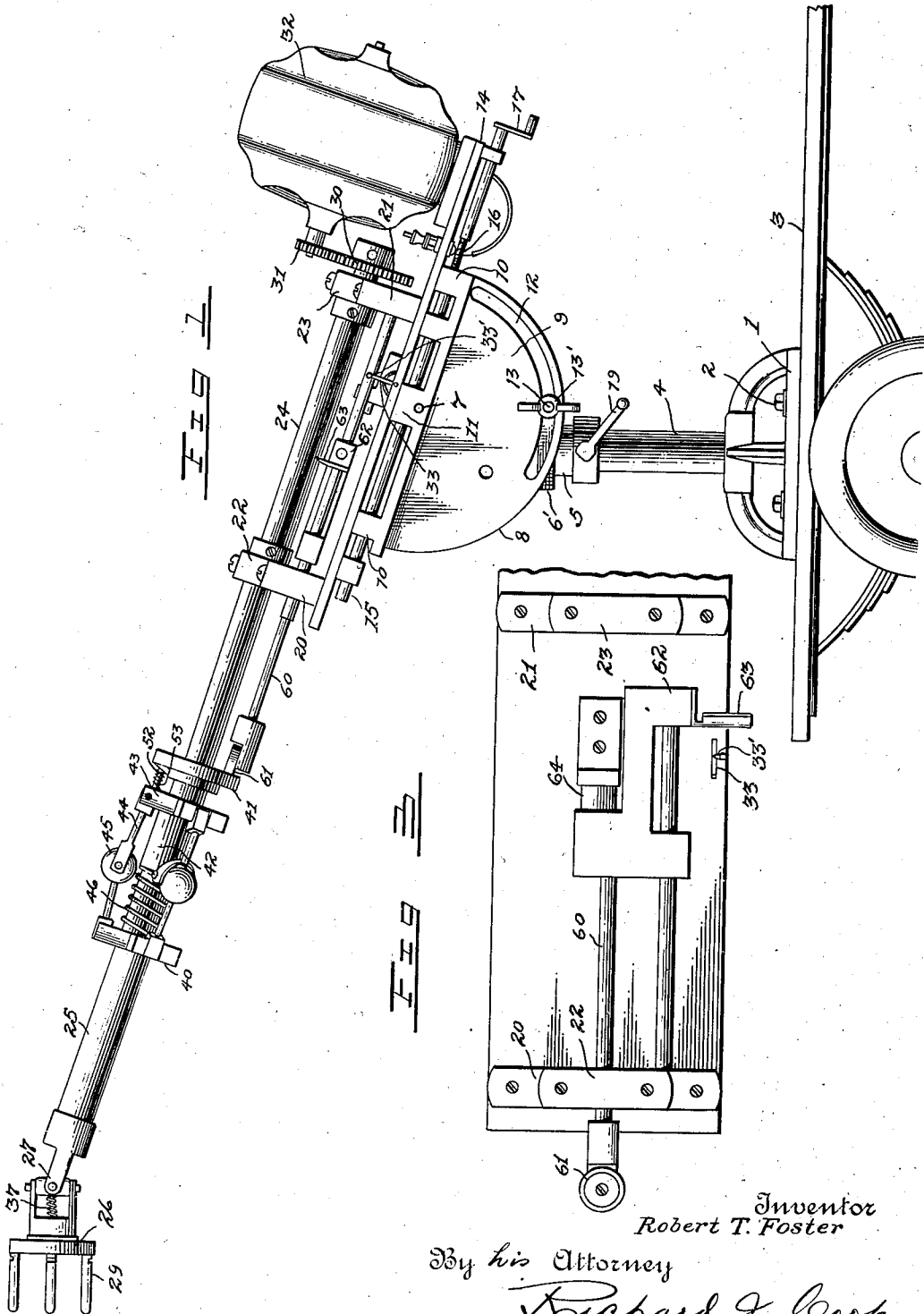


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APPLICATION FILED MAY 10, 1920.

1,417,508.

