

Feb. 13, 1923.

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C. H. BIEDERMAN.

CRANKING MEANS FOR STARTING INTERNAL COMBUSTION MOTORS.

FILED MAR. 10, 1919.

2 SHEETS—SHEET 1.

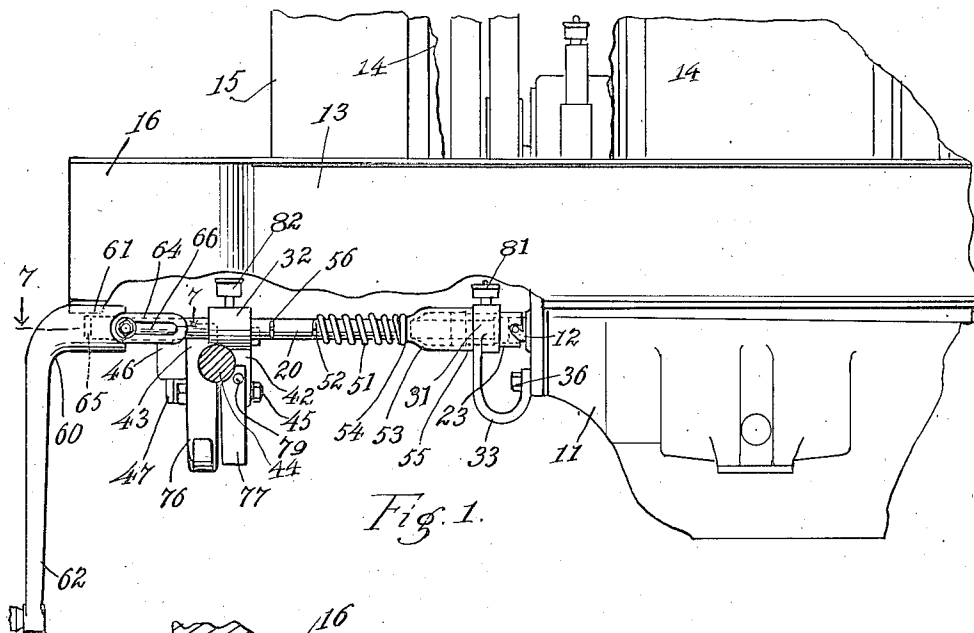


Fig. 1.

