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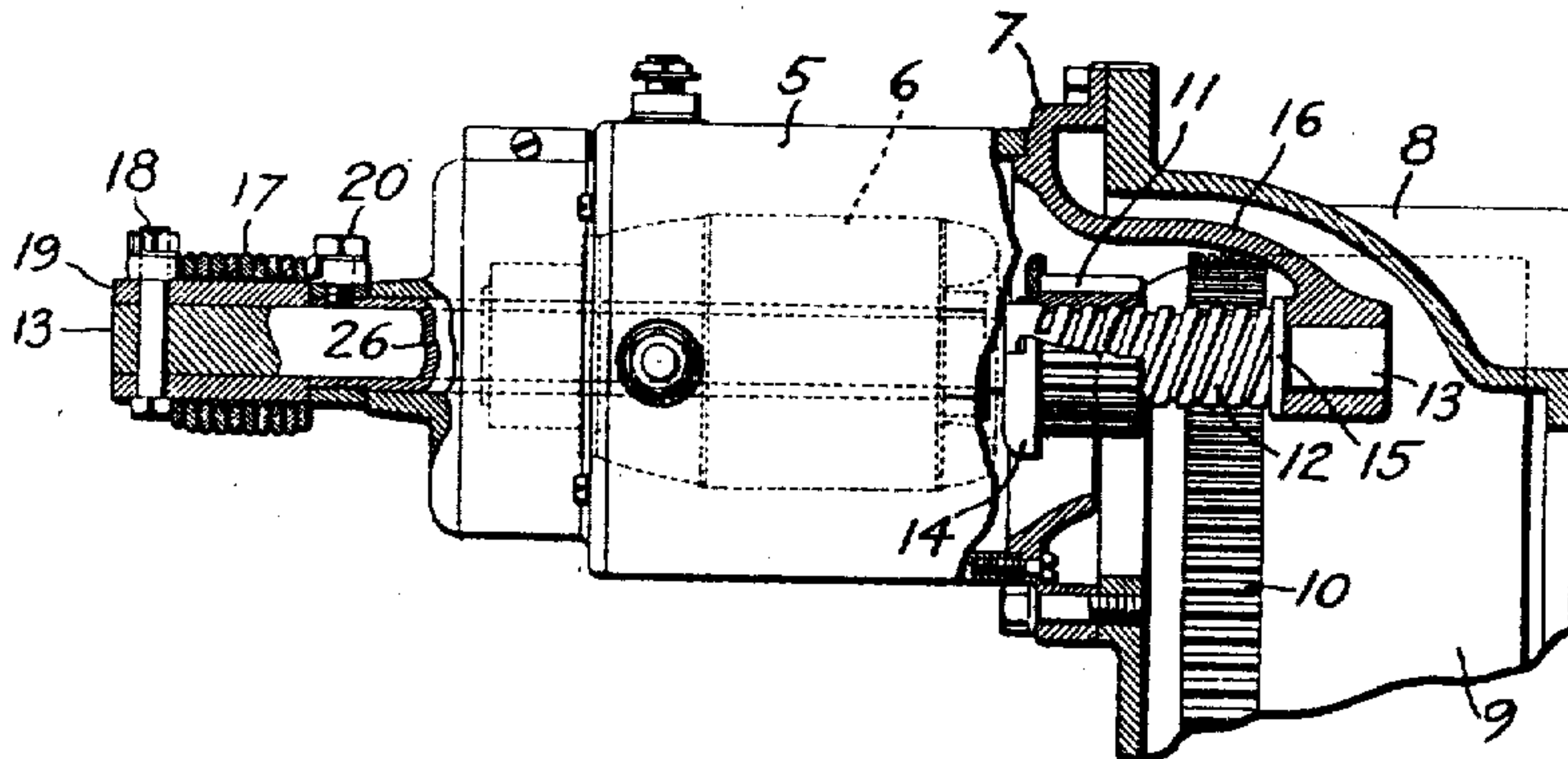
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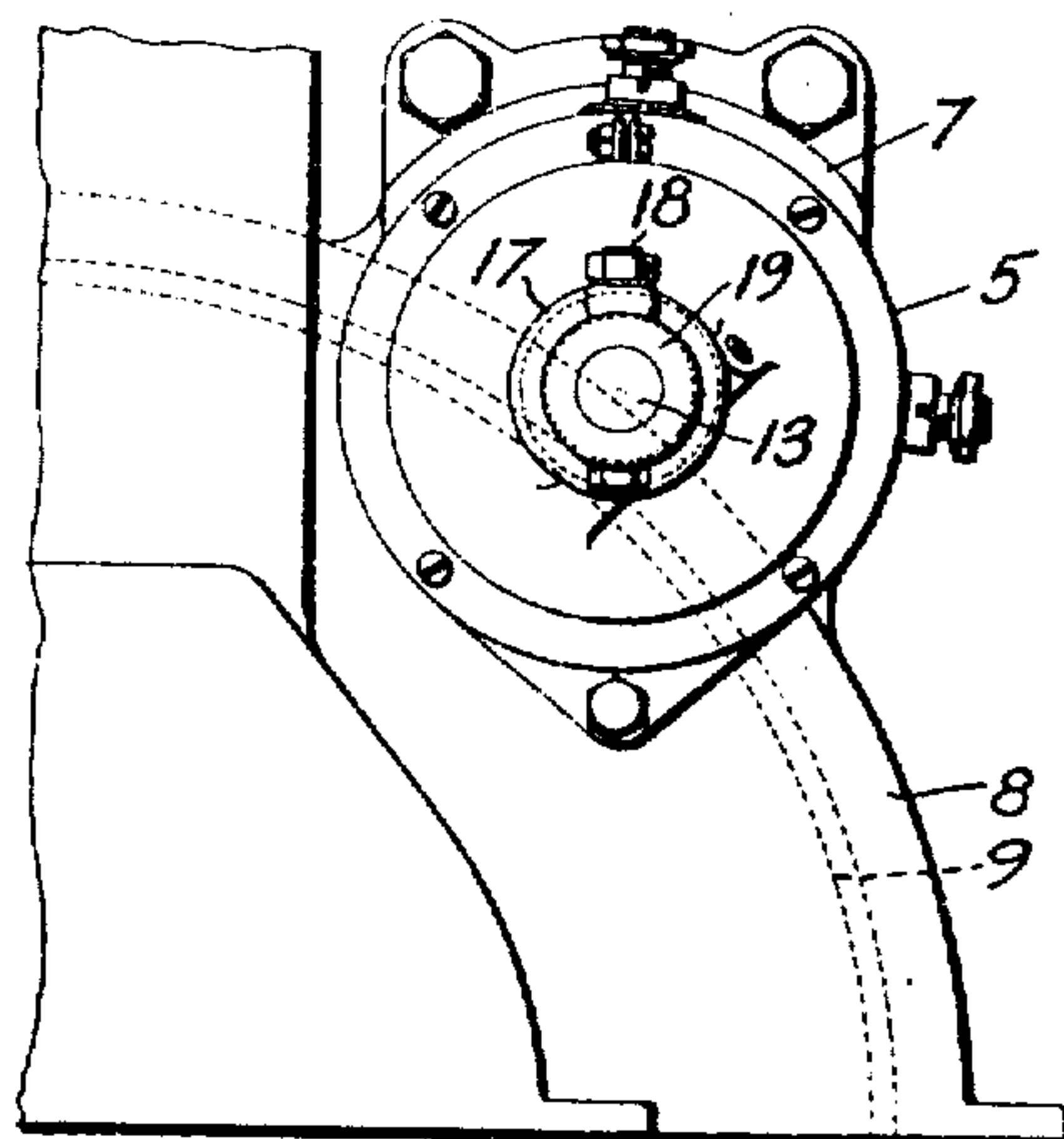
ENGINE STARTER

