978,939.

E. F. RUSSELL & E. E. LAVOIE.

AUTOMOBILE ENGINE STARTING DEVICE.

APPLICATION FILED JULY 28, 1909.

Patented Dec. 20, 1910.

3 SHEETS—SHEET 1.

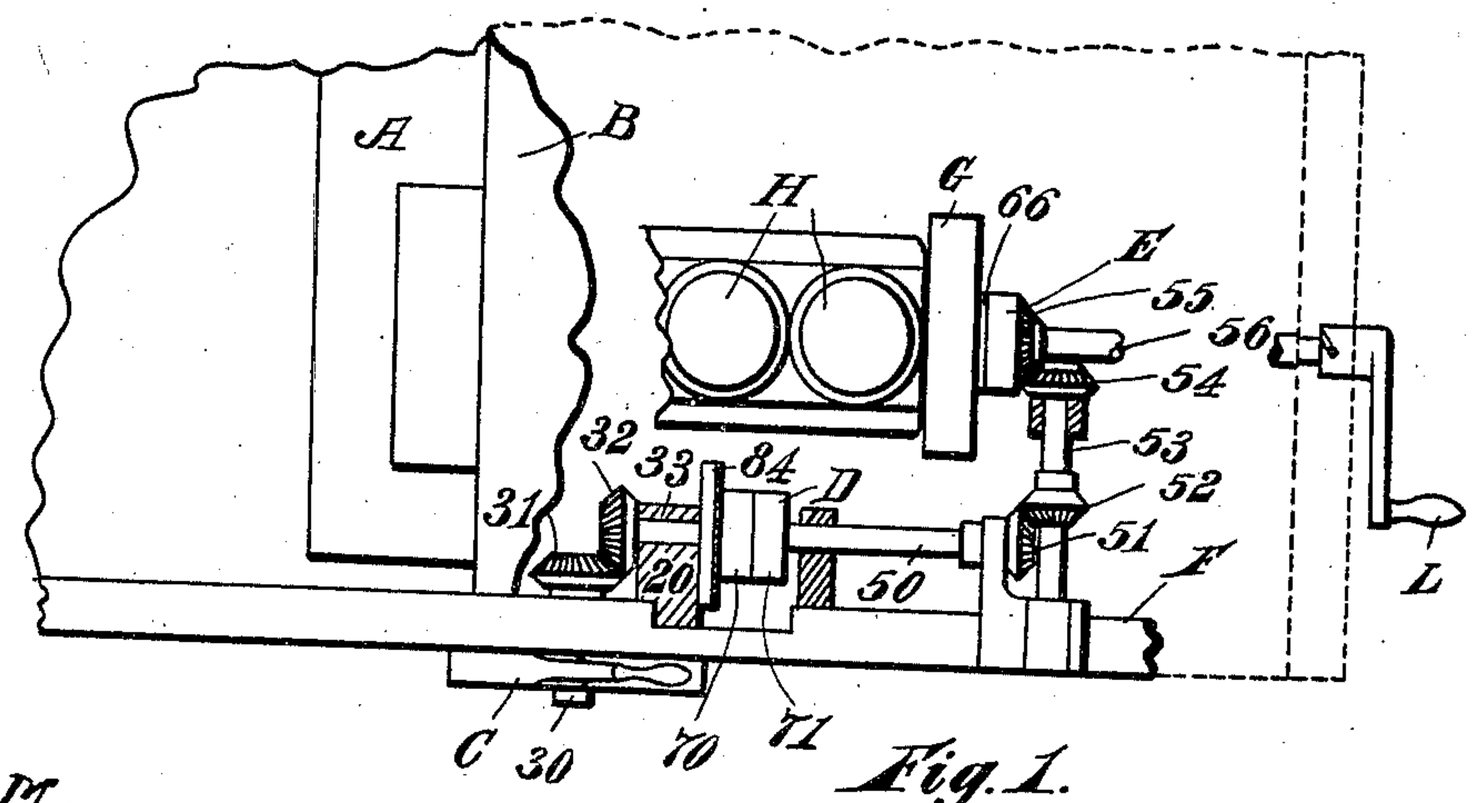

Fig. 1.