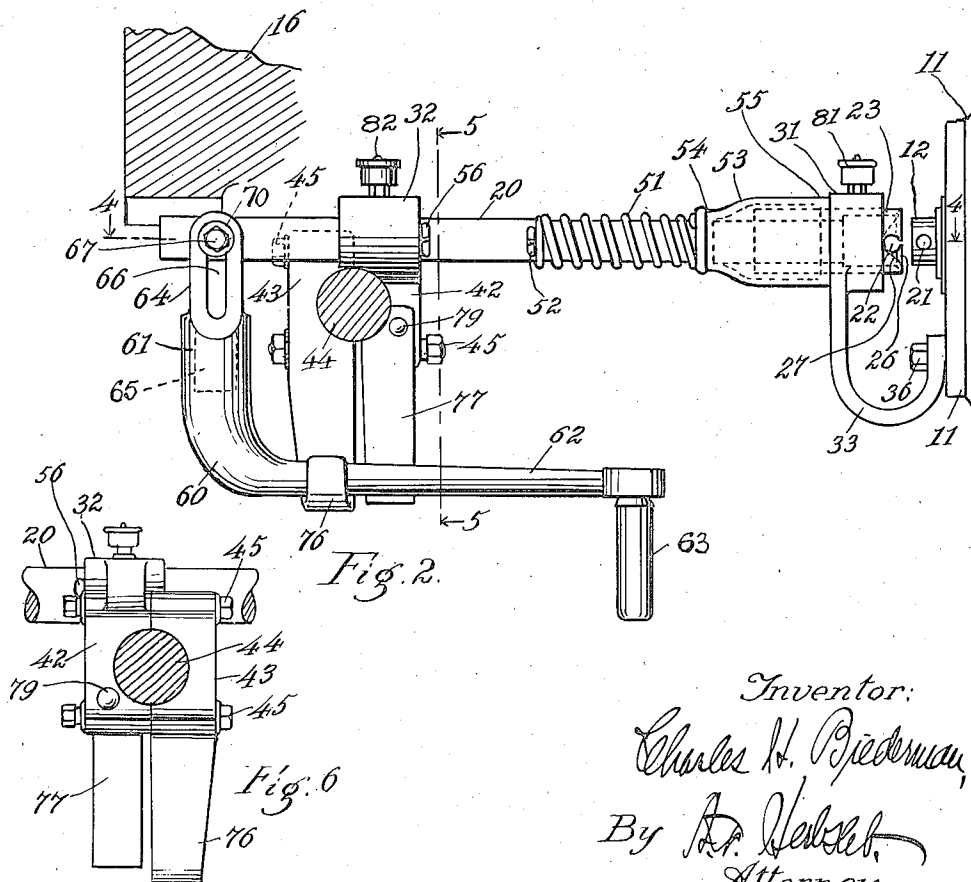


Fig. 2.

Fig. 6.

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2 SHEETS—SHEET 2.