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*Fig. 1*



*Fig. 2*



*Witness:*

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*Fernum F. Dorsey*

## UNITED STATES PATENT OFFICE.

WILLIAM H. HUTCHINS, OF ROCHESTER, NEW YORK, ASSIGNOR TO NORTH EAST ELECTRIC COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

## ENGINE STARTER.

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*To all whom it may concern:*

Be it known that I, WILLIAM H. HUTCHINS, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Engine Starters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to apparatus employed in connection with an internal-combustion engine, for the purpose of starting the engine.

Where an electric motor is used as a source of power for the purpose of starting an internal-combustion engine, it is common to employ means for connecting the motor with the engine, which comprise gearing thrown automatically into mesh by the rotation of the motor-armature.

The object of the present invention is to produce engine-starting mechanism of the type above described, in which the elements are so arranged and combined as to secure compactness, simplicity and strength. The invention is particularly designed for use in connection with the engine of a motor-vehicle, wherein one of the gear-members is formed upon or attached to the fly-wheel of the engine, and the motor is mounted upon and supported by the housing of the fly-wheel.

To the foregoing ends the invention resides in the engine-starting mechanism hereinafter described, as it is defined in the appended claims.

In the accompanying drawings Figure 1 is a side-elevation of an engine-starter embodying the present invention, together with a portion of the fly-wheel and the fly-wheel housing of the engine to which it is applied, certain parts being broken away to show the interior construction, and Fig. 2 is a front-elevation, looking from left to right in Fig. 1, of the engine starter, together with adjacent parts of the engine.

The invention is illustrated as embodied in an engine starter comprising an electric motor, of the enclosed type, having the usual combined field-ring and casing member 5 within which the armature 6 is enclosed. One end of the casing 5 is secured to a head or end-frame 7, which in turn is fastened,

by screws, to a flange upon the forward surface of the housing 8 in which the fly-wheel 9 of the engine is enclosed.