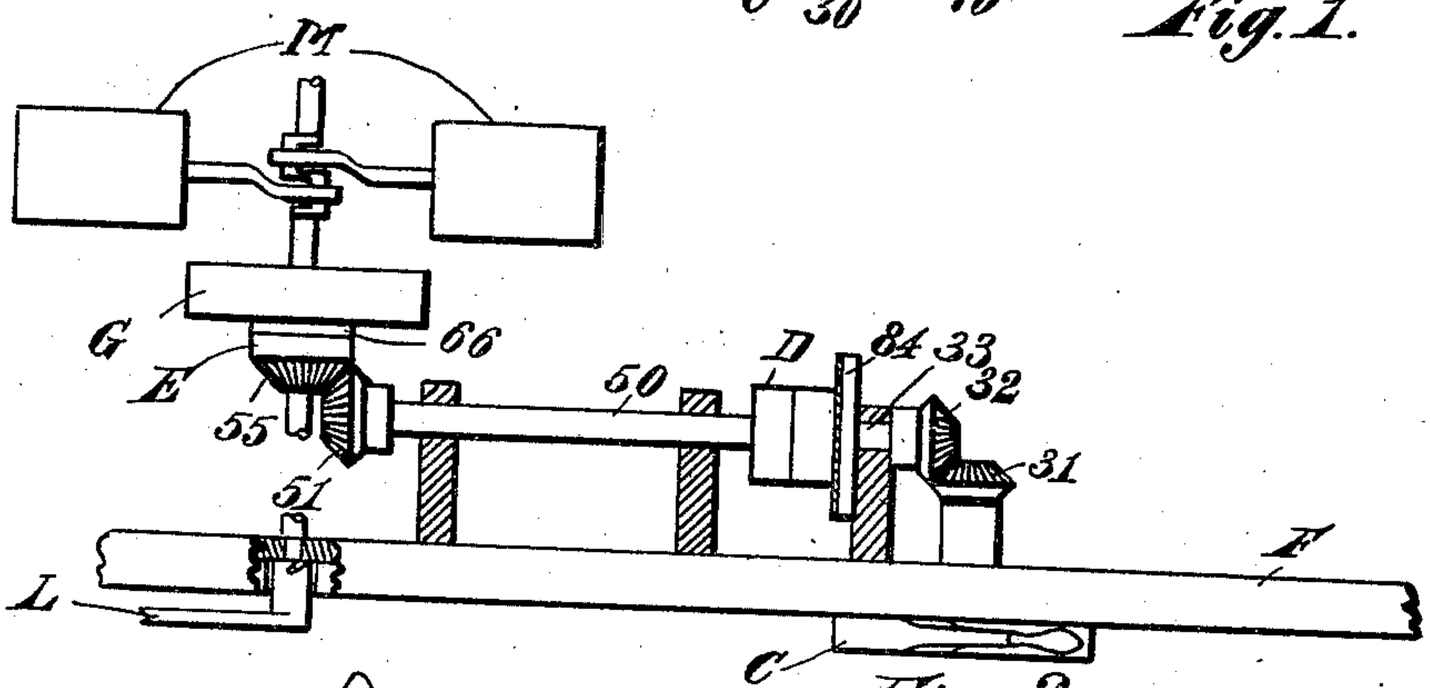

Fig. 2.

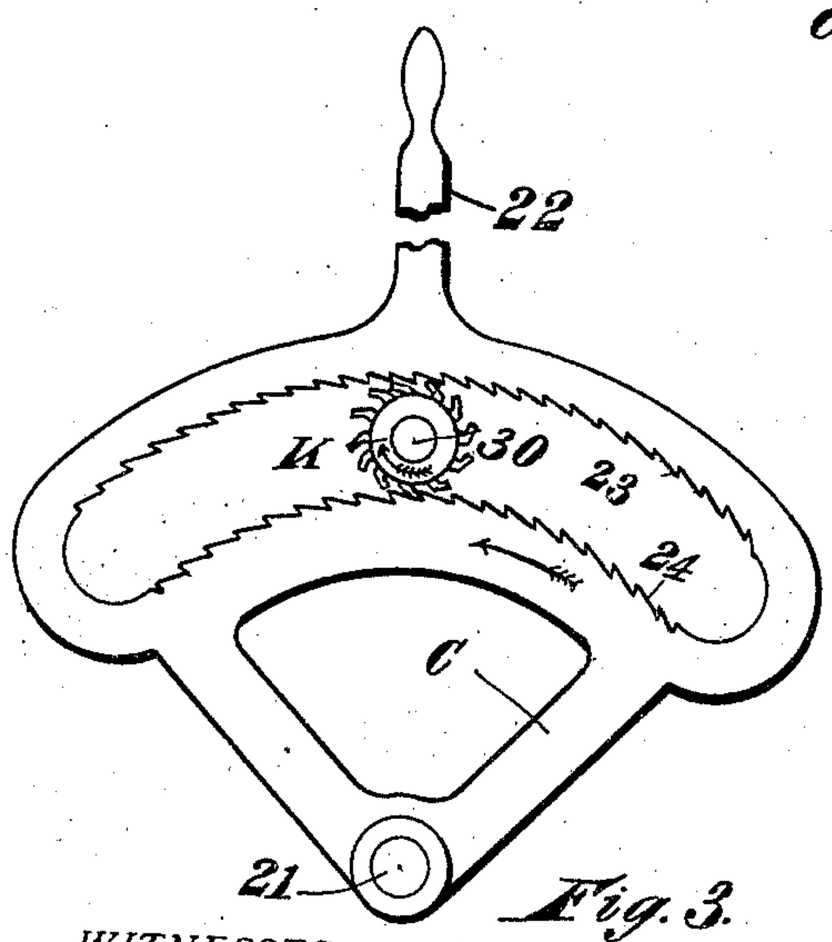

Fig. 3.

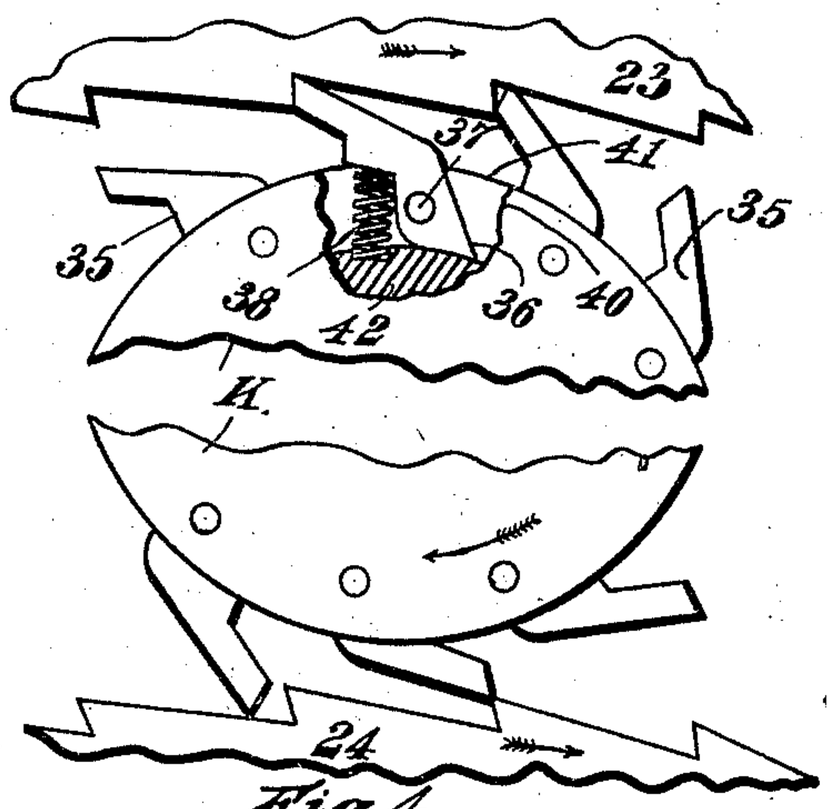

Fig. 4.