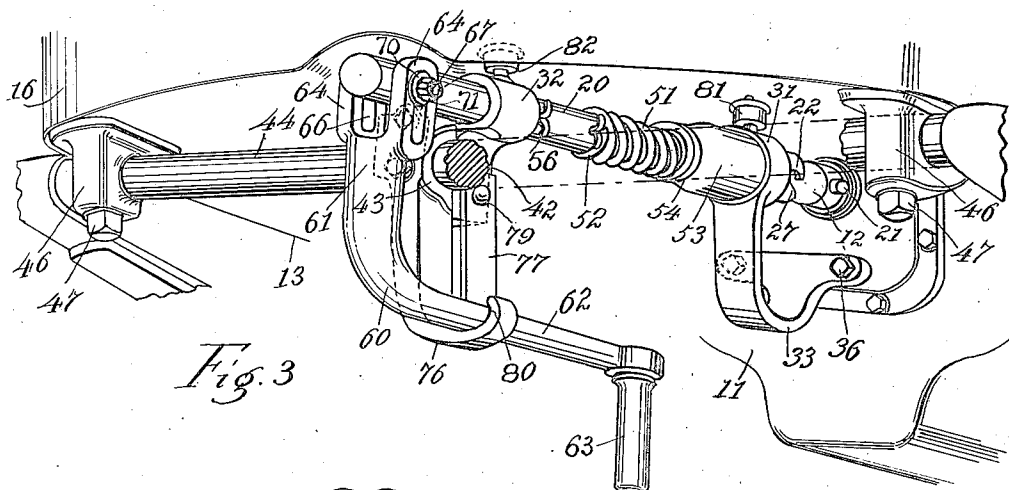


Fig. 3

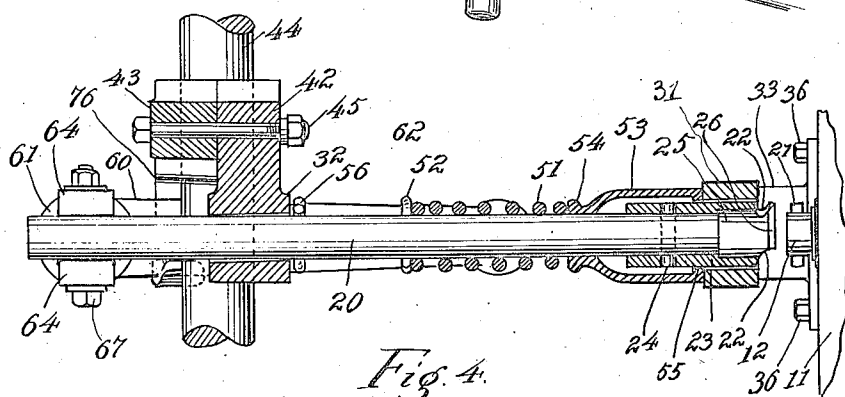


Fig. 4

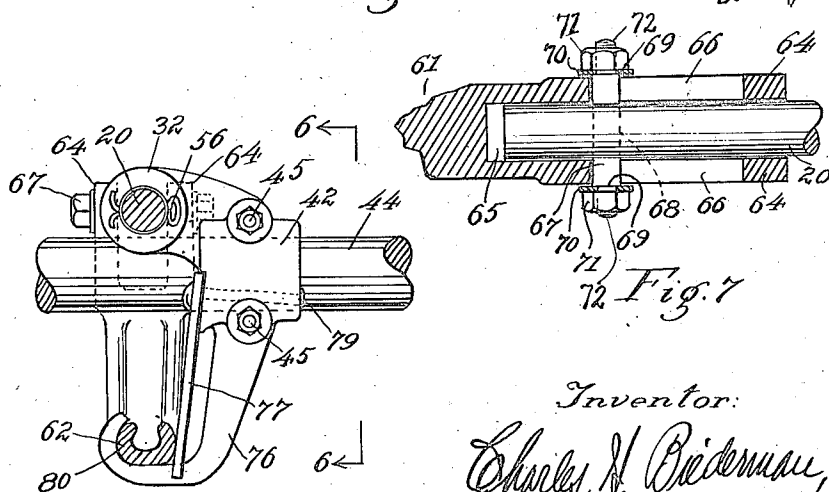


Fig. 5

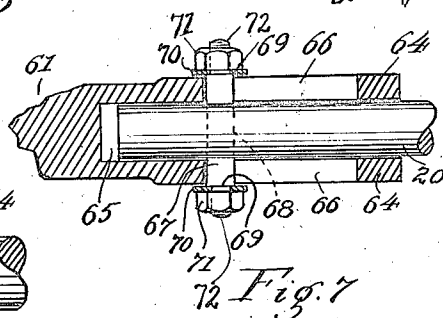


Fig. 6

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UNITED STATES PATENT OFFICE.

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CRANKING MEANS FOR STARTING INTERNAL-COMBUSTION MOTORS.

Application filed March 10, 1919. Serial No. 281,656.

To all whom it may concern:

Be it known that I, CHARLES H. BIEDERMAN, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Cranking Means for Starting Internal-Combustion Motors, of which the following is a specification.

My invention relates to cranking means for starting internal combustion motors, and is especially applicable in connection with self-propelled vehicles, for instance, motor trucks. It is the object of my invention to provide new and improved cranking means for starting internal combustion motors, comprising a crank-handle, and novel means whereby to position the crank-handle in active relation, and to swing the same into inactive relation; further, to provide novel means whereby to hold the crank-handle in inactive relation in such manner as to prevent rattling of the starting mechanism; and, further, to provide novel means whereby to connect the crank-handle with a rotary member of the motor, and to release the crank-handle from active relation and to position the crank-arm of the same in obscure inactive relation.

The invention will be further readily understood from the following description and claims, and from the drawings, in which latter:

Fig. 1 is a side elevation of my improved device, shown in connection with so much of a motor truck and the motor thereon as is necessary to illustrate my invention, the cranking mechanism being shown in active relation.

Fig. 2 is a similar view, the cranking mechanism being shown in inactive relation.

Fig. 3 is a perspective view of the latter, partly broken away.

Fig. 4 is a horizontal section of my improved device, taken on the line 4—4 of Fig. 2.

Fig. 5 is a cross-section of my improved device taken on the line 5—5 of Fig. 2.

