole pieces being arranged so that when the armature teeth are alined with the teeth on one pole piece they are unalined with the teeth on the other pole piece, primary and secondary transformer windings surround- 85 ing one of said toothed pole pieces, the primary winding being connected to the armature and means for interrupting the flow of current through said primary winding.

In testimony whereof, I have hereunto set 90 my hand at San Francisco, California, this 1st day of September, 1916.

ALFONS H. NEULAND.

In presence of—
H. G. PROST.