Patented May 30, 1922.

2 SHEETS—SHEET 1.



Inventor
Robert T. Foster

By his Attorney

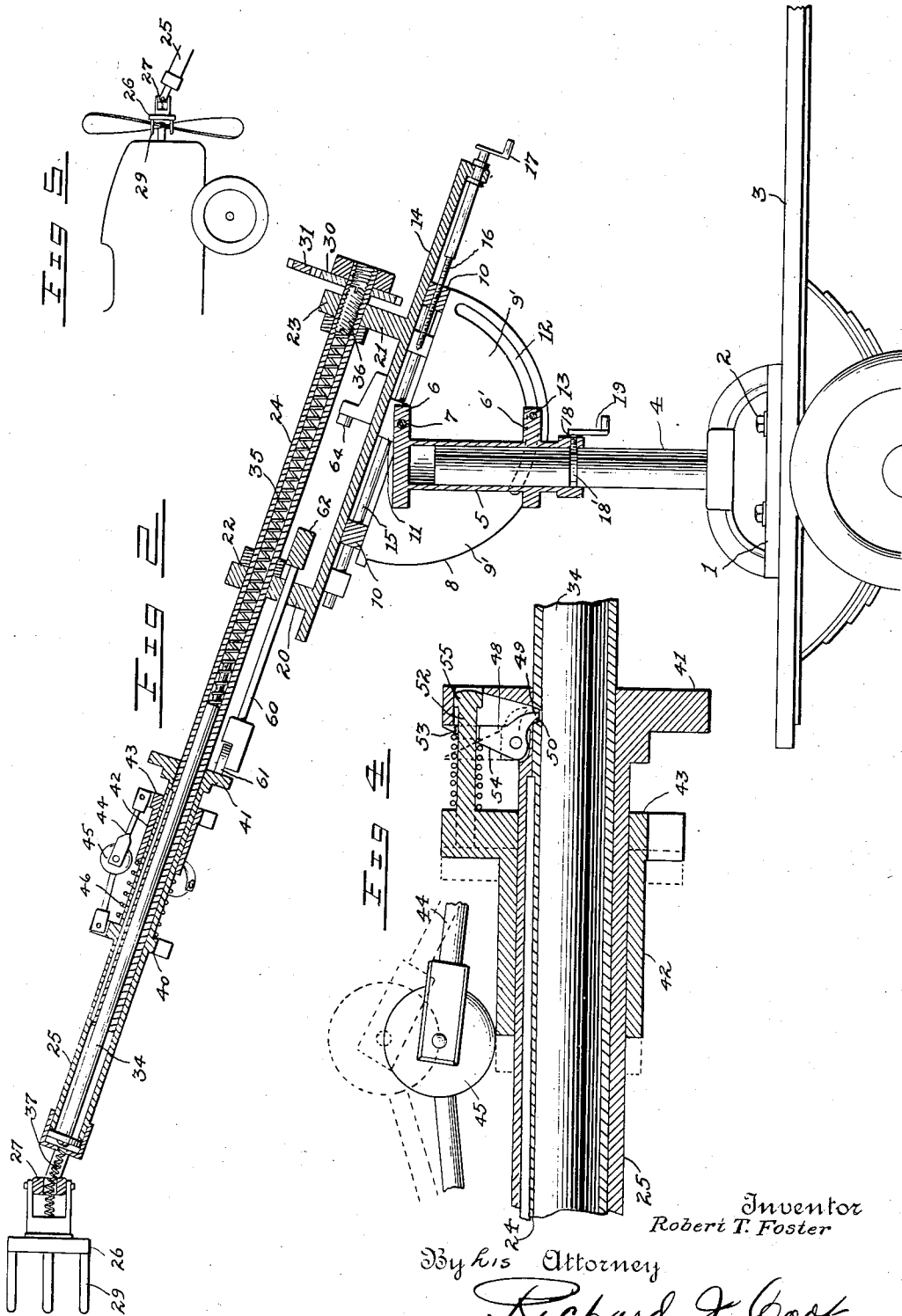
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UNITED STATES PATENT OFFICE.

