Aug. 12, 1924. 1,504,766

H. KNIPFER

STARTING DEVICE FOR AEROPLANES

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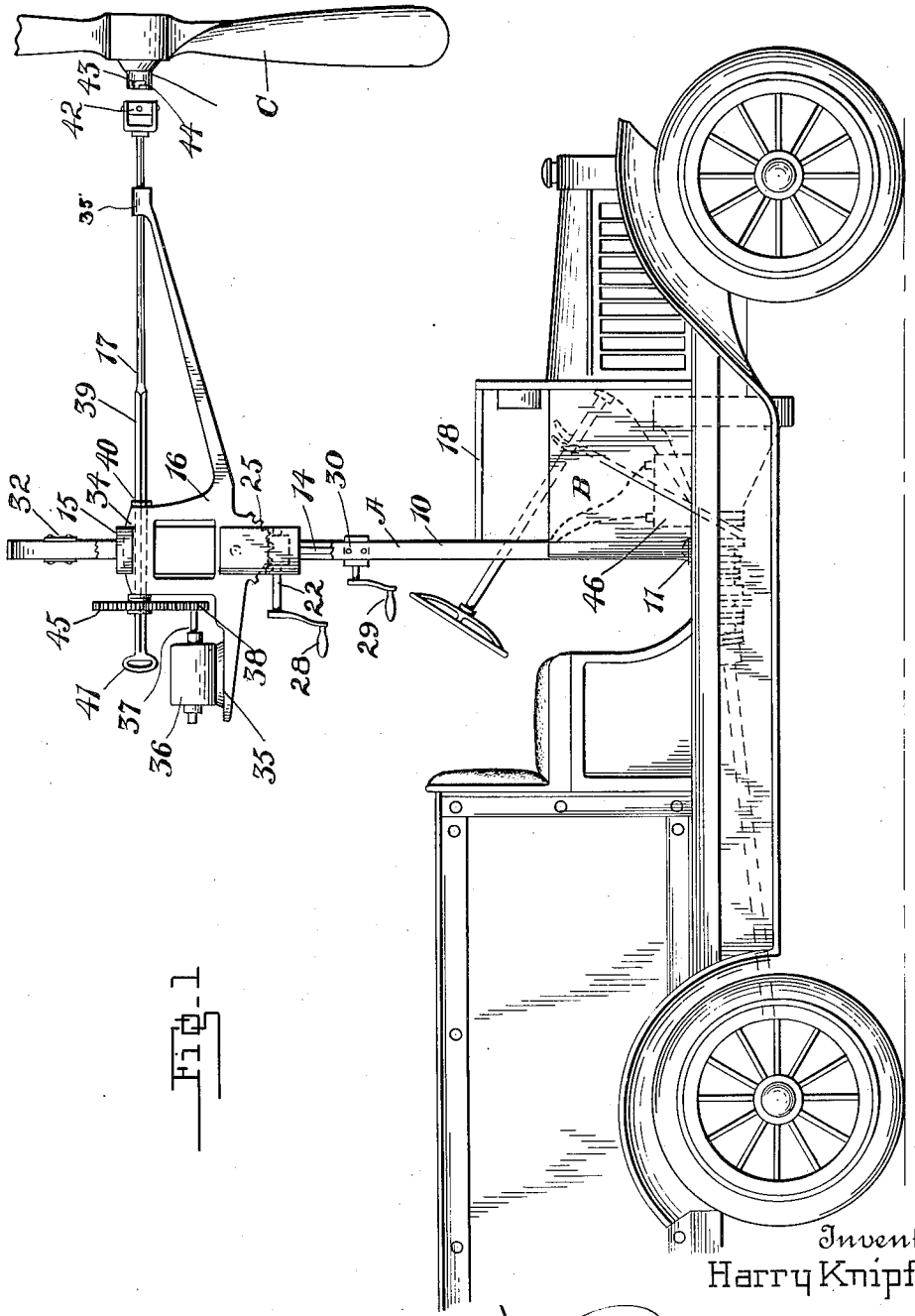