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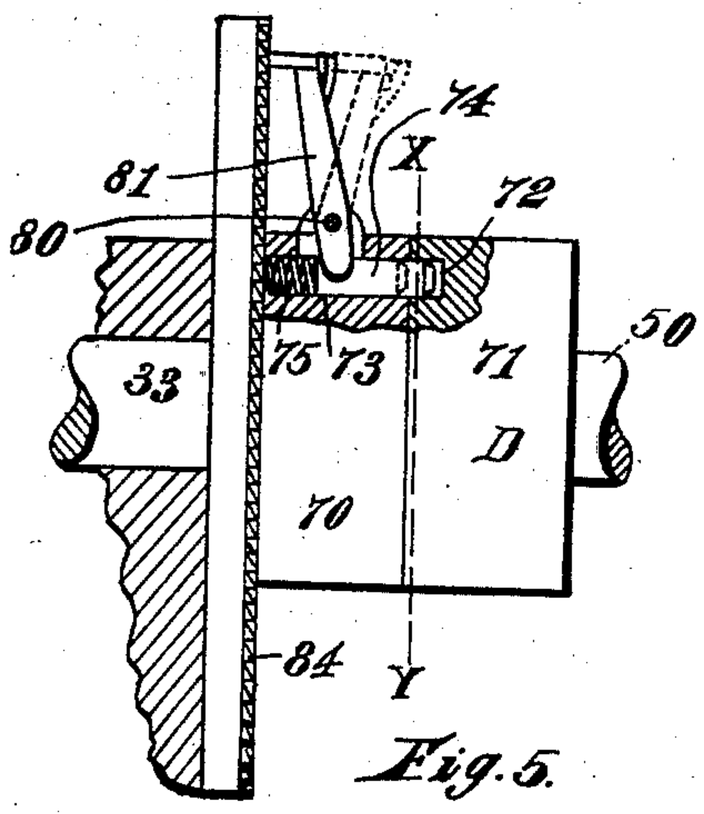

Fig. 5.

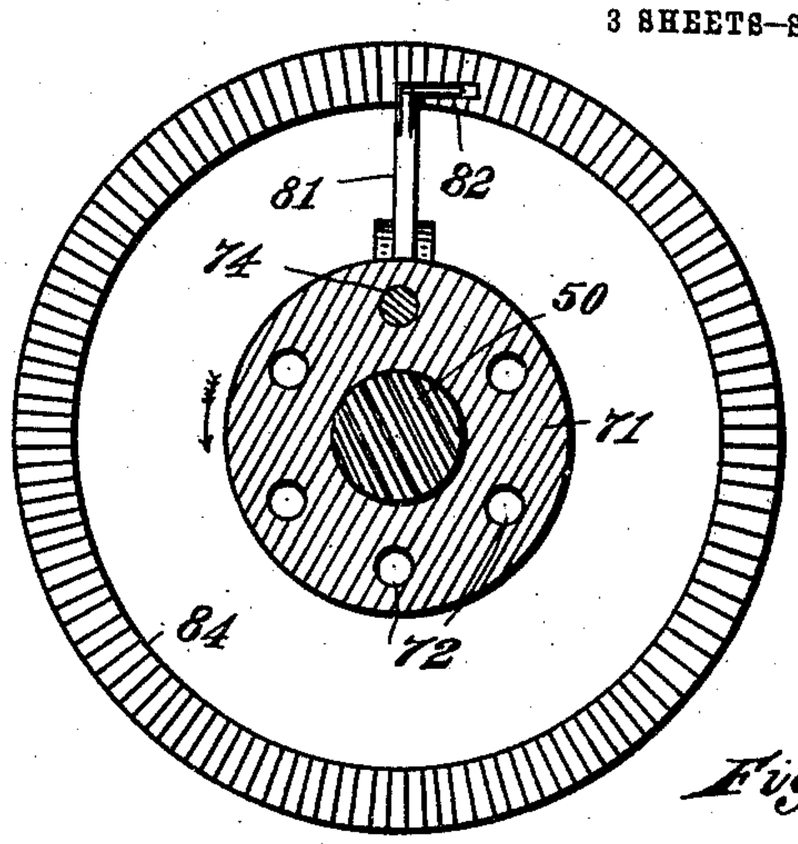

Fig. 6.