ROBERT T. FOSTER, OF SEATTLE, WASHINGTON.

STARTING DEVICE FOR AEROPLANE ENGINES.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ROBERT T. FOSTER, a citizen of the United States, and resident of the city of Seattle, county of King, and State of Washington, have invented certain new and useful Improvements in Starting Devices for Aeroplane Engines, of which the following is a specification.

This invention relates to improvements in starting devices for internal combustion engines, and more particularly to a device for starting, or cranking the engines of aeroplanes or the like; the principal object of the invention being to provide a portable, electrically driven device of this character, comprising a cranking shaft, having telescoping sections that may be extended and removably attached to the propeller of an aeroplane, and may be driven to effect starting of the aeroplane engine, and which will automatically detach itself from the propeller after the engine has been started.

It is also an object of the invention to provide a device of this character comprising a cranking shaft that is mounted upon a tiltable base member that may be adjusted to permit the shaft to be extended in various directions and at different elevations, so that it may be applied to one or more engines on the same aeroplane without re-setting or relocating the vehicle on which the starting device is supported.

It is also an object of the invention to provide governor mechanism on the starting shaft that is operable to effect the automatic release of the shaft from the aeroplane member when a certain driving speed has been attained, and to provide a circuit control switch for the motor which operates the starting shaft which will be actuated by the shaft when released to open the circuit to the motor.

It is a further object of the invention to provide novel means for elevating and extending the sections of the starting shaft in the different directions, and to provide means for retaining the shaft at any adjusted position.

In accomplishing these and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein—

Figure 1 is a side elevation of a starting device constructed according to the present

invention; showing the cranking shaft extended.

Figure 2 is a longitudinal sectional view of the same.

Figure 3 is a plan view of the adjustable platform whereon the cranking shaft is mounted, showing the push rod and guides used for extending the shaft sections.

Figure 4 is a detail sectional view, illustrating the locking dog which holds the shaft sections extended, and the governor mechanism which actuates it from locking position.

Figure 5 is a view illustrating the manner in which the clutch head is applied to an aeroplane propeller for starting the aeroplane engine.

Referring more in detail to the several views of the drawings wherein like reference numerals designate like parts, 1 designates a base plate which may be secured in any suitable manner, as by bolts 2, upon the frame or body of a vehicle of any suitable character whereon the device may be conveniently transported. Mounted in this base plate is a vertical post 4 which, at its upper end, has a sleeve 5 revoluble thereon.

Formed on the sleeve, adjacent its upper and lower ends, respectively, are laterally directed flanges 6 and 6', and pivotally supported by a pin 7 that is extended horizontally through the flange 6, is a frame 8, comprising two semi-circular plates 9 and 9', which depend along opposite sides of the sleeve with their straight edges in the same plane and secured together at opposite ends by cross bars 10, and which have blocks 11 fixed thereto at opposite sides of the flange 6 through which the pivot pin 7 extends to support the frame. Each of the plates has an arcuate slot 12 formed therein, about the pin 7 as a center, through which the opposite ends of a bolt 13 are extended, and threaded onto the ends of the bolt are nuts 13' which may be loosened to permit pivotal adjustment of the carriage on the pin 7 and may be tightened to hold the same at any adjusted position.

Mounted slidably upon the cross bars 10 of the frame is a platform 14, which is held in position by means of guide rods 15 fixed on the under side thereof and slidable longitudinally through the cross bars 10 and blocks 11. A screw 16 is fixed revolubly at one end in a depending end flange of the

platform 14 and at the opposite end threads into a cross bar 10 of the frame, which may be turned by a crank 17 at its outer end to effect longitudinal adjustment of the platform on the supporting frame.

Threaded through the lower end of the sleeve 5 is a bolt 18, which, at its inner end, extends into an annular slot 18' in the shaft, and at its outer end has a crank 19 fixed thereon whereby it may be turned and tightened against the shaft to hold the sleeve and platform against rotation on the post.

Secured at the forward and adjacent the rearward ends of the platform 14, are cross beams 20 and 21, comprising bearings 22 and 23, wherein a tubular cranking or starting shaft 24 is revolvably mounted. This shaft extends from the platform and at its outer end has a tubular extension 25, keyed telescopically thereon which, in turn, has a clutch head 26 fixed at its outer end through the connection of a universal coupling, as is indicated at 27. The head consists of a base plate from which posts or fingers 29 are extended in a manner that will permit them to engage the propeller of an aeroplane in a driving connection, as is illustrated in Figure 5; the method of applying being to extend the posts of the head along opposite sides of the propeller at the hub portion, so that the head is concentric with the engine shaft whereon the propeller is mounted.

The extension 25 is adapted to move longitudinally on the shaft section 24 but not revolvably so that the clutch head is driven by driving the mounting section, which at its inner end has a gear wheel 30 fixed thereon that operates in mesh with a driving gear wheel 31 on the shaft of an electrically driven motor 32, that is mounted on the platform 14, through which a circuit is controlled by a switch 33.

Slidably contained within the shaft 24 is a rod 34 which, at its outer end, has a fixed connection with the outer end of the extension 25, and at its inner end has the outer end of a coiled spring 35 fixed thereto, which yieldingly holds the extension shaft at its inner limit, or telescoped position; the inner end of the spring being fixed to a plug 36 that is threaded into the inner end of the shaft section 24.

A coiled spring 37 of considerable stiffness is also attached to the clutch head and end of the shaft, which serves to hold the clutch extended and provides for easier application to the aeroplane propeller when the parts are adjusted to starting position.

Fixed on the inner end of the extendible shaft section are annular, spaced-apart collars 40 and 41, and slidably contained on the shaft intermediate these collars is a sleeve 42 provided with an annular flange 43. Pivottally attached to the flange 43 and collar 40 are the weight arms 44 of a ball governor 45,

which acts, as the shaft is revolved, to draw the sleeve toward the collar against the pressure of a spring 46, coiled about the tube and bearing at its opposite ends against the sleeve and collar 41.

Pivottally mounted on the extension member, adjacent the collar 41, is a holding dog or latch, 48, having a tooth 49 adapted to extend through an opening in the tubular shaft section 25, and into a notch 50 in the shaft 24, when the outer section is extended to hold the parts in this position against the tension of the spring 35. A pin 52 extends from the face of the flange 43 of the sleeve 42, through an eye 53 in the arm 54 of the dog, and at its end has a head 55 thereon which will engage the arm as the sleeve is drawn outwardly by the governor device, and will in this way release the dog from locking relation with the shaft and permit the parts to telescope.

Slidably mounted in the cross bearing 20, and extending in the longitudinal direction of the shaft, is a push rod 60 provided at its outer end with a roller 61 which may engage the flange 41 of the extendible shaft section 25, and at its inner end has a head 62 provided with a laterally extending handle 63, whereby the rod may be moved outwardly to extend the shaft sections. Also fixed on the platform is a yieldable bumper 64 against which the head of the push rod may strike to limit the inward movement of the rod and extension shaft when the latter is released by the latch 48.

The switch 33 is so located on the platform that the switch lever 33' will be engaged by the handle of the push rod, when the latter is moved to its inner limit of travel, and will cause the circuit to the motor to be opened and driving thereby stopped.

Assuming that the device is thus constructed and mounted, in using the same for starting an aeroplane engine, it is positioned by the vehicle forwardly of the propeller of the plane. The shaft 25 is then extended by moving the push rod 60 outwardly and the platform is adjusted at the proper incline and direction that will place the head 26 adjacent the forward side of the propeller hub. By turning the crank 17, a closer adjustment of the shaft 25 is made to effect the proper driving engagement of the fingers 29 with the propeller. The switch 33 is then closed to energize the motor which by its operation drives the shaft 24 to start the aeroplane motor.

After the motor has been started, the governor mechanism acts to move the sleeve 42 outwardly, which, through the pin 52, moves the dog from locking position, so that the spring 35 draws the extension shaft inwardly to disengage the head 26 from the propeller.

As the shaft sections telescope, the push rod moves inwardly so that its handle engages the switch lever 33' to open the circuit to the motor and stop driving of the shaft.

5 It is apparent that with the device mounted as described, it could, if properly positioned, be used to start one or more engines of the same plane without relocating.

10 Having thus described my invention, what I claim as new and desire to protect by Letters Patent, is:

1. A device of the character described comprising a base member, a vertical post supported by the base member, a platform supported revolubly on said post and adapted to be tilted to various degrees of inclination, a starting shaft comprising telescoping sections, mounted revolubly on said platform and extendible therefrom, a clutch head at the outer end of the shaft removably applicable to the propeller of an aeroplane or the like to effect driving connection with the aeroplane engine, means for extending the telescoping shaft sections, a locking dog for retaining the sections normally extended, a spring for telescoping the shaft sections when the dog is released, a motor on the platform for driving the starting shaft and a governor mechanism on the shaft operable to release the dog when said shaft is revolved at a predetermined speed to effect the release of the clutch head from the aeroplane propeller.

2. A device of the character described comprising a base member, a post fixed vertically on the said base, a sleeve mounted revolubly on the post, a platform hingedly mounted on the sleeve, means for securing the platform at an adjustably inclined position and other means for securing the sleeve at any position to which it may be revolved on the post, a cranking shaft revolubly mounted on the platform, an extension shaft telescoping on the first shaft and keyed to move longitudinally thereon, a clutch head at the outer end of the extension section adapted for removable attachment with an aeroplane propeller or the like, means for extending the outer shaft section to move the clutch into functional position, a dog pivotally mounted on the outer section adapted to hold the same normally extended, a spring contained within the shaft for telescoping the parts when the dog is released, a motor on the platform having driving connection with the cranking shaft and a governor mechanism operable to release the dog when the shaft is revolved at a predetermined speed to effect the release of the clutch from driving engagement.

3. A device for starting aeroplane engines or the like, comprising a base member, a platform revolubly mounted on the base, an extendible shaft revolubly mounted on the platform, a motor on the platform having driving connection with the shaft, a clutch head mounted at the outer end of the shaft through the intermediacy of a universal connection and removably applicable to the propeller, or shaft of an aeroplane engine or the like, means for extending the shaft to adjust the clutch to driving position, and means for automatically releasing the clutch from this connection when the shaft is revolved at a certain speed.

4. In a device of the character described, a revoluble and tiltable supporting platform, a tubular shaft revolubly mounted on the platform having an extension shaft telescopically mounted and keyed to move longitudinally on its outer end, a clutch head fixed at the outer end of the extension section through a universal connection, a rod slidable within the shaft fixed at its outer end to the extension section, a spring within the shaft fixed at one end to the inner end of the rod and at its opposite end within the inner end of the shaft to yieldingly retain the extension section at its inner limit of travel, an annular flange formed on the inner end of the extendible section, a push rod slidably mounted on the platform engageable with the flange and movable to adjust the section to extended position, a locking dog for holding the parts normally extended, and a governor device operable on revolving the shaft at a certain speed, to actuate the dog to release the section, for the purpose set forth.

5. In a device of the character described, a supporting platform, a cranking shaft revolubly mounted on and extending from the platform, having an extendible section telescopically keyed thereon, provided at its outer end with a driving clutch head and at its inner end with an annular flange, a push rod slidably mounted on the platform having a roller at its outer end engageable with the flange and a handle at its inner end whereby it may be moved to advance the extension, a spring for drawing the extension inwardly when released, an electric motor for driving the shaft, a switch for closing the circuit to the motor, engageable by the push rod handle when it is moved inwardly by release of the shaft extension to open the circuit to the motor, for the purpose set forth.

Signed at Seattle, Washington, this 29th day of April, 1920.

ROBERT T. FOSTER.