Fig. 1

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Fig. 2

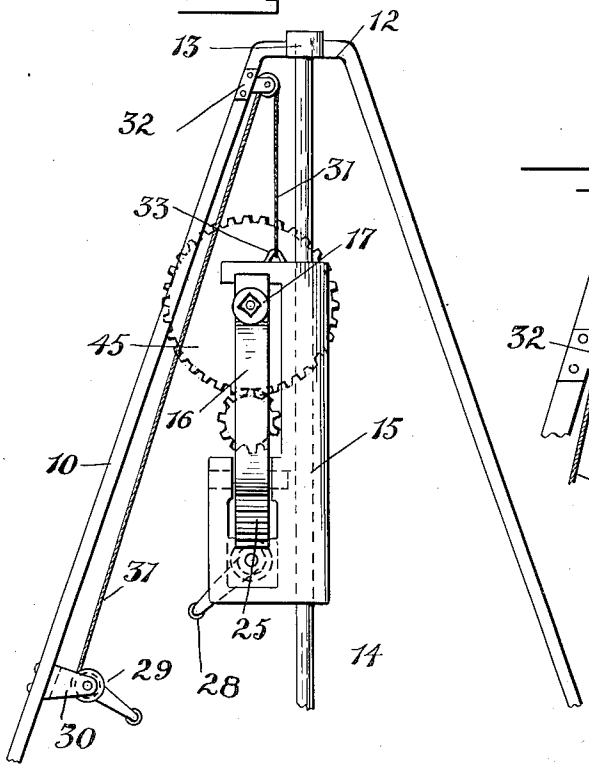


Fig. 3.

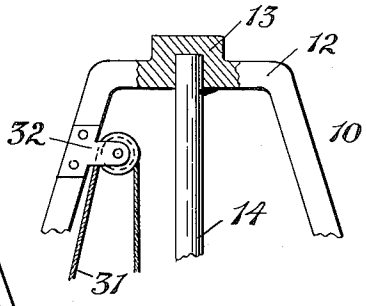


Fig. 4.

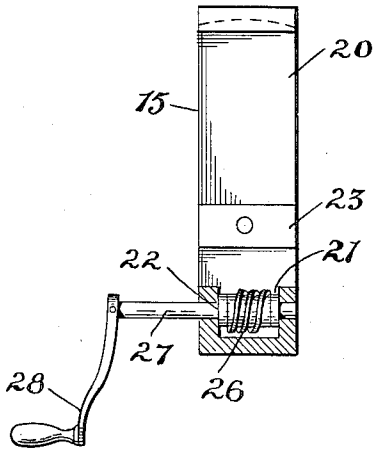
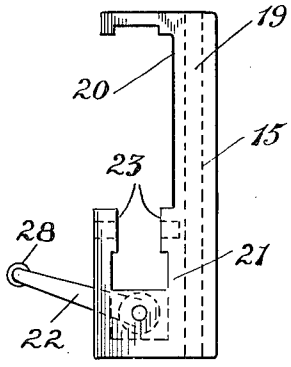


Fig. 5.



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Fig. 6.

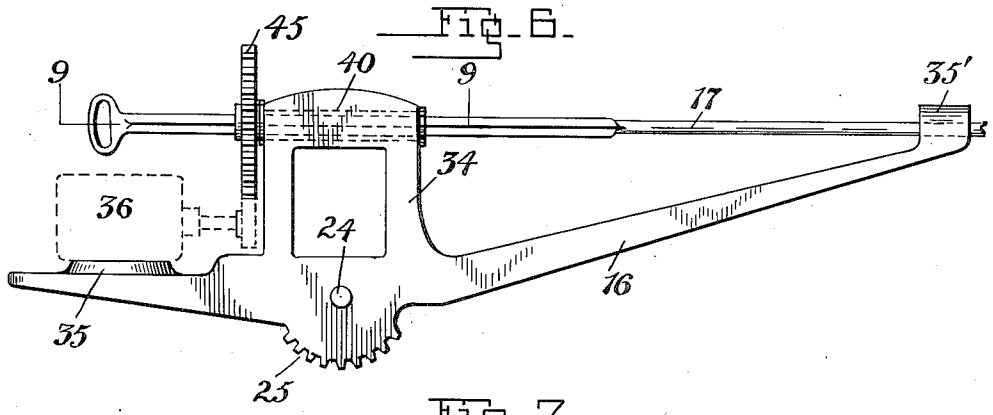


Fig. 7.