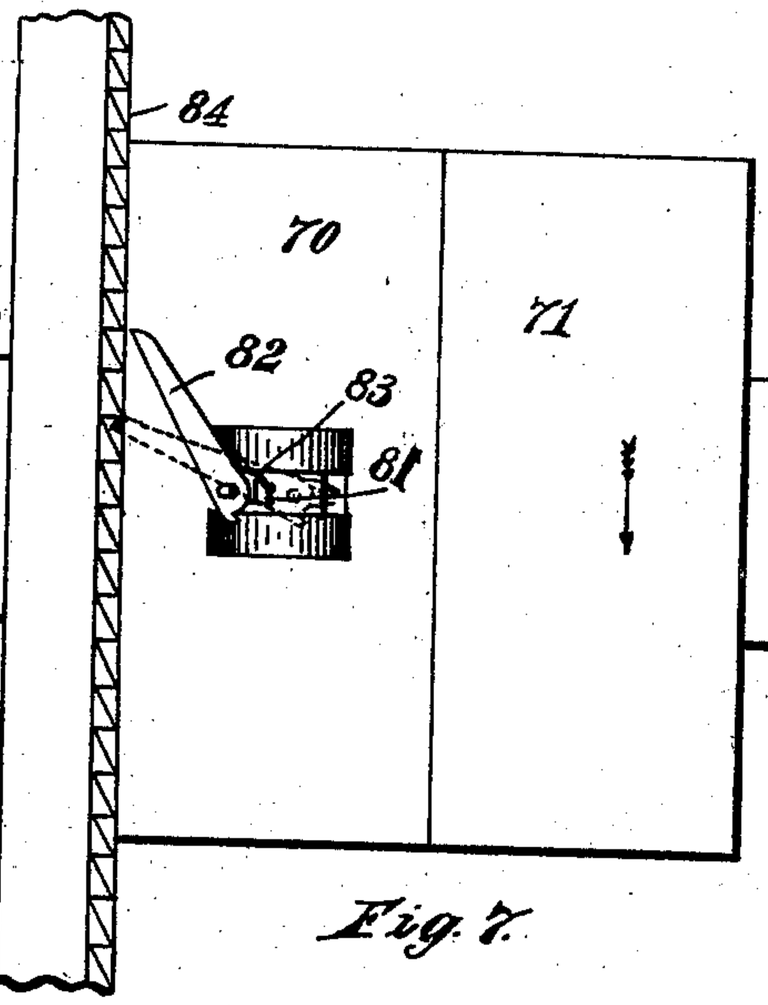

Fig. 7.

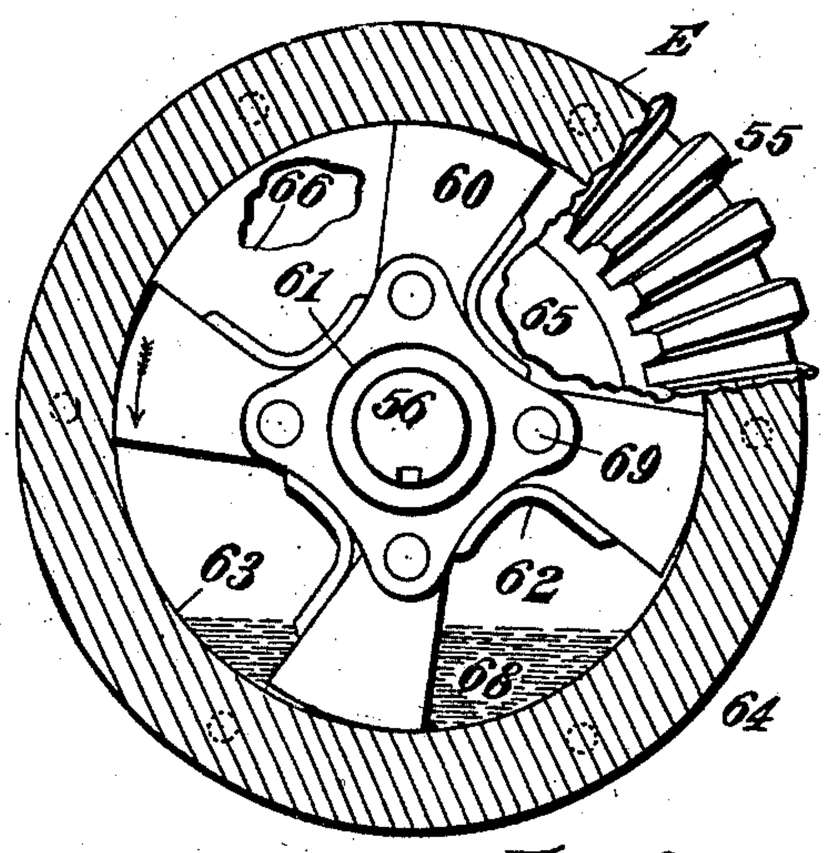

Fig. 8.

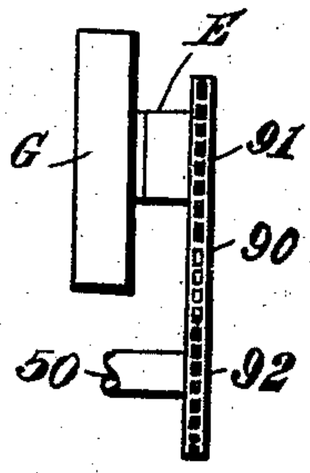

Fig. 9.

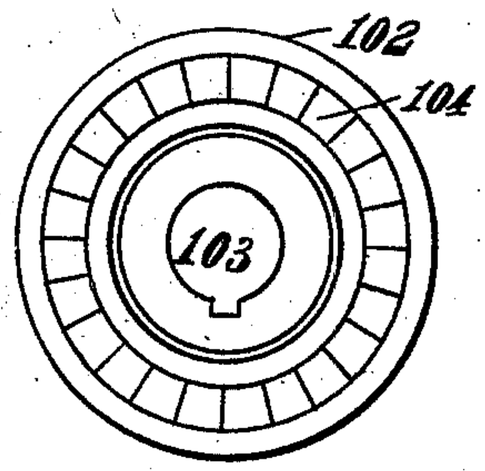

Fig. 10.

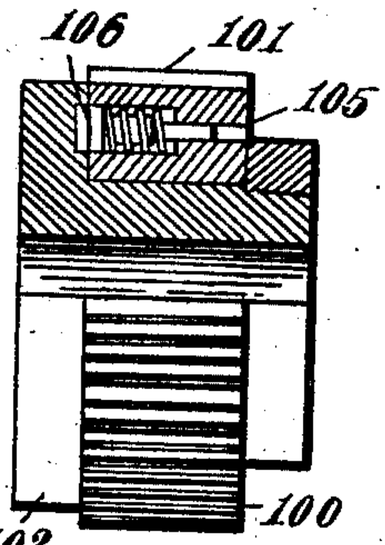

Fig. 11.