The gearing by which the motor is connected with the engine is of the well-known type in which a pinion, connected with the armature-shaft of the motor, moves axially into and out of engagement with a toothed annulus 10 upon the fly-wheel. The pinion 11 has a threaded engagement with a screw-threaded portion 12 formed upon a drive-shaft 13, and an eccentric weight 14, fixed to the pinion, tends to prevent rotation of the latter, so that when the drive-shaft is rotated by the motor the combined effect of the weight and the inertia of the pinion causes the pinion to traverse the threaded part 12 and thus move axially into mesh with the teeth 10. This movement is arrested by engagement of the pinion with a flange on the drive-shaft, so that when the teeth are fully meshed the pinion is rotated positively by the shaft. This form of gearing is not claimed as a part of the present invention, but is selected merely as a suitable gearing for use in connection with the novel features of the invention.

The inner end of the drive-shaft is supported in a bearing formed in an arm 16, which projects into the fly-wheel casing and constitutes a part of the head 7. The drive-shaft is concentric with the armature and it passes directly through the hollow armature-shaft 26, within which it may turn freely. The armature-shaft is supported, in part, by the drive-shaft, while its forward end turns in a bearing in the motor-casing, in the usual manner. Both shafts project from the casing at its forward end, and are there connected by a spring 17. This spring is mounted upon a sleeve 19 surrounding the drive-shaft, and one end of the spring is fixed to the drive-shaft by attachment to a bolt 18, which passes through the sleeve 19 and the drive-shaft. The other end of the spring is attached to a screw 20 fixed in the end of the armature-shaft.

The spring 17, through its torsional resiliency, constitutes a yielding connection between the armature-shaft and the drive-shaft. Accordingly, when the gearing has been thrown into mesh by the rotation of the armature-shaft, and the pinion is momentarily prevented from rotating by the inertia



of the motionless fly-wheel, the spring 17 yields and permits the armature to continue rotation and momentarily to overrun the drive-shaft, until the force transmitted through the pinion has started the fly-wheel into motion.

It will be apparent that by making the head 7 of the peculiar form shown, and locating the pinion 11 within this head and within the shaft-bearing supported by it, it is rendered possible to bring the gearing close to the end of the armature, which, in turn makes it possible to mount the motor casing upon the fly-wheel housing with the centre of gravity of the motor so close to the housing that the motor may be supported entirely upon the housing without the necessity of additional braces or supports.

While a spring has been disclosed as the means of connection between the armature-shaft and the drive-shaft, it will be apparent that the invention is not limited to this particular form, and also that the particular form of gearing described for connecting the drive-shaft and the engine is not an essential feature of the invention.

The invention claimed is:—

1. In a starting motor unit, in combination, a rotor having a shaft, a casing for said rotor carrying bearings for said shaft, and a driving member for an engine connected to be driven from said shaft and mounted between said rotor and the bearing nearest thereto on one side thereof.

2. In a starting motor unit, in combination, a rotor having a shaft, a yoke encircling said rotor, a pair of end heads mounted upon said yoke, each provided with a bearing for said shaft, and an outboard shiftable driving connection mounted upon said shaft and disposed between said rotor and the proximate bearing on one side thereof.

3. In apparatus of the class described, in combination, a starting motor, having a shaft, a yoke and a head, said shaft projecting beyond said yoke at the end remote

from the head, an automatic engine starting drive, threaded on the projecting end of said shaft, and a housing for said drive, having a part secured with respect to said yoke, and having a bearing for the extended end of said shaft, said shaft being unsupported between said two bearings.

4. In apparatus of the class described, in combination, a starting motor having a casing, bearings in said casing, an engine starting drive within said casing between said bearings, and means for wholly supporting said motor on a non-rotating part associated with said engine, at a point between said bearings.

5. In apparatus of the class described, in combination, an engine leg, a starting motor, heads for said motor, having bearings, an engine starting drive between said bearings and extending within one of said heads, and a flange on said motor, near the center of inertia thereof, secured around an opening in said leg, said motor being unsupported at its ends.

6. In apparatus of the class described, in combination, an engine leg, a starting motor having a shaft, heads for said motor, one of said heads being cup-shaped, bearings for said shaft near the outer ends of said heads, an automatic engine starting drive threaded on said shaft and extending through said cup-shaped head and a flange rigid with respect to said cup-shaped head, at a point spaced from its outer end and near the center of inertia of said motor, and secured to said engine leg, said motor being unsupported at its ends.

7. In apparatus of the class described, in combination, a motor, heads for said motor, one of said heads being cup-shaped, a driving connection for an engine, disposed in said cup-shaped head, and means for supporting said motor on a non-rotating part associated with said engine, at a plane near the center of inertia of said motor.

WILLIAM H. HUTCHINS.