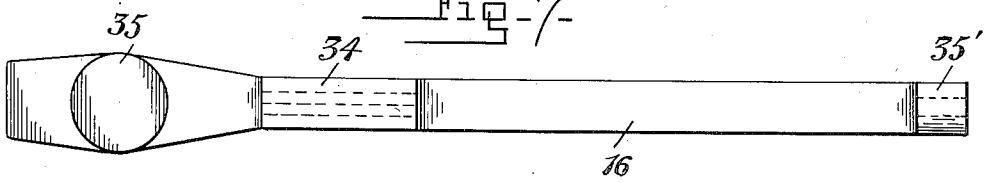


Fig. 8.

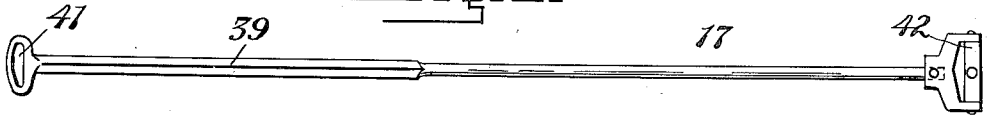
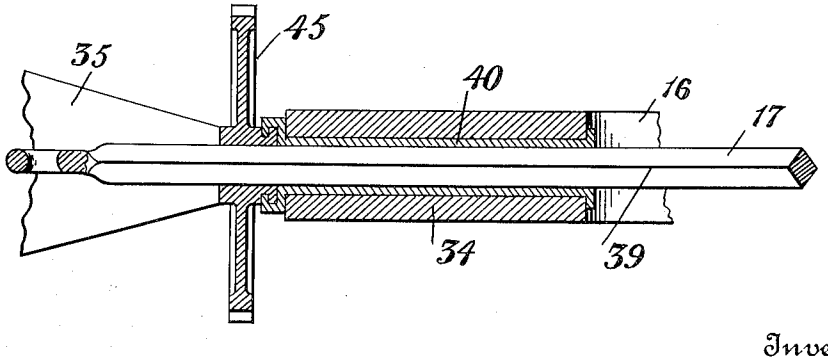


Fig. 9.



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UNITED STATES PATENT OFFICE.

HARRY KNIPFER, OF NEW AUBURN, WISCONSIN.

STARTING DEVICE FOR AEROPLANES.

Application filed March 22, 1920. Serial No. 367,910.

To all whom it may concern:

Be it known that I, HARRY KNIPFER, a citizen of the United States, residing at New Auburn, in the county of Chippewa and State of Wisconsin, have invented certain new and useful Improvements in Starting Devices for Aeroplanes, of which the following is a specification.

This invention relates to starting and cranking devices for aeroplanes, and the primary object of the invention is to provide an improved mechanical means for starting the engine of aeroplanes so as to eliminate the necessity of starting the same by hand, thereby eliminating the manual labor and danger associated therewith.

Another object of the invention is to provide an improved means for starting the engines of aeroplanes including a wheeled body so that the starter may be readily moved over a field to start the engines of aeroplanes located at various points on the field.

A further object of the invention is to provide means for starting the engines of aeroplanes including a motor vehicle truck and a frame carried by the truck having a starting shaft arranged to detachably engage the hub of an aeroplane propeller, and means for mechanically rotating said starting shaft.

A further object of the invention is to provide an improved means for raising and lowering the starting shaft so as to permit the same to engage the propellers of flying machines of various sizes, said starting shaft also having means for permitting the angle thereof in relation to the horizontal to be adjusted so as to permit the same to engage the propellers arranged at various angles.

A further object of the invention is to provide means for permitting the starting shaft to be moved laterally in relation to the supporting frame so as to permit the convenient engagement of the starting shaft with the aeroplane propeller, when the supporting motor truck has not been stopped at the correct position in relation to the aeroplane propeller.

A still further object of the invention is to provide an improved means for starting the engines of aeroplanes, of the above character which is durable and efficient in use, one that is simple and easy to manufacture, and one which can be placed upon the market at a reasonable cost.