Fig. 6 is a cross-sectional detail of the same, taken on the line 6—6 of Fig. 5; and,

Fig. 7 is a detail in section on the line 7—7 of Fig. 1.

The motor to be started is represented as an internal combustion motor 11, which may be of any ordinary or usual construction,

and comprises a rotary member 12, which is the initial member to be rotated in starting the motor, and may, for instance, be the crank-shaft of the motor. The motor may be mounted on a suitable vehicle, for instance a truck, the chassis of which is exemplified at 13, comprising a buffer 16, the motor being suitably supported on the chassis. The vehicle and the chassis or support for the motor may be of any ordinary or usual construction. A suitable housing, indicated at 14, for the motor, may be suitably supported by the chassis. The housing may include a suitable radiator 15.

A shaft 20 is exemplified as a rotary and axially movable shaft. It will be hereinafter referred to as the starting shaft. The starting shaft and rotary member of the motor are provided with complementary connecting means, these connecting means being exemplified as a pin 21 extending through and projecting from the sides of the rotary member, arranged to coact with notches 22 in a socket-member 23 fixed to the shaft, as by means of a pin 24.

When it is desired to start the motor, axial movement is manually imparted to the starting shaft for having the socket-member 23 received about the rotary member. The wall of the socket 25 in the socket-member spreads radially, as shown at 26, at its end adjacent to the rotary member, so as to act as a guiding wall or means for directing the wall of the socket about the rotary member.

When the complementary connecting means are in engagement, the starting shaft is arranged to rotate the rotary member, when rotating the starting shaft in one direction, as by having the pins seat in the notches 22.

When the motor is started, whereby the rotary member is rotated at an accelerated speed by the motor, which is greater than the speed of rotation of the starting shaft, the starting shaft is automatically disconnected from the rotary member, as by having the pins 24 travel along the inclined faces 27, so as to be received outside the notches 22, and to move the starting shaft axially away from the rotary member.

The starting shaft has movement in bearings 31, 32. The bearing 31 is adjacent to the rotary member of the motor, and the bearing 32 is removed therefrom. The bearing adjacent to the rotary member is preferably on a bowed bearing-piece 33, having

a substantially U-shaped shank, fixed to a stationary part, for instance, the crank-case of the motor, by means of bolts 36. The bearing-piece is preferably a malleable casting or forging. The bowed form of the shank of the bearing-piece permits the forceful adjustment of the bearing thereon, so as to place the same in substantial axial relation with the rotary member when mounting the parts in place, the bearing-piece being of sufficient rigidity for preventing unintentional change of relation between its bearing and the rotary member.

The bearing 31 preferably has the socket-member 23 of the starting shaft therein, while the bearing 32 preferably has an intermediate portion of the starting shaft therein.

The bearing 32 is on a bearing-member, exemplified as comprising sections 42, 43, received about a cross-shaft 44 and clamped thereon by means of clamp-bolts 45 and nuts therefor. The cross-shaft is preferably a rigid part of the chassis, being fixed in bearings 46 thereon and fixedly held in said bearings, as by means of set-bolts 47.

The starting shaft is normally urged away from the rotary member, as by means of a spring 51, shown as a helical spring about the starting shaft, located between a pin 52 received through said shaft and a pocket-member 53 received about the starting shaft and its socket-member, and having a bearing 54 about the starting shaft and a bearing 55 about the socket-member 23, the outer end of the socket-member moving in said pocket-member so as to protect the action of the latter. A stop 56, shown as a pin received through an aperture in the starting shaft, acts to limit retractive movement of the starting shaft from the rotary member.

A crank-handle 60 is so connected as to be placed in active relation for rotating the starting shaft, or to be moved into inactive and obscure relation, means being provided whereby to firmly hold the crank-handle and the starting shaft, to prevent rattling of the same during operation of the vehicle.

The connection of the crank-handle with the starting shaft is shown as a slidable and pivotal connection. The crank-handle comprises a hub 61 and an arm 62, having a manually operable hand-grip 63 extending therefrom.