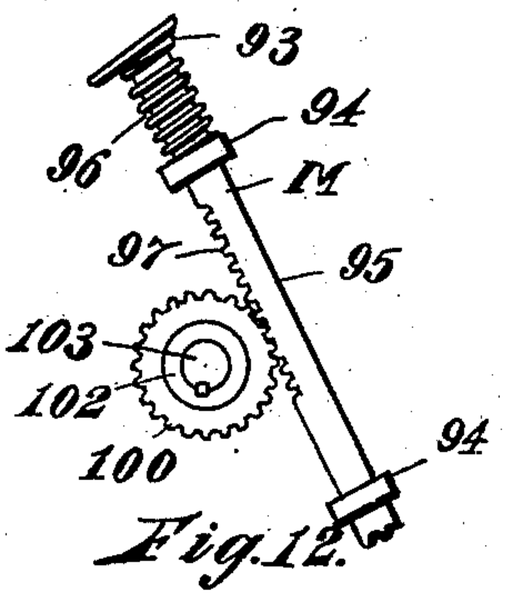

Fig. 12.

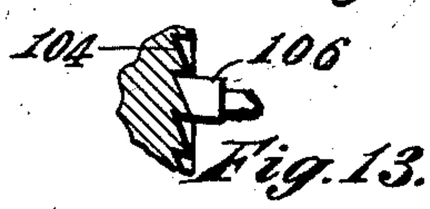

Fig. 13.

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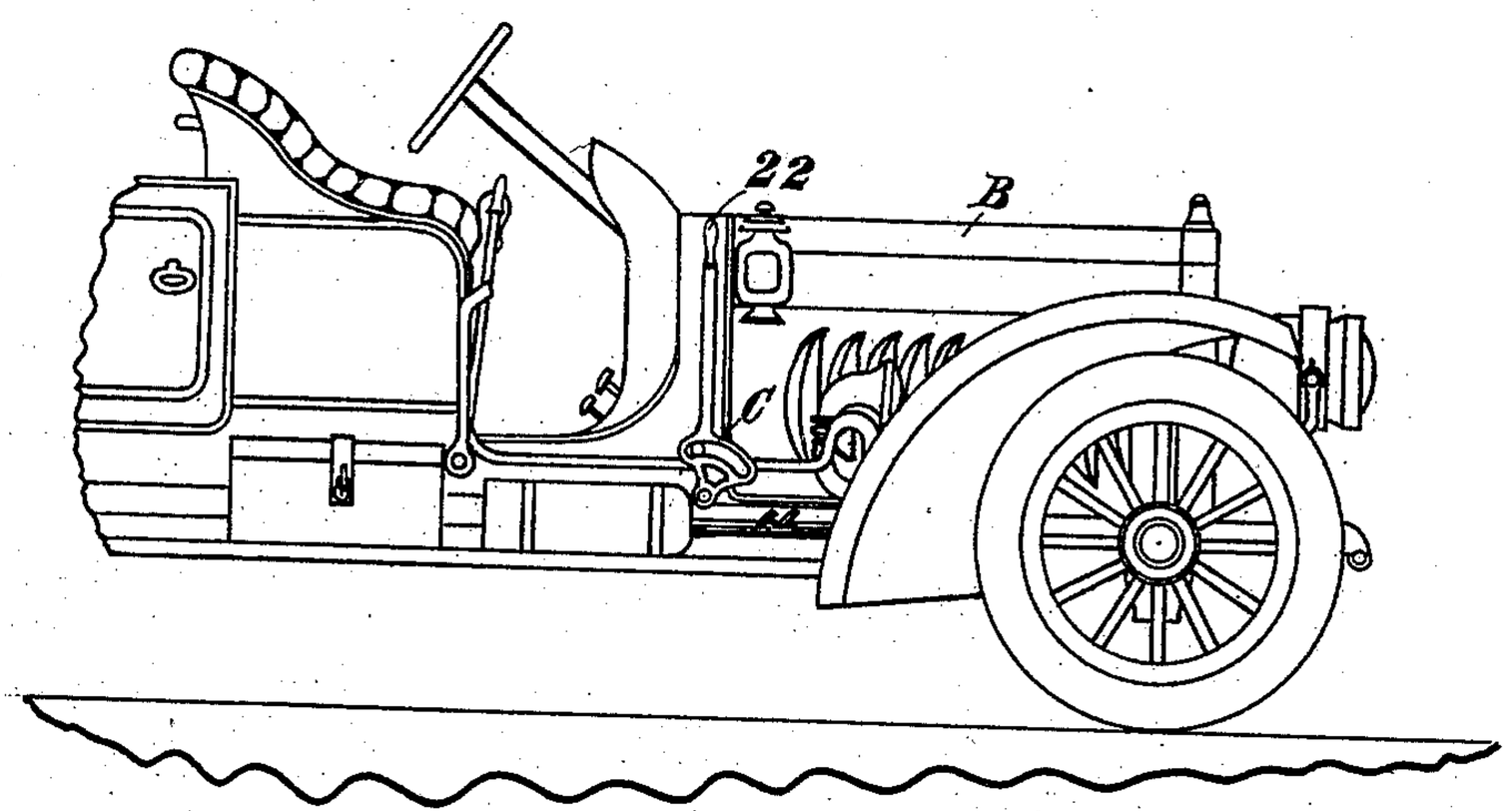

Fig. 14.