With these and other objects in view, the invention consists in the novel construction, arrangement and formation of parts, as will be hereinafter more specifically described, claimed and illustrated in the accompanying drawings forming a part of this specification, in which:

Figure 1 is a side elevation of the improved cranking mechanism for the engines of areoplanes showing the same mounted on a motor truck body, and in operative position in relation to the propeller of an aeroplane.

Figure 2 is a fragmentary front elevation of the same.

Figure 3 is an enlarged fragmentary front elevation of the same, parts of the same being shown in section.

Figure 4 is a vertical longitudinal section through the sliding block for carrying the starting shaft frame.

Figure 5 is a detail elevation of the block for carrying the starting shaft frame.

Figure 6 is a side elevation of the starting shaft and frame.

Figure 7 is a top plan view of the frame for the starting shaft.

Figure 8 is a detail view of the starting shaft, and

Figure 9 is a fragmentary enlarged longitudinal section through the supporting frame for the starting shaft taken on the line 9—9 of Figure 6.

Referring to the drawings in detail, wherein similar reference characters designate corresponding parts throughout the several views, the letter A indicates the improved cranking mechanism for the engine of an aeroplane and B the motor vehicle for carrying the starting mechanism, and C the propeller of an aeroplane.

The improved starting mechanism A includes a substantially inverted V-shaped frame 10 having outwardly extending feet 11 formed thereon, which are bolted or otherwise secured to the chassis of the motor vehicle B. As shown the frame 10 is bolted to the upper surface of a motor vehicle directly in rear of the dashboard thereof so as to permit the motor vehicle to be driven directly in front of the aeroplane to be cranked. However, it is to be understood that the position of the frame 10 on a motor vehicle is merely arbitrary and the same can be secured on the upper surface of the truck body at any portion thereof such as to permit the starting shaft to project

outwardly from one side thereof. The bight portion 12 of the inverted V-shaped frame 10 supports a bearing or hub 13 for the upper end of the cylindrical centrally disposed vertical standard 14, on which is slidably mounted the block 15 for the frame 16 of the starting shaft 17. The lower end of the centrally disposed standard 14 may be secured in any preferred manner at its lower end to the motor vehicle and as shown in Figure 1, an inwardly extending brace 18 is carried by the motor vehicle for receiving the said lower end of the standard.

The block 15 is provided with a vertically extending longitudinal bore 19, which slidably and rotatably receives the centrally disposed standard 14. The block, as clearly shown in Figure 2 of the drawings, projects laterally from one side of the standard, and this laterally projecting portion is provided with notches or recessed sections 20 and 21 in which is fitted respectively the frame 16 for the starting shaft 17 and the adjusting mechanism 22 for the inclination of the frame 16. The block 15 is provided with a pair of bearings 23 which rotatably receive the terminals of the shaft 24 carried by the frame 16 of the starting shaft. The shaft 24 is located intermediate the ends of the frame 16 and adjacent to its lower end. The lower end of the frame 16 has formed thereon in concentric relation to the shaft 24 the arcuate rack bar or sector worm 25, which is adapted to be engaged by the worm 26 keyed to the adjusting shaft 27 which is operated by a hand crank 28. The worm 26 is positioned in the recess 21 and the walls of said recess form bearings for the adjusting shaft 27. Thus it can be seen that by turning the hand crank the inclination of the frame 16 may be regulated for a purpose which will be hereinafter more fully described. The block 15 can be raised or lowered on the centrally disposed standard 14 by means of a small hand windlass 29 which is secured as at 30 to one leg of the inverted V-shaped frame. The cable 31 for the windlass 29 is trained over a pulley 32 secured to the frame adjacent to its upper end. The outer end of the cable is secured to the upper end of the block 15 as at 33. Thus it can be seen by winding upon the windlass, the block can be raised when desired for a purpose which will be hereinafter more fully described. The block 15 can be rotated also on the standard 14 so as to swing the frame in a horizontal plane the purpose of which will be also hereinafter more fully described.