The hub has ears 64 extending therefrom and is provided with a bore 65. The ears are provided with slots 66. A pivot-pin 67 is fixed in an aperture 68 extending through the starting shaft and through the slots, the ends of the pins being provided with shoulders 69 against which washers 70 are received, the washers being clamped in place by means of nuts 71 received over the threaded ends 72 of the pin. (See Fig. 7.)

The crank-handle is movable, with its hub and bore therein extending axially of the starting shaft, whereby the wings are caused to move along the pivot-pin connection of the crank-handle with the starting shaft. When the hub is moved inwardly or toward the starting shaft, the starting shaft is received in the bore of the hub. Continued movement inwardly of the crank-handle causes inward axial movement of the starting shaft for moving the socket-member 23 toward the rotary member of the motor, for causing engagement between the complementary connecting means with which the socket-member and the rotary member are respectively provided, whereby the crank-handle is placed in active relation with the rotary member for manually rotating the rotary member, in order to start the automatic or power operation of the motor.

When the power operation of the motor has been initiated, thereby accelerating rotation of the rotary member, the starting shaft is automatically moved axially away from the motor. Upon cessation of urging movement of the starting shaft toward the motor, the spring 51 automatically retracts the starting shaft.

When the motor has been started, the crank-handle is moved so as to move its hub axially away from the starting shaft, whereby the inner end walls of the slots 66 contact the pivot-pin 67 in the starting shaft, the bore of the hub of the crank-handle having meanwhile moved beyond the outer end of the starting shaft, in order that the crank-handle may be swung on its pivotal connection with the starting shaft. The pivotal axis of this pivotal connection is exemplified at right angles to the arm 62, whereby the arm 62 may be moved to be substantially parallel with the starting shaft when the crank handle is in idle relation.

Means are provided for fixing the crank-handle in inactive relation, accomplished in the present exemplification by a receiving hook 76, which extends from the bearing-section 43, the hook extending in lateral direction with relation to the starting shaft, and being located preferably in radial direction with relation to the axis of the starting shaft. This is accomplished, in the present exemplification, by locating the bearing 32 and the hook 76 to one side of the bodies of the bearing-sections 42, 43.

The bearing-section 42 is provided with a spring 77, shown as a leaf-spring extending lengthwise of the shank of the hook 76, and fixed to the bearing-member by means of a rivet 79. The arm of the crank-handle, when swung on its pivot, is caused to extend lengthwise of the starting shaft and to be received in the hook 76, the hook having an inturned end for forming a recess 80, the wall of which conforms in general outline

to the side of the crank-arm, the crank-arm being urged into this hook-formed recess by means of the spring 77.

The spring 77 and the hook are relatively 5 located side by side, lengthwise of the axis of the starting shaft and of the crank-arm when the latter is in inactive position. When the crank-arm is placed on the hook, the spring is forced laterally, with the result that the spring urges the crank-arm 10 against the hook, which latter thereby acts as a fulcrum, the spring pushing the end of the crank-arm at one side of the fulcrum in one direction, and the end of the crank-arm, namely the pivotal end thereof, at the 15 other side of the fulcrum, in the opposite direction. This has the result that the outer end of the starting shaft is forced in one lateral direction, whereby one side of the inner wall of the bearing 32 is caused to 20 act as a fulcrum, on which the operating shaft is swung for swinging its inner end in the opposite direction against the other side of the inner wall of the bearing 31. This action has the effect of clamping or 25 cramping the crank-handle and the starting shaft, and rigidly positioning the same in the hook and in the bearings respectively and rigidly binding the pivotal connection 30 between the crank-handle and the starting shaft, whereby all rattling of the parts is prevented. Suitable oil-cups 81, 82, may be provided for the bearings 31, 32.

