

Nov. 29, 1938.

L. E. CHAUVIERE

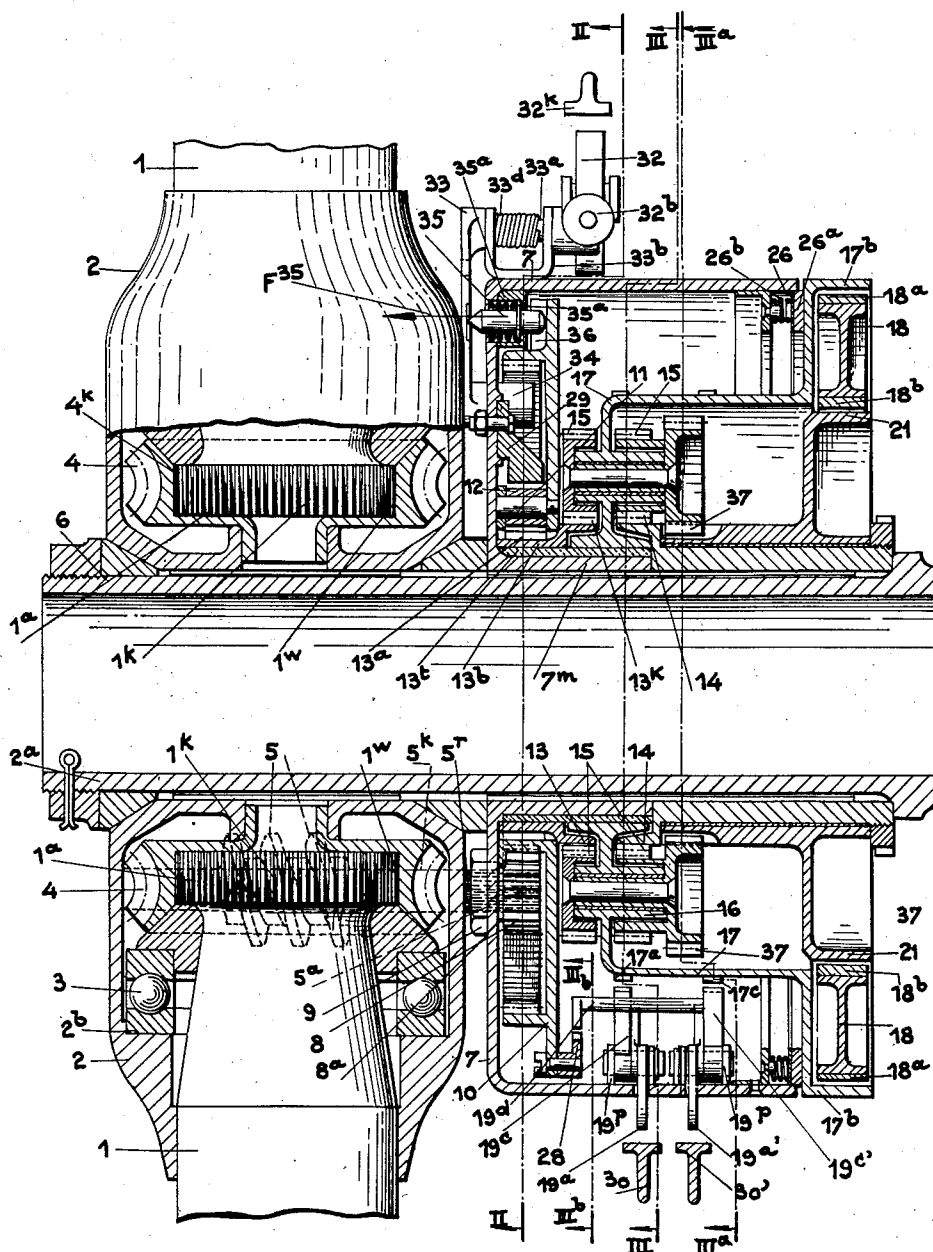
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AIRSCREW HAVING A VARIABLE PITCH

Filed June 17, 1936

10 Sheets-Sheet 1

Fig. 1.



INVENTOR:
LUCIEN EDOUARD CHAUVIERE
By *Haseltine, Lake & Co.*
ATTORNEYS

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L. E. CHAUVIÈRE.

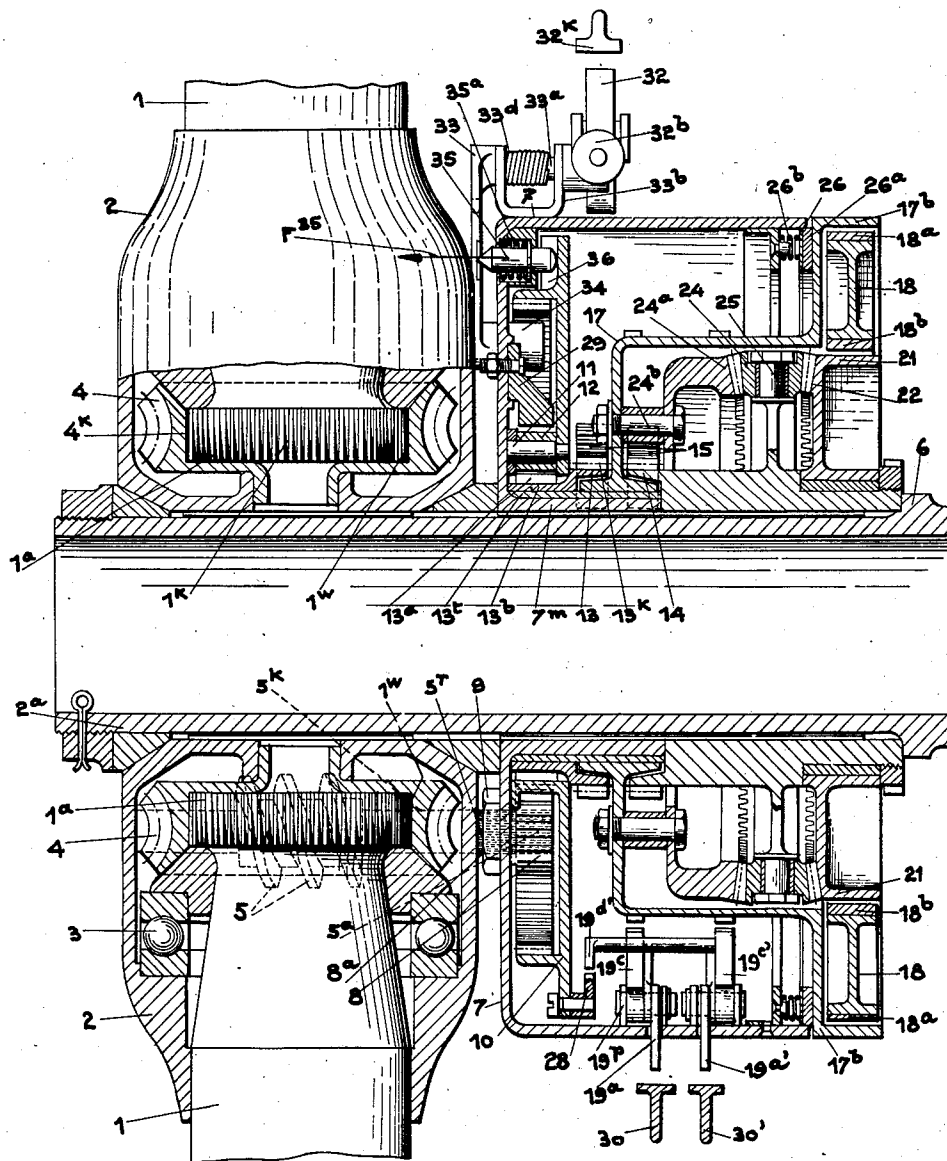
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FIG. 1a.



INVENTOR:
LUCIEN EDOUARD CHAUVIERE
By *Hasseltine, Lake & Co.*
ATTORNEYS

Nov. 29, 1938.

L. E. CHAUVIÉRE

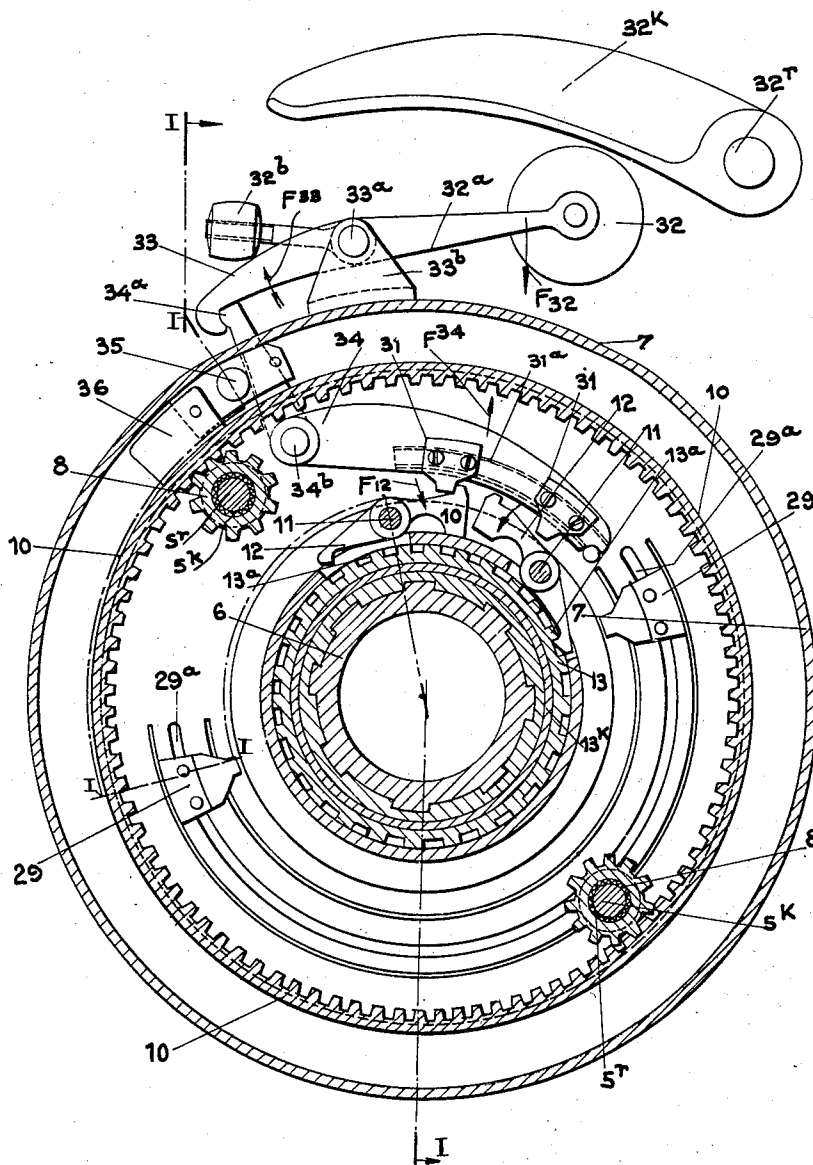
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Fig.2.



INVENTOR:
LUCIEN EDOUARD CHAUVIERE
By *Haseltine, Lake & Co.*
ATTORNEYS

Nov. 29, 1938.

L. E. CHAUVIÈRE

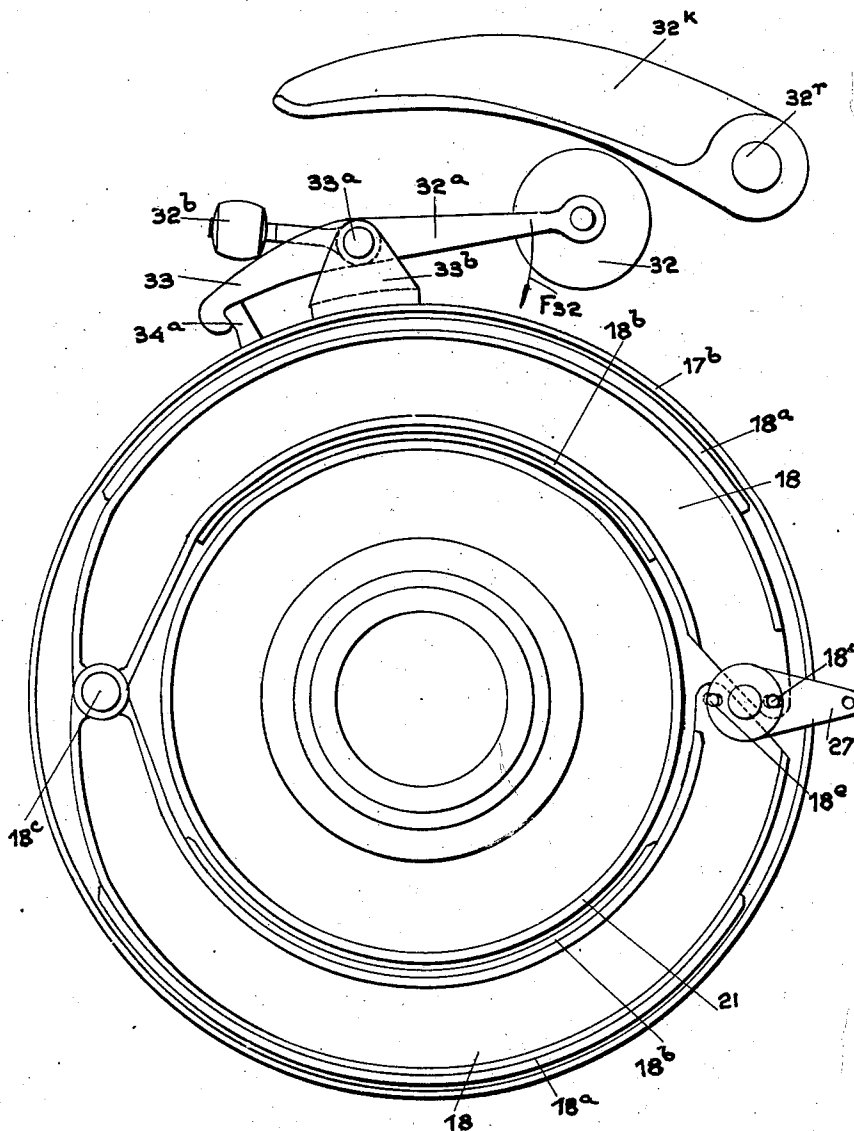
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FIG. 2a



INVENTOR:
LUCIEN EDOUARD CHAUVIERE
By *Haseltine, Lake & Co.*
ATTORNEYS

Nov. 29, 1938.

L. E. CHAUVIÈRE

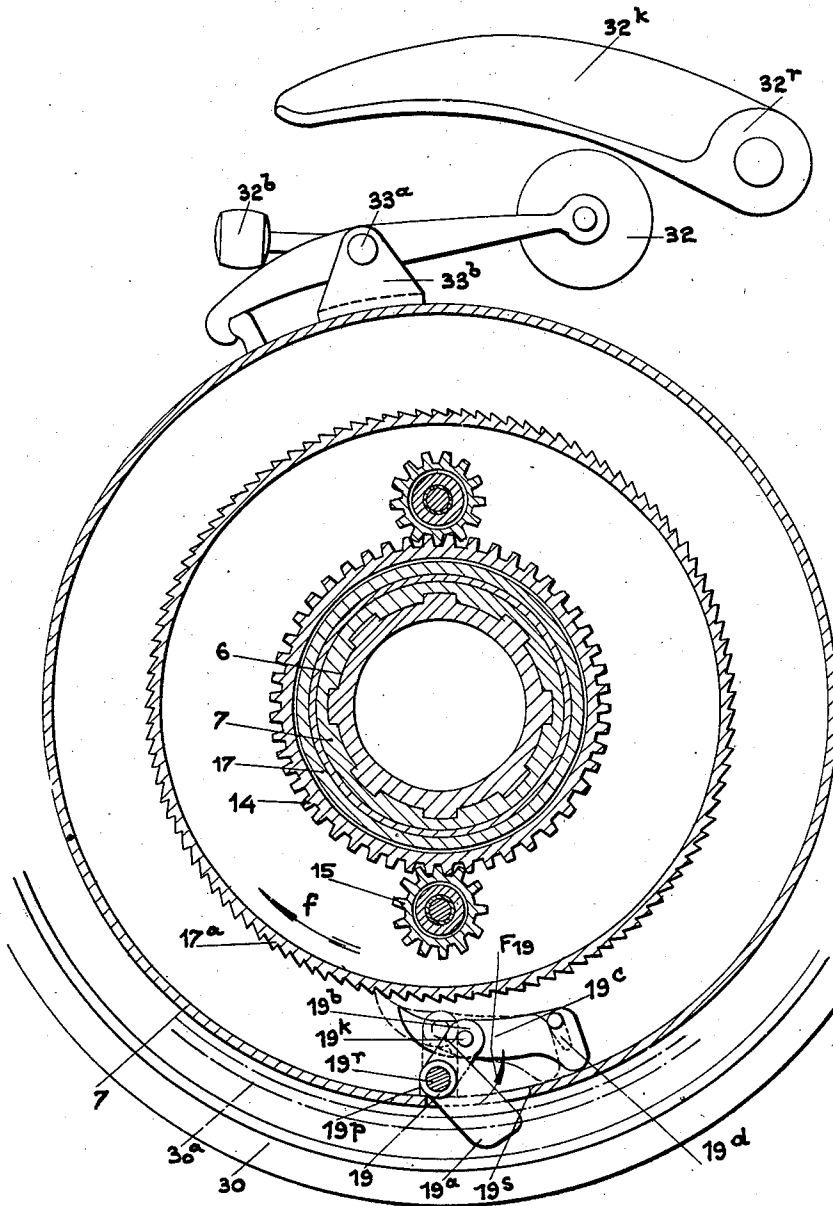
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AIRSCREW HAVING A VARIABLE PITCH

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FIG. 3.



INVENTOR:
LUCIEN EDOUARD CHAUVIERE
By *Haseltine, Lake & Co.*
ATTORNEYS

Nov. 29, 1938.

L. E. CHAUVIERE

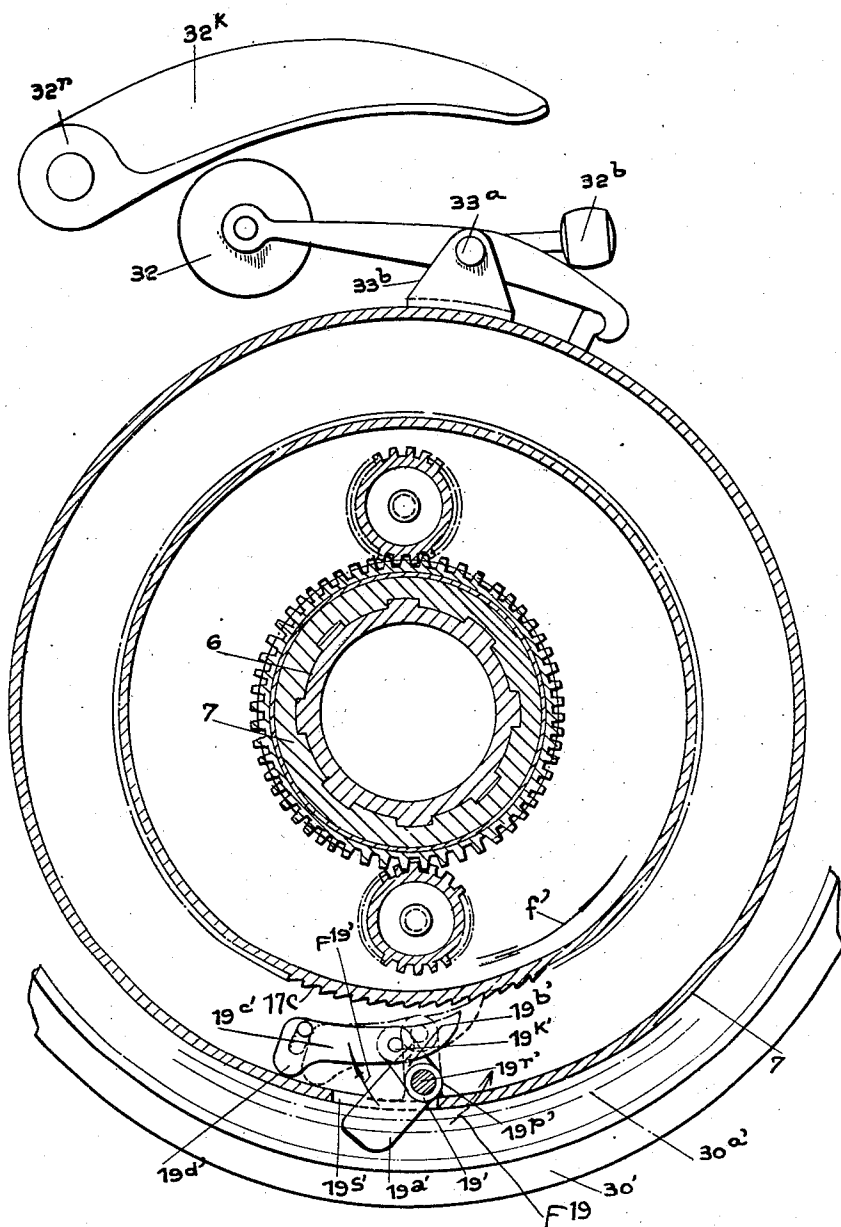
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AIRSCREW HAVING A VARIABLE PITCH

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Fig. 3 a.



INVENTOR:
LUCIEN EDOUARD CHAUVIERE
By *Haseltine, Lake & Co.*
ATTORNEYS

Nov. 29, 1938.

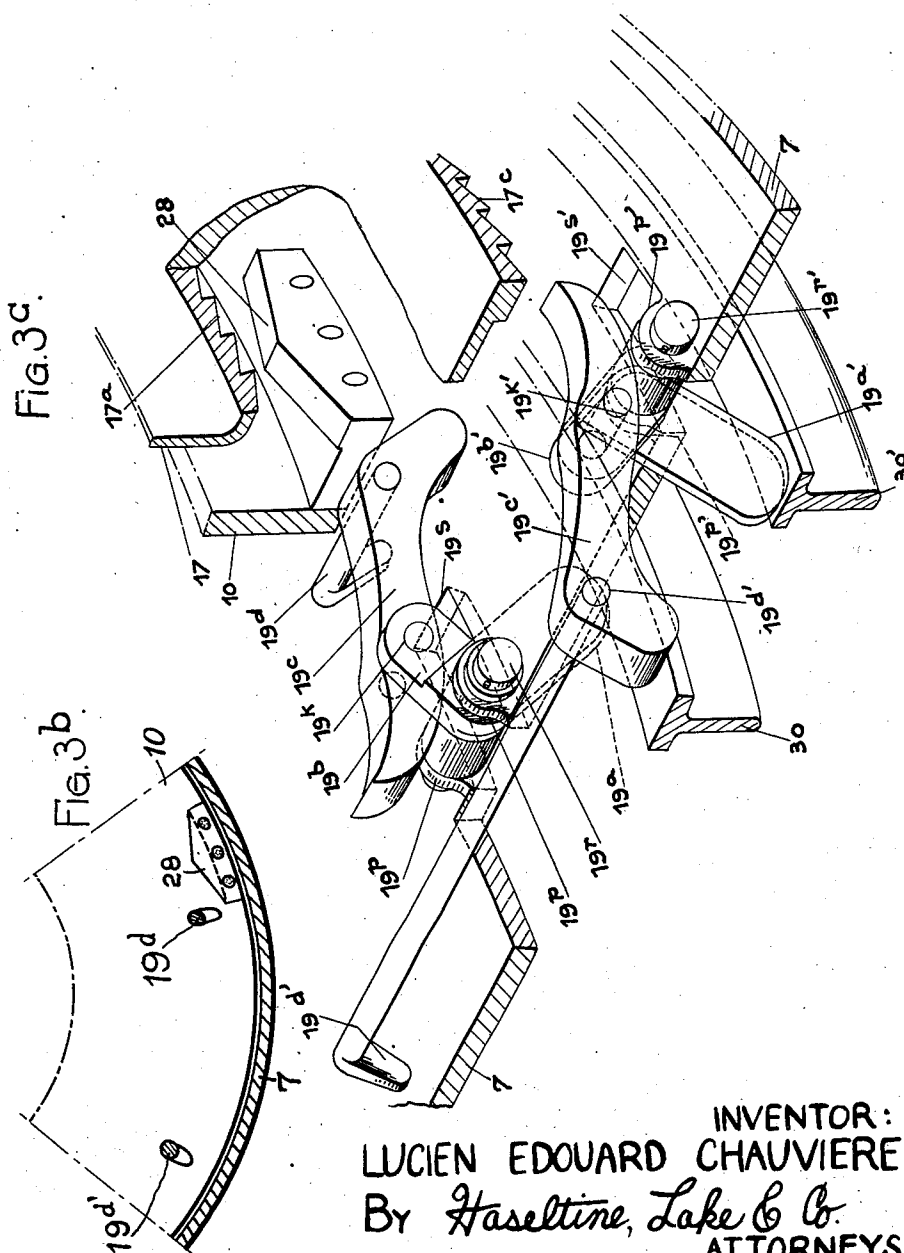
L. E. CHAUVIÈRE

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L. E. CHAUVIÈRE

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Fig. 5.

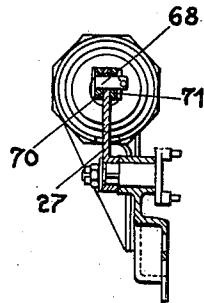
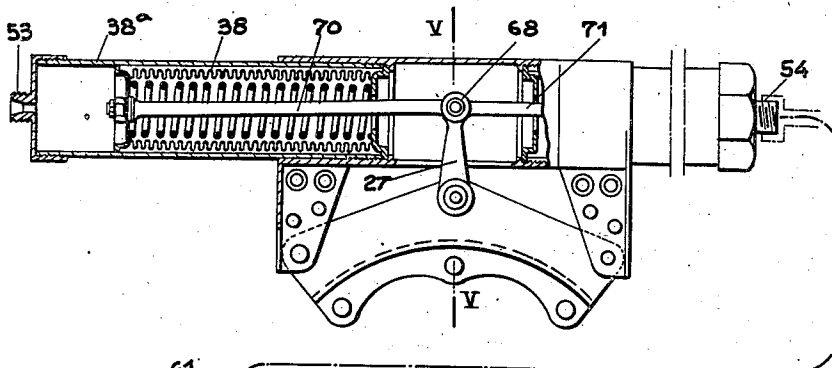
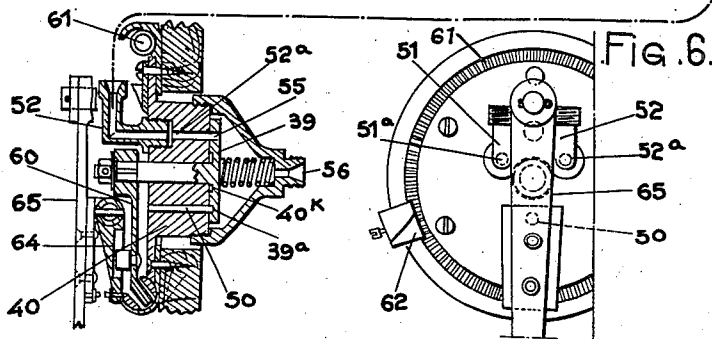


Fig. 4.



INVENTOR:
LUCIEN EDOUARD CHAUVIÈRE
BY *Haseltine, Lake & Co.*
ATTORNEYS

Nov. 29, 1938.

L. E. CHAUVIERE

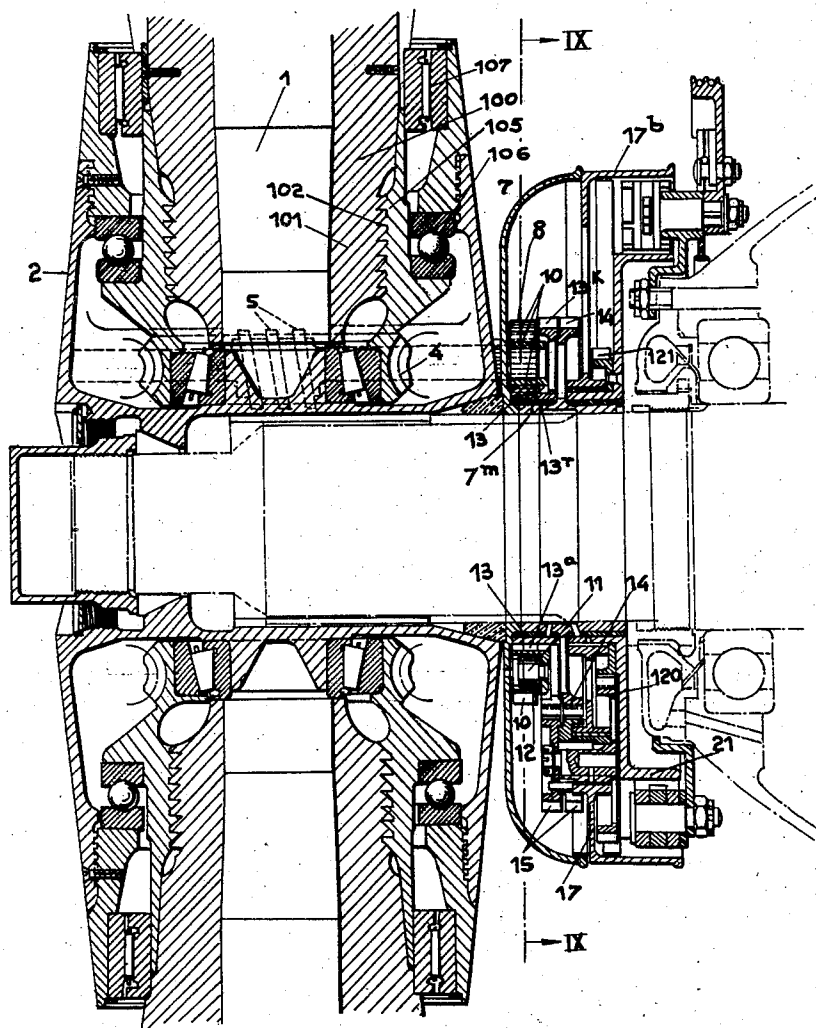
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Fig. 7.



INVENTOR:
LUCIEN EDOUARD CHAUVIERE
By *Haseltine, Lake & Co.*
ATTORNEYS

Nov. 29, 1938.

L. E. CHAUVIÈRE

2,138,339

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Fig. 9.

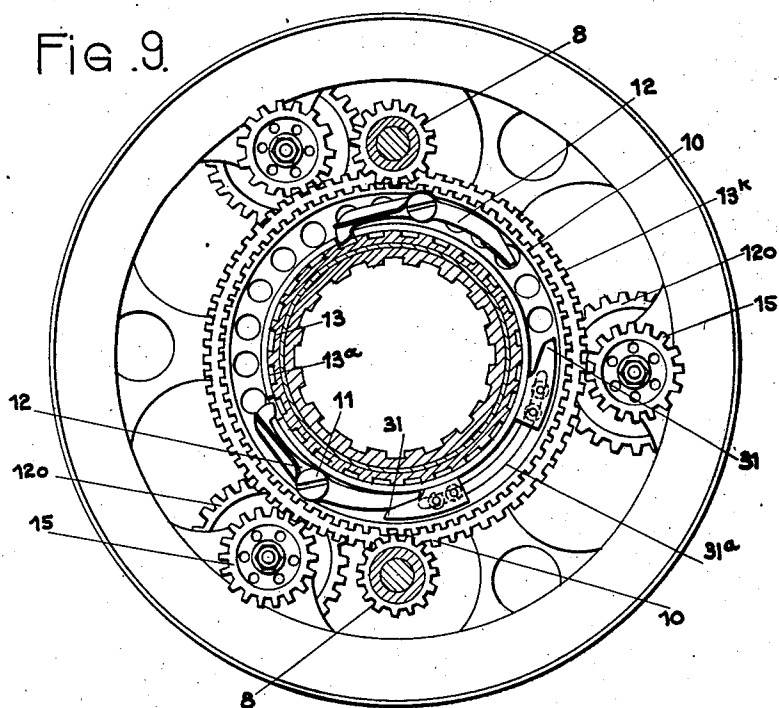