The frame 16 includes an intermediate bearing 34 and an end bearing 35 and these bearings are adapted to receive the starting shaft 17. The rear end of the frame 16 is provided with a platform 35 on which is adapted to be positioned any preferred type of starting motor 36, the armature 37 of which is provided with a gear wheel 38. The starting shaft 17 is provided with a squared portion 39 adjacent to its rear end and this squared portion 39 is slidably mounted in a squared bearing sleeve 40 which is rotatably mounted in the intermediate bearing bracket 34. The outer end of the shaft 17 is provided with an operating handle 41 by means of which the shaft may be readily slid in or out of the bearing sleeve 40. The bearing sleeve 40 is held against movement in the bearing brackets 34 by suitable annular flanges formed on the terminals thereof. The outer terminal of the starting shaft 17 is provided with a head 42, which is swivelly connected to the starting shaft by any suitable preferred type of universal joint, and the head is provided with pins which are adapted to engage in suitable cam slots 43 formed in the hub 44 of the propeller C. Thus it can be seen that if the motor vehicle is not driven to the desired correct point in relation to the propeller, the shaft 17 may be readily slid in or out so as to facilitate the positioning of the head 42 on the hub 44. The shaft 17 has also mounted on the square portion 39 thereof a relatively large gear wheel 45 which is provided with a hub having a squared bore for the reception of the squared portion of the shaft. This permits the adjustment of the shaft in relation to the gear wheel and still permits the rotation of the gear wheel with the shaft. The gear wheel may be connected with the bearing sleeve 40 in any preferred manner if so desired so as to prevent the accidental displacement thereof. The relatively large gear wheel 45 meshes with the relatively small gear wheel 38 secured to the armature shaft 37 of the motor 36 and thus it will be seen that when the motor is in operation the starting shaft 17 will be rotated therewith. The motor 36 is connected in any preferred manner to a suitable source of electrical energy, such as a storage battery 46 which may be secured on any portion of the motor vehicle body. A hand switch is adapted to be interposed in the circuit for the motor 36 so as to control the operation thereof.

In operation of the improved device, the motor vehicle B is driven in front of the aeroplane which is to be started, and the crank 29 is turned until the shaft 17 is at the correct elevation in relation to the hub of the aeroplane propeller, at which time the shaft 17 is forced inwardly into engagement with the hub. The electric motor is then started and when the engine of the aeroplane starts the shaft 17 will be forced out of engagement with the hub 44 and the motor is then stopped. If the propeller of the aeroplane is at a different angle than

the starting shaft 17, the hand crank 28 may be turned so as to permit the worm to turn the sector worm wheel 25, and swing the frame 16 on the shaft 24 to adjust the inclination of the shaft 17 to the same or approximately the same inclination as the propeller C. The head 42 is connected to the shaft 17 by a universal coupling which also permits the shaft 17 to be connected to the propellers of aeroplanes which are positioned at different angles to the starting shaft. If the motor vehicle is driven up to the aeroplane with the starting crank at one side of the hub 44, the block 15 can be rotated or swung on the centrally disposed standard 14 so as to bring the head 42 in engagement with the hub 44.

From the foregoing description it can be seen that an improved mechanical means is provided for starting the engines of aeroplanes which is exceptionally durable in construction, and which can be readily adjusted so as to permit the use thereof with all sizes and forms of aeroplanes.

Changes in details may be made without departing from the spirit or scope of my invention; but,

I claim:

1. A starting device for the engines of aeroplanes comprising a wheeled body, a frame carried by the wheeled body, a block slidably and rotatably carried by the frame, means for adjusting the elevation of the block, a starting shaft rotatably carried by the block, an electric motor carried by the block, and means for operatively connecting the motor and the starting shaft.

2. A device for starting the engines of aeroplanes comprising a wheeled body, an upstanding frame carried by the wheeled body, a block slidably carried by the frame, means for adjusting the elevation of the block, an electric starting motor carried by the block, means for operatively connecting the shaft with the starting motor, and means slidably mounting the shaft on the block in relation to the block and starting motor.

3. A starting device for the engines of aeroplanes comprising a wheeled body, an upstanding frame carried by the wheeled body, a block slidably supported by the frame, means for adjusting the elevation of the block, a starting shaft, a frame for the starting shaft, means pivotally connecting the frame of the starting shaft with the block, means for adjusting the elevation of the starting shaft in relation to the horizontal, an electric motor carried by the starting shaft frame, and means for operatively connecting the starting motor with the starting shaft.