The construction also aids in presenting a 35 pleasing appearance of the parts, as the only parts presented to view when the parts are in inactive relation, are the outer end of the starting shaft and the downwardly extending bowed outer end of the crank-handle, the arm of the crank-handle and the 40 hand-grip at its end being positioned out of view under the chassis and housing of the vehicle.

In order to provide for easy and ready 45 operation of the parts in starting the motor, and to compensate for variations in axial relations there may be between the axis of the starting shaft and the axis of the rotary member, I make the bores of the bearings 31, 32, and the bore 65 in the hub 61 50 of the crank-handle, oversize. Thus the bore 65 is made one sixty-fourth inch larger in diameter than the diameter of the starting shaft received therein, the bore of the bearing 32 is made one thirty-second inch larger 55 in diameter than the diameter of the starting shaft at that point, and the bore of the bearing 31 is made one sixteenth inch larger in diameter than the diameter of the socket-member 23 coacting therewith. This construction, in connection with the outwardly 60 tapering inner end 26 of the socket 25 of the socket-member, permits ready finding of the rotary member by the socket-member when moving the starting shaft axially into coac-

tive relation with the rotary member, and compensates for differences there may be in axial relations between the starting shaft and the rotary member.

The lever action of the receiving hook and 70 spring on the crank-arm, when the crank-handle is in inactive relation, forces one side of the starting shaft against one side of the bearing 32, and the other side of the starting shaft, that is, the socket-member 75 thereof, against the other side of the bearing 31, for rigidly holding all the operating parts, whereby all rattling of the parts is prevented.

Having thus fully described my invention, 80 what I claim as new and desire to secure by Letters Patent, is:

1. In mechanism of the character described, the combination of a starting shaft, a crank-handle comprising a hub, a crank-arm and a handle, a pivotal slidable connection between said hub and said starting 85 shaft, the pivot of said pivotal slidable connection extending at right angles to the plane in which said crank-arm and said handle are located, positioning means between said hub and said starting shaft connected 90 by axial movement of said hub along said slidable connection for cranking position of said crank-handle, said pivotal connection 95 arranged for swinging said crank-handle into inactive relation with said arm extending lengthwise of said starting shaft and substantially parallel with said starting shaft, and a latch proximate to said starting 100 shaft for latching said crank-arm in said last-named relation.

2. In mechanism of the character described, the combination of a starting shaft, a crank-handle comprising a hub and a 105 crank-arm, a pivotal slidable connection between said hub and said starting shaft, positioning means between said hub and said starting shaft connected by axial movement of said hub along said slidable connection 110 for cranking position of said crank-handle, said pivotal connection arranged for swinging said crank-handle into inactive relation lengthwise of said starting shaft, and a 115 latch for latching said crank-arm in said last-named relation, said latch comprising a fulcrum and a spring constructed and arranged whereby to exert lateral strain on said crank-handle and said starting shaft at 120 said pivotal connection.

3. In mechanism of the character described, the combination, with a rotary member of an internal combustion motor, of an axially movable starting shaft, a bearing therefor adjacent to said rotary member, a 125 bearing therefor distanced from said rotary member, said starting shaft and said rotary member provided with complementary releasable connecting members for rotating said rotary member by means of said starting 130

shaft, resilient means normally causing separation between said complementary members. a crank-handle including a crank-arm, said crank-handle having operative connection
 5 including a pivotal connection with said starting shaft, the pivotal axis of said pivotal connection being at substantially right angles to said crank-arm, and arranged for active relation of said crank-handle with
 10 said starting shaft, or for inactive relation of said crank-handle with said crank-arm extending lengthwise of said starting shaft, and latching means for said crank-arm in-

cluding resilient means and a fulcrum for said crank-arm acting through said pivotal connection on said starting shaft for exerting lateral pressure by said starting shaft in opposite directions on said respective bearings.

In testimony whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

CHARLES H. BIEDERMAN.

Witnesses:

RALPH L. HINDS,
 THERESA M. SILBER.