June 17, 1930. F. O. REED 1,763,819

AEROPLANE

Filed Sept. 4, 1929 3 Sheets-Sheet 1

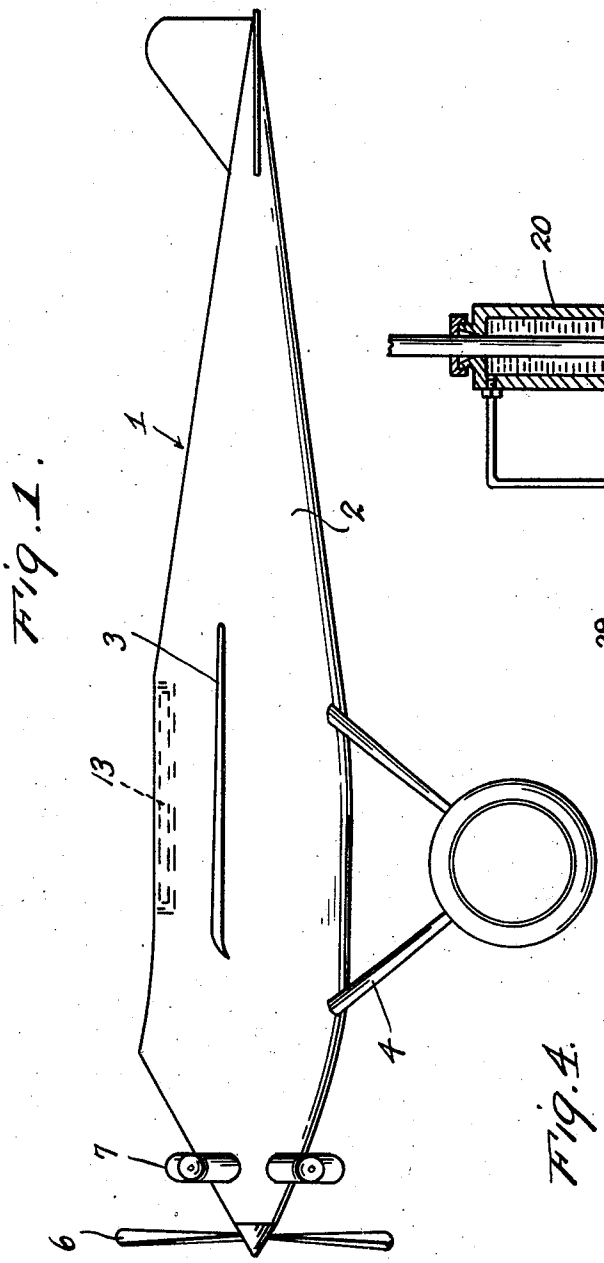


Fig. 1.

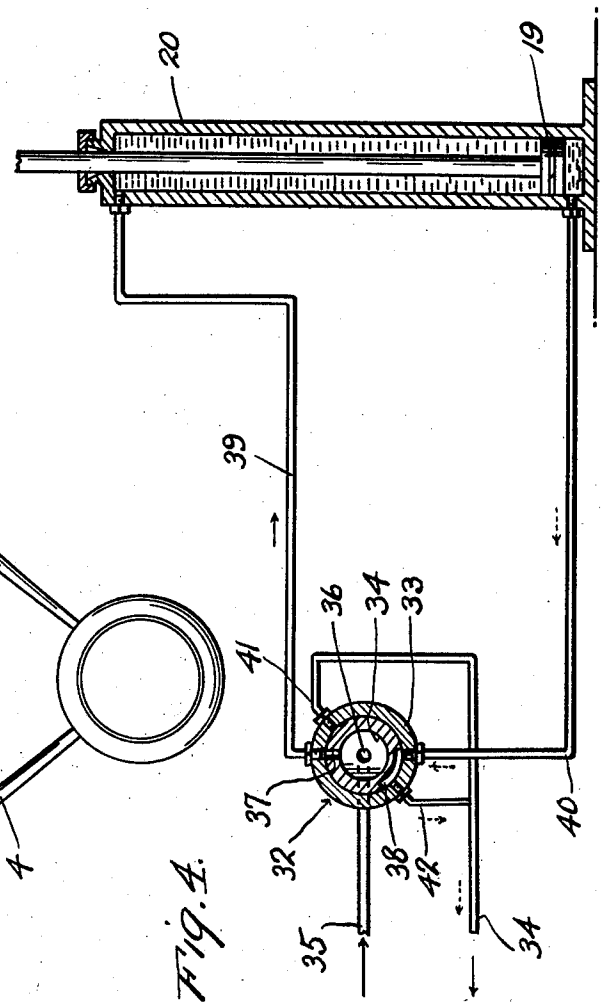


Fig. 4.