4. In a starting device for the engines of aeroplanes, a substantially inverted V-shaped frame a centrally disposed standard carried by the frame, a block slidably and rotatably mounted on the standard, means for adjusting the elevation of the block on the standard, a shaft rotatably carried by the block, a starting motor carried by the block, and means for operatively connecting the starting motor with the starting shaft.

5. In an aeroplane engine starting device, an inverted V-shaped frame, a centrally disposed cylindrical standard carried by the frame, a block slidably mounted on the standard, a starting shaft, a frame for rotatably and slidably supporting the starting shaft, means pivotally connecting the frame with the block, means for adjusting the inclination of the frame in relation to the horizontal, means for adjusting the elevation of the block, a starting motor carried by the frame, and means operatively connecting the starting motor with the starting shaft.

6. In a starting device for the engines of aeroplanes, a frame, a block slidably and rotatably carried by the frame, means for adjusting the elevation of the block, a starting shaft, a frame rotatably and slidably supporting the starting shaft, means pivotally connecting the starting shaft frame with the block, a sector worm wheel secured to the starting shaft frame intermediate its ends, a worm wheel rotatably carried by the block and meshing with the sector worm wheel, means for rotating the worm, a starting motor carried by the starting shaft frame, and means for operatively connecting the motor with the shaft.

7. In a starting device for internal combustion engines, a standard, a block slidably and rotatably mounted on the standard, a frame pivotally secured to the block, means carried by the block for swinging said frame on its pivot, a starting shaft rotatably and slidably carried by the frame, and an operating motor for the shaft carried by the frame.

8. In a starting device for internal combustion engines, an inverted substantially V-shaped supporting frame, a centrally disposed standard carried by the frame, a block slidably and rotatably mounted on the standard, a starting shaft carried by the block, means for operating the starting shaft, a block rotatably carried by the supporting frame, means for rotating the drum, a cable wound upon the drum and secured to the block, and a guide pulley for the cable secured to the supporting frame above said block.

9. In a starting device for internal combustion engines, a vertically disposed standard, a block having a vertical bore formed therein at one side of the longitudinal axis thereof for slidably and rotatably receiving the standard, said block having an inwardly extending recess formed in one longitudinal side edge thereof, a starting shaft frame arranged in said recess and projecting

forwardly and rearwardly therefrom, means pivotally securing the starting shaft frame to the block, means carried by the block for swinging the starting shaft frame on its pivot, a starting shaft carried by the frame, and means for operating said starting shaft.

10. In a starting device for internal combustion engines, a support, a starting shaft frame pivotally secured to the support intermediate its ends, a forwardly extending arm formed on the frame, a rearwardly extending base plate formed on the frame, the starting shaft frame having a horizontally disposed bore formed therein, a collar formed on said arm arranged in alignment with said bore, a sleeve rotatably mounted in said bore having outwardly extending flanges formed on the opposite ends thereof for engaging the opposite faces of the starting shaft frame, said sleeve having a polygonal shaped bore, a starting shaft polygonal shaped in cross section slidably mounted in said sleeve, and rotatably and slidably mounted in said collar, a gear wheel having a polygonal shaped bore slidably mounted upon said starting shaft, means operatively connecting the gear wheel with said sleeve, a starting motor arranged on said rearwardly extending base plate including a drive shaft, a gear wheel secured to said drive shaft and meshing with said first mentioned gear wheel, means carried by the forward end of said shaft for engaging a propeller of an aeroplane, and a handle carried by the rear portion of said starting shaft.

11. In an aeroplane launching device, the combination with the blades of an aerial propeller, of rotatable projections adapted to engage with said blades, means for adjusting said projections substantially longitudinally of the propeller axis, and means for adjusting them laterally and also vertically relatively to said axis, all of said adjustments being manually operated from a common point remote from the point of application of said projections.

12. A starting device for aeroplane propeller engines, comprising a base, a rotatable support thereon, a secondary support adjustably mounted on the rotatable support, a motor carried by the secondary support, and means operatively connected to the motor and adapted to be operatively connected with the propeller shaft.

HARRY KNIPFER.