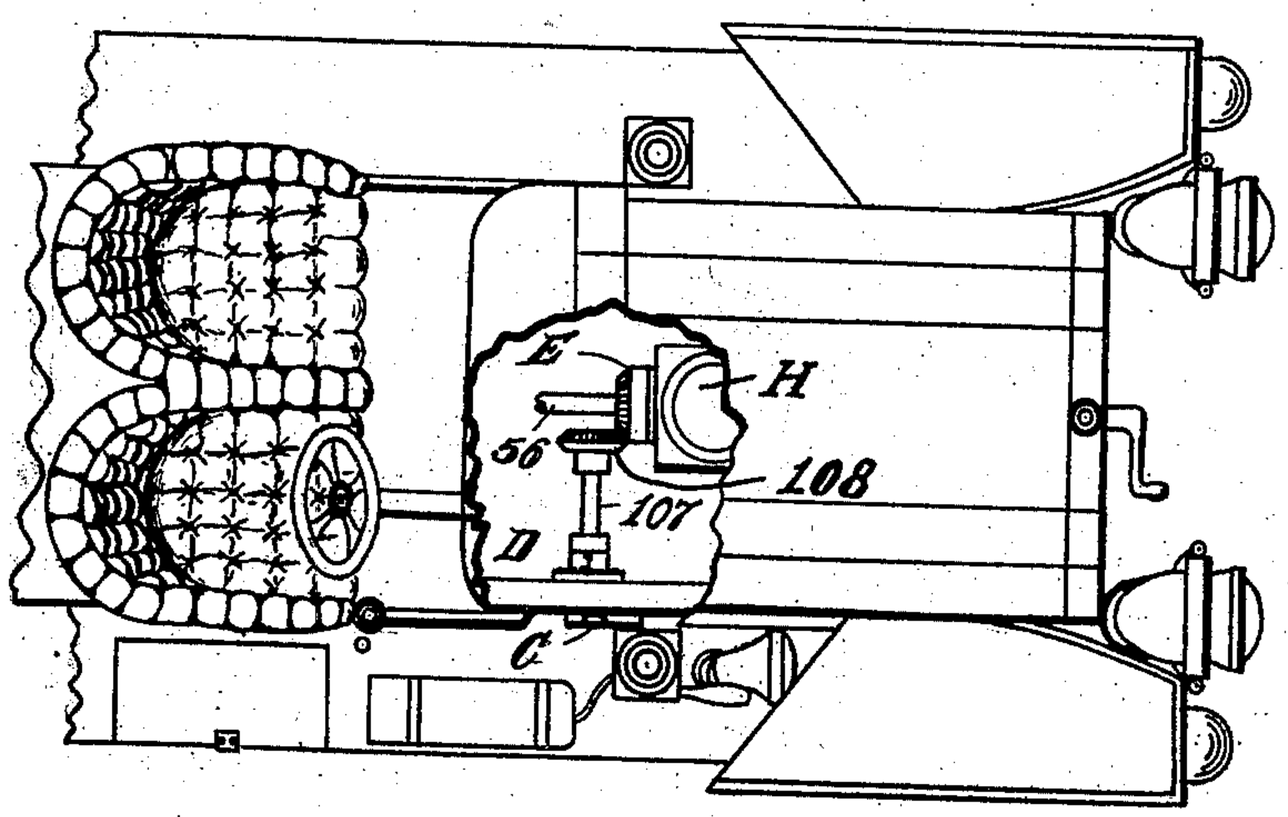

Fig. 15.

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UNITED STATES PATENT OFFICE.

EDWARD F. RUSSELL AND EUGENE E. LAVOIE, OF LOWELL, MASSACHUSETTS.

AUTOMOBILE-ENGINE-STARTING DEVICE.

978,939. Specification of Letters Patent. Patented Dec. 20, 1910.

Application filed July 28, 1909. Serial No. 510,060.

To all whom it may concern:

Be it known that we, EDWARD F. RUSSELL and EUGENE E. LAVOIE, both citizens of the United States, residing at Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Automobile-Engine-Starting Devices, of which the following is a specification.

Our invention relates to automobiles and especially to the mechanism for starting explosive engines therein. The ordinary method of starting is to turn over the engine by the use of a crank which is arranged with a tooth or clutch which engages a pin on the end of the main engine shaft. By this method, if the crank is turned forward, the engine is turned over in the forward direction, and if the crank is turned the other way, it is released from the shaft. Such a crank is usually in front of the radiator or hood, but in some styles of machines, it is on the side of the automobile somewhat in the rear of the driver's seat. With such a cranking system, it is necessary for the operator to dismount to crank the engine, and then return to his place on the driver's seat. This is inconvenient and troublesome. Moreover, it takes considerable strength to turn over the engine, and if the engine back fires, the crank will be reversed, frequently causing injury to the operator, sometimes even breaking an arm.

The purpose of our invention is to provide a device by which the engine can be started without the operator leaving the driver's seat.

Among others it accomplishes the following special objects. The starting lever is so arranged that a back and forth movement is transformed into a continuous rotary movement which is transmitted through the medium of shafts and gearing and a clutch, to the engine shaft. This clutch is preferably of the friction type and is so made that after the engine starts, the clutch is released and thereafter there is no clicking.

Besides the starting lever and the clutch, the other principal feature of our invention is a release mechanism which is operative only in case the engine reverses from any cause such as back firing. In such case, the connections from the starting lever are released from the engine connections, and are stopped instantly. There is therefore no danger of the operator being struck or injured by the starting lever being forcibly thrown back.

Our mechanism does not interfere in any respect with the usual starting crank, shown at L, which can be used if any part of our device breaks or becomes inoperative from any cause.

In the drawings, Figure 1 is a top view of our device with our hand starting lever applied to the front of an automobile, the automobile parts being broken away or merely outlined. Fig. 2 is a similar view of our device applied to an automobile in which the engine is at the rear instead of under the front hood. Fig. 3 is a side view of the starting lever and segment. Fig. 4 is a detail of the elastic cog wheel operative by the starting ratchet. Fig. 5 is a side view of the releasing mechanism in partial section. Fig. 6 is a sectional view thereof from the right on line X—Y of Fig. 5. Fig. 7 is a side view in another position. Fig. 8 is a detail of the friction clutch in partial section. Fig. 9 shows a chain connection with the engine shaft. Figs. 10, 11, 12, and 13 are details of an alternative form of starting means operative by the foot. Fig. 14 is a side view of the front of an automobile with our device in place. Fig. 15 is a top view of an automobile with our device connected directly to the engine shaft in rear of the engine instead of in front of the engine.

A is the foot board of an automobile and B is the hood.

C is our hand starting lever and D is the release mechanism.

E is the friction clutch.

F is part of the frame of an automobile, G is the fly wheel and H is the engine.

Hand lever C is pivoted at 21 at the side of the automobile in any convenient position whereby the starting handle 22 will be within easy reach of the hand of the operator as shown in Fig. 14. It should be out of the way of the change gear levers, brake levers and other levers which are usually near the driver's seat. This starting lever C is provided with two interiorly toothed concentrically curved racks 23 and 24, the teeth of which point in opposite directions. Between these racks, we locate an elastic cog

wheel K which is carried by cog shaft 30 at the end of which is a bevel gear 31 which meshes with bevel gear 32 on driving shaft 33 which is supported by suitable bearings 20 attached to the frame of the automobile. This elastic cog wheel K is provided with movable teeth 35 each of which is pivoted between flanges 40 and 41. Each tooth 35 has a tail 36 which limits the backward movement of the tooth by striking interior drum 42. A spring 38 which bears against a shoulder under the front of each tooth 35 and rests in a depression in drum 42 normally keeps each tooth 35 pressed outward. Consequently the teeth 35 will engage the teeth on say rack 23 when that rack is moving against said cog teeth. When that rack 23 moves in the other direction, however, its teeth will pass over the cog teeth in the same manner as the teeth of rack 24 are shown at the bottom of Fig. 4. Thus when racks 23 and 24 are moving in the direction of the arrows thereon in Fig. 4, the teeth of 23 will engage teeth 35 and cog K will be turned in the direction of the arrow thereon. On the other hand, when the racks are moving in the direction of the arrow in Fig. 3, the teeth of rack 24 will engage the teeth of cog K and will continue to move it in the same direction as the arrow shown on cog K. Thereby a backward and forward movement given to starting lever C by means of handle 22, will continuously rotate cog wheel K. This rotary movement is transmitted on the construction shown in Fig. 1, through shaft 30, bevel gears 31 and 32, driving shaft 33, releasing mechanism D, driven shaft 50 which is supported in suitable bearings, bevel gears 51 and 52, shaft 53, bevel gear 54 and bevel gear 55 of clutch E to main shaft 56 of the engine H.

The clutch E may be of any usual type but is preferably a friction clutch of such type that while the engine is in motion, there will be no clicking. We prefer the type shown in Fig. 8 wherein the sector like clutch arms 60 are pivoted on the hub 61 firmly carried by main shaft 56. The outer faces of these arms fit the interior face 63 of clutch drum 64 and they are pivoted to hub 61 at points 69 which are nearly in line between the front edge of the arm and the center of shaft 56. Suitable springs 62 press them forward and hold them normally in engagement with the inner surface 63 of the drum 64.

At the back near the fly wheel G, we place a cover 66 for drum 64 which fits main shaft 56 with a smooth bearing fit, and is screwed or otherwise fastened to clutch drum 64. The outer end 65 or head of clutch drum 64 is preferably formed integral therewith and is cut to form a bevel gear 55 to mesh with gear 54. As the head 65 also snugly fits shaft 56, the clutch drum 64 is thereby supported by it and by cover 66. We prefer to place inside of this clutch drum vaseline or heavy oil 68 whereby it is self oiling and perfectly noiseless. It is apparent that when moving in the direction of the arrow in Fig. 8, the biting surface 63 will seize hold frictionally of the adjoining surface of the arms 60 and will tend to swing the arms pivotally in the direction which will tend to force the back of the arm outward thus bringing the parts together still more closely. The result is a powerful, noiseless clutch. Now when the engine starts and begins to rotate main shaft 56 in the direction of the arrow, it will rapidly overtake the drum 64 and as it overtakes it, the friction between surface 63 and arms 60 will tend to swing the arms out of contact, thus releasing the clutch. It will thus be seen that the clutch E will start the engine, but when the engine is started and the starting mechanism is stopped, the arms 60 will release themselves and thereafter while the engine is going, will spin around freely and with little or no friction in the vaseline or oil.

Clutch E should be placed on main shaft 56 inside of crank L. In the construction shown in Figs. 1 and 2, it is between the crank and fly wheel while in the construction shown in Figs. 14 and 15, it is behind the engine on the main shaft thereof and on the opposite end thereof from crank L.

The releasing mechanism D is interposed between the starting gear 32 and the gear 51 which transmits motion to the clutch E. It comprises a solid or substantially solid driving drum 70 carried by driving shaft 33 at the opposite end from gear 32. Driven shaft 50 is centered the same as shaft 33 and carries a substantially solid driven drum 71 in close juxtaposition to drum 70.

On the face adjoining drum 70, drum 71 has a plurality of shallow pin receiving holes 72. Opposite these holes 72 in drum 70 is a single pin hole 73 in which slides a pin 74. Behind this pin is a spring 75 which normally tends to press the pin 74 forward into one of the holes 72 as shown in Figs. 5 and 6. Thereby the drums 70 and 71 will be normally locked together or if not locked, they will be locked as soon as sufficient motion is transmitted to either drum to permit pin 74 to drop into any of the pin receiving holes. On the curved surface of drum 70, we pivot on a projecting bearing at 80, the substantially radial release arm 81. The short end of this release arm 81 enters a depression in pin 74 whereby, by moving arm 81, pin 74 may be withdrawn. At the end of arm 81, we pivot at right angles thereto, a detent 82, which is normally pressed downward by a spring 83 into the teeth of stationary ratchet 84 which is preferably fastened to the bearings 20 of shaft 33.

It will be readily seen that normally pin 74 will rest in one of the receiving holes 72 and thus hold drums 70 and 71 and shafts 33 and 50 together so that they will rotate together. Thus the normal starting movements of the starting lever will be transmitted to the engine through main shaft 56. If however, the engine back fires, it will rotate shaft 56 in the opposite direction which will not release clutch E but will carry it in the direction opposite to the arrow in Fig. 8. This motion will be transmitted through the various shafts and gears to shaft 50 and drums 71 and 70. The moment these drums start backward in the direction opposite to the arrow in Figs. 6 and 7, the detent 82 will strike in one of the teeth of stationary ratchet 84, and will be forced back and up carrying arm 81 with it as shown by the dotted lines in Figs. 5 and 7. This action will withdraw pin 74 from the receiving hole in drum 71 and will also stop drum 70 and all intermediate mechanism between it and the starting lever instantly.

Instead of the gear connection between clutch E and shaft 50, we may use a chain 90 and sprockets 91 and 92 as shown in Fig. 9.

Instead of the hand lever, we may use a foot rack M as shown in Figs. 10, 11, 12 and 13. This comprises a foot rest 93, bearing collars 94, 94, and a spindle 95 on which are rack teeth 97. These rack teeth engage teeth 100 on a collar 101 revoluble on and carried by a hub 102 which is attached to and carried by a shaft 103 which is connected with the shaft 33 by any suitable connections. In hub 102 are toothed depressions 104 and in collar 101 is a squared hole 105 in which rests a squared pin 106 with a beveled nose adapted to slide over depressions 104 in one direction and to catch them when moving in the opposite direction. This pin is spring pressed as shown in Fig. 11, the whole being a well known form of ratchet. This foot action does not continuously rotate the engine as does our hand starting device, but it can be used on certain types of machines.

In the construction shown in Fig. 2, we can dispense with the shaft 53 and gears 52 and 54, for in this case we merely run driven shaft 50 to the rear and mesh its gear 51 directly with clutch gear 55.

In the construction shown in Fig. 15, we dispense with still more shafts and gears. In this case the shaft 30 carries elastic cog wheel K at one end and becomes the driving shaft for driving drum 70 of release mechanism D which it carries at its other end. The stationary ratchet is attached directly to the side frame of the machine and shaft 107 becomes the driven shaft as it carries at one end, drum 71 and at its other end bevel gear 108 which meshes directly with the bevel gear on clutch E. Clutch E is located behind the engine H as stated.

With our device, the engine can be started by the crank L in the usual manner if desired.

What we claim as our invention and desire to cover by Letters Patent, is:

1. In an automobile starting device, a starting lever pivoted to the side of the automobile comprising concentrically curved racks with oppositely pitched teeth, an elastic toothed cog wheel between said racks, a stationary ratchet, a driving shaft rotative with said cog wheel and which passes centrally through the stationary ratchet, a driving drum carried by said driving shaft having a pin hole in its outer face, a spring pressed pin slidable therein, a substantially radial arm pivoted to the curved surface of the driving drum in operative relation with said pin, a spring pressed detent pivoted on the outer end of said arm in operative relation with said ratchet, a driven shaft, a driven drum carried thereby opposite the driving drum, and pin receiving holes in the driven drum opposite the pin in the driving drum, combined with an engine, a main shaft therefor, a hub carried thereby, sector shaped spring pressed arms pivoted to said hub near one of their straight edges and off the shaft center, a clutch drum formed with a head at one end which pivotally fits the main shaft and is formed as a bevel gear on its outside, a gear carried by the driven shaft which meshes therewith, and a cover fastened to the open end of the clutch drum and pivotally carried by the main shaft.

2. In an automobile, an engine, a main shaft therefor, a hub carried thereby, sector shaped spring pressed arms pivoted to said hub near one of their straight edges and off the shaft center, a clutch drum formed with a head at one end which pivotally fits the main shaft and is formed as a bevel gear on its outside, a gear carried by a starting shaft which meshes therewith, a cover fastened to the open end of the clutch drum and pivotally carried by the main shaft, and means for rotating the starting shaft as described.

3. In an automobile starting device, a starting lever pivoted to the side of the automobile comprising concentrically curved racks with oppositely pitched teeth, an elastic toothed cog wheel between said racks, a driving drum rotative with said cog wheel, an engine, a main shaft therefor, pivoted spring actuated arms carried thereby, a clutch drum pivotally supported on said main shaft outside of said arms, a driven drum proximate the driving drum rotative with the clutch drum and having a plurality of pin receiving holes, and a hole in the driving drum opposite the pin receiving holes a pin therein, a spring behind the pin, a pivoted arm operative on said pin, a spring

pressed pivoted detent at the end of said arm, and a stationary ratchet adjoining the free end of the detent.

4. In an automobile starting device, a stationary ratchet, a driving shaft passed centrally therethrough, a driving drum carried thereby having a pin hole in its outer face, a pin slidable therein, a spring behind the pin, bearings which project from the curved surface of the drum, a substantially radial arm pivoted therein in operative relation with said pin, a spring pressed detent pivoted on the outer end of said arm in operative relation with said stationary ratchet, combined with a driven shaft rotative by the engine, a driven drum carried thereby opposite the driving drum, and pin receiving holes in the driven drum opposite the pin in the driving drum.

5. In an automobile engine starting device, means for imparting rotary motion to a driving shaft, a stationary ratchet, said driving shaft passed centrally therethrough, a driving drum carried by said driving shaft having a pin hole in its outer face, a spring pressed pin slidable therein, a substantially radial arm pivoted to the curved surface of the driving drum in operative relation with said pin, a spring pressed detent pivoted on the outer end of said arm in operative relation with said ratchet, a driven shaft, a driven drum carried thereby opposite the driving drum, and pin receiving holes in the driven drum opposite the pin in the driving drum, combined with an engine, a main shaft therefor, a hub carried thereby, sector shaped spring pressed arms pivoted to said hub near one of their straight edges and off the shaft center, a clutch drum formed with a head at one end which pivotally fits the main shaft and is formed as a bevel gear on its outside, a gear carried by the driven shaft which meshes therewith, and a cover fastened to the open end of the clutch drum and pivotally carried by the main shaft, as described.

In testimony whereof we hereto affix our signatures in presence of two witnesses.

EDWARD F. RUSSELL.
EUGENE E. LAVOIE.

Witnesses:
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JOHN G. GOURDEAU.