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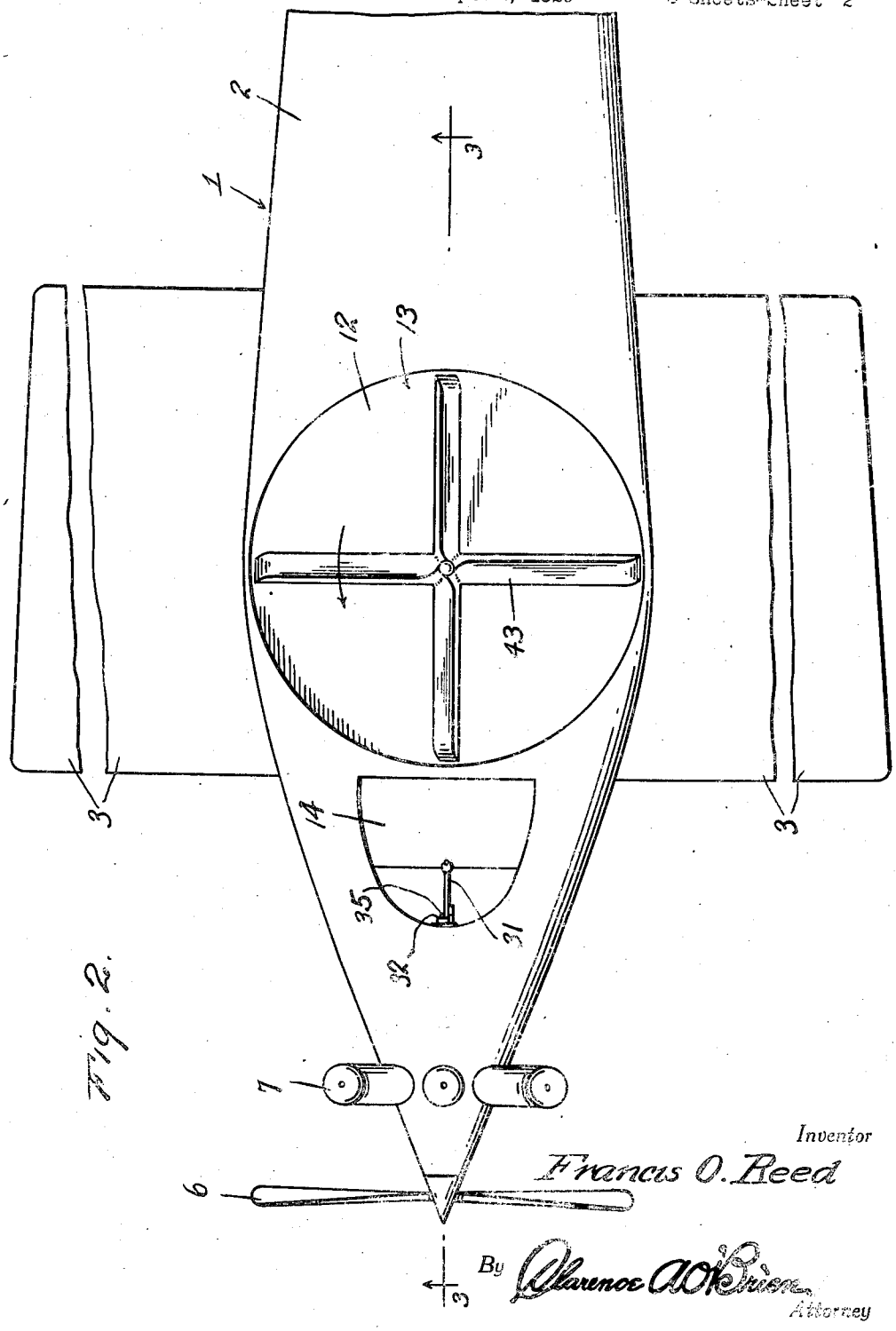


Fig. 2.

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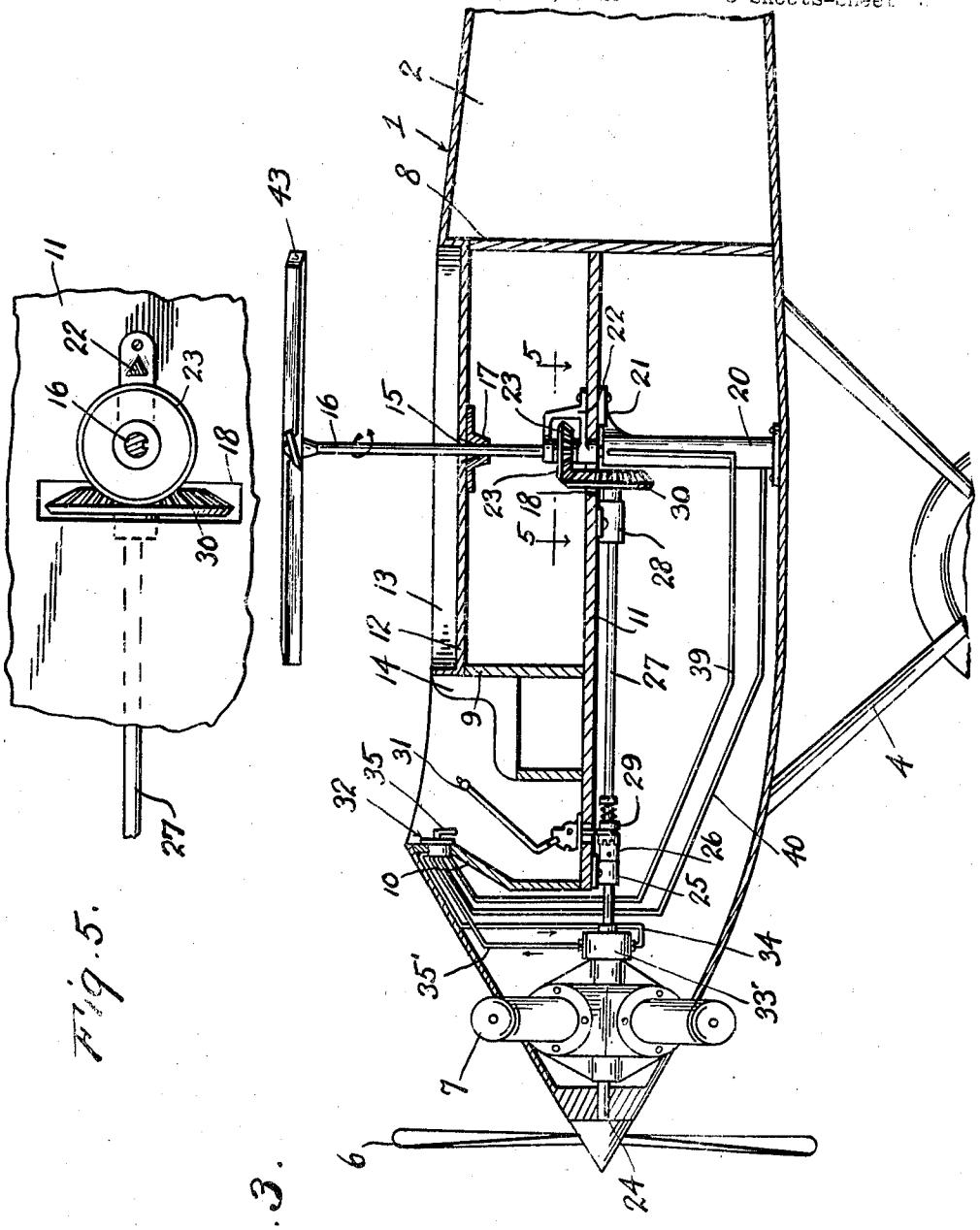


Fig. 5.

Fig. 3.

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UNITED STATES PATENT OFFICE

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AEROPLANE

Application filed September 4, 1929. Serial No. 390,299.

This invention relates to aeroplanes and more particularly to machines of this character having lifting mechanism embodied therein for raising the craft vertically from the ground and has for one of its objects the provision of a craft of this character, wherein the vertical lifting mechanism is constantly under the control of the operator or pilot.

Another object of the invention is to provide, in a manner as hereinafter set forth, an aeroplane of the character described, wherein the helicopter or vertical lifting propeller may be retracted into a pocket or compartment formed for that purpose in the fuselage of the aeroplane when said propeller is not in use, as is the case after the aeroplane has attained sufficient altitude.

A still further object of the invention is to provide, in a manner as hereinafter set forth, an aeroplane of the character described having hydraulically operated means for raising or lowering the helicopter propeller, and wherein said hydraulic mechanism is operated from the aeroplane engine and is constantly under the control of the operator.

Other objects of the invention are to provide an aeroplane of the character set forth, which will be simple in construction, strong, durable, efficient in its use, and which may be manufactured at a low cost.

Other objects and advantages of the invention will become apparent from a study of the following specification, taken in connection with the accompanying drawings, wherein like characters of reference designate corresponding parts throughout the several views, and wherein:

Figure 1 is a view in side elevation of an aeroplane embodying this invention.

Figure 2 is a top plan view thereof.

Figure 3 is a longitudinally sectional view taken approximately on the line 3—3 of Figure 2.

Figure 4 is a sectional view of the hydraulic jack mechanism for raising and lowering the helicopter propeller and also the control valve therefor.

Figure 5 is a detail view in top plan of the gear mechanism for coupling the helicopter propeller shaft to the power shaft from the engine.

Referring to the drawings in detail, the reference character 1 designates generally an aeroplane having a fuselage 2, wings 3, landing gear 4, screw propeller 6 and a radial type engine 7. The fuselage 2 of the craft is provided with a transversely extending vertical partition 8, and vertical walls 9 and 10, which, together with the side walls of the fuselage, constitute the pilot's compartment. The floor board 11 extends rearwardly to the partition 8 and spaced vertically therefrom is the bottom 12 of a well or compartment 13, formed in the upper side of the fuselage and extending from the wall 9 to the partition 8. The purpose of the compartment 13 will be presently set forth.

The pilot's seat is designated by the reference character 14, the bottom 12 of the well 13 is provided with a centrally disposed opening 15, for the passage of the vertical propeller shaft 16. A bearing sleeve 17 is mounted on the lower surface of the bottom 12 for rotatably supporting the shaft 16. The shaft 16 extends downwardly through an opening 18 in the floor board 11 and is provided, on its lower end, with a piston 19, adapted to reciprocate in the cylinder 20 which is mounted on the floor of the fuselage 2 and extends upwardly therefrom to a point adjacent the floor board 11. The upper end of the cylinder 20 is provided with a laterally extending supporting arm or bracket 21 for connection with the floor board 11, for supporting the upper end of the cylinder.

A substantially U-shaped bracket is secured to the upper side of the floor board 11, in vertical alignment with the opening 15, and the cylinder 20 and said bracket is provided with vertically aligned openings for

the passage of the shaft 16. The U-shaped bracket is designated by the reference character 22. A bevelled gear 23 is slidably keyed upon the shaft 16 between the bearing openings in the ends of the U-shaped bracket 22, as clearly shown in Figure 3 of the drawings. The engine 7 is provided with a crank shaft 24, which extends rearwardly from said engine and has its rear end supported in a bearing bracket 25, on the floor board 11. Rearwardly of the bracket 25, a clutch element 26 is keyed on the shaft 24. A drive shaft 27 is supported under the floor board 11, by means of a supporting bracket 28 and has its forward end provided with a slidable clutch element 29 for co-action with the clutch element 26 for coupling the drive shaft 27 to the crank shaft 24 of the engine. The rearward end of the drive shaft 27 is provided with a bevelled gear 30, which meshes with the gear 23 on the vertical shaft 16. A clutch actuating lever 31 is conveniently positioned in the pilot's compartment and connected for operating the clutch element 29.

As shown in Figure 4 of the drawings, the cylinder 20 is adapted to contain a suitable fluid, such as oil or glycerine for raising or lowering the piston 19 together with its vertical shaft 16. To accomplish this, a pump of any suitable type, such as a gear pump is mounted on the crank shaft 24 rearwardly of the engine 7 and has outlet and inlet conduits extending therefrom to a multi-way control valve 32. The pump is designated by the reference character 33', the inlet conduit by the reference character 34 and the outlet conduit is designated by the reference character 35. The valve 32 comprises an outer casing 33, and an inner rotary hollow plug or core 34. The core 34 is provided, at one end, with an actuating handle 35', and its opposite end is provided with a port 36, which establishes communication with the conduit 35 and the interior of the core 34, as shown in Figure 4. The core 34 is also provided, in its side wall, with a passage 37, and an elongated passage 38, formed in its outer periphery. A conduit 39 has its opposite ends connected to the upper end of the cylinder 20 and to the casing 33 of the valve 32. Another conduit 40 has its opposite ends connected to the lower ends of the cylinder 20 and to the valve casing 33, at a point diametrically opposite from the point at which the conduit 39 is connected. The pump inlet pipe is connected to the valve 32 at points spaced circumferentially from the conduits 39 and 40, as indicated by the reference characters 41 and 42.

A horizontally disposed propeller 43 is mounted on the upper end of the shaft 16 for lifting the plane vertically. The operation of the invention is as follows: When not in use, the propeller 43 is positioned in the compartment or well 13 in the fuselage 2. When it is desired to use this propeller for lifting or lowering the plane vertically, the core 34 of the valve 32 is rotated, until the port 37 therein registers with the end of the conduit 40 in the casing 33. In this position, the passageway 36 in the periphery of the core 33 has been shifted to a point where it establishes communication between the conduit 39 and the conduit 41 of the pump return pipe 34. The pump, when in operation, will now force the fluid through the conduit 35, into the core 34 through the centrally disposed port 36 and then out through the port 37 and into the conduit 40 from which it goes into the lower end of the cylinder 20 below the piston 19 and forces the same upwardly together with the shaft 16 and the propeller 43. When this occurs the fluid which is above the piston 19 in the cylinder 20 is forced out through the conduit 39, through the passageway 36 and into the pipe 41, where it travels to the pump through the medium of the pipe 34. The clutch elements 26 and 29 are then engaged through the medium of the actuating lever 31 and motion is thus imparted to the propeller 43 through the medium of the shaft 16, bevelled gears 23 and 30, drive shafts 27 and crank shaft 24 of the engine. When it is no longer necessary or desirable to use the propeller 43, the same is shifted or retracted into the well or compartment 13 by shifting the valve 32 to the position shown in Figure 4 of the drawings. In this position, when the pump 33 is in operation, the fluid is forced through the pipe 35, and ports 36 in the valve core 34, and into the interior of said core, from which it passes from the port 37 into the conduit 39 and into the upper end of the cylinder, said operation forcing the piston 19 downwardly and expelling the fluid therebelow through the pipe 20, passageway 36, the outlet pipe 42 and back to the pump through the return pipe 34. It is of course understood that the clutch elements are disengaged prior to returning the propeller to the housing 13.

It is believed that the many advantages of an aeroplane constructed in accordance with this invention will be readily understood and although the preferred embodiment of the invention is as illustrated and described, it is to be understood that changes in the details of construction may be had, which will fall within the scope of the invention as claimed.

What is claimed is:

In an aeroplane of the character described comprising a fuselage having an open top compartment in its upper portion and an engine and crank shaft therein, a vertical shaft slidably mounted in said fuselage, said shaft extending upwardly therefrom, a horizontally disposed propeller on the upper end of the shaft, a piston on the lower end of the shaft, a fluid containing cylinder supported on the fuselage for the reception of the piston, a fluid pump connected to the engine and

actuated thereby, conduits connecting said pump with the upper and lower ends of the cylinder, a control valve for selectively directing the fluid into the upper or lower end of the cylinder in a manner to shift the piston therein, and means for coupling the vertical shaft to the engine, said means comprising a longitudinally extending drive shaft, a shiftable clutch thereon, a gear element on one end of the drive shaft, and a gear element slidably mounted on the vertical shaft and in mesh with the first named gear.

In testimony whereof I affix my signature.

FRANCIS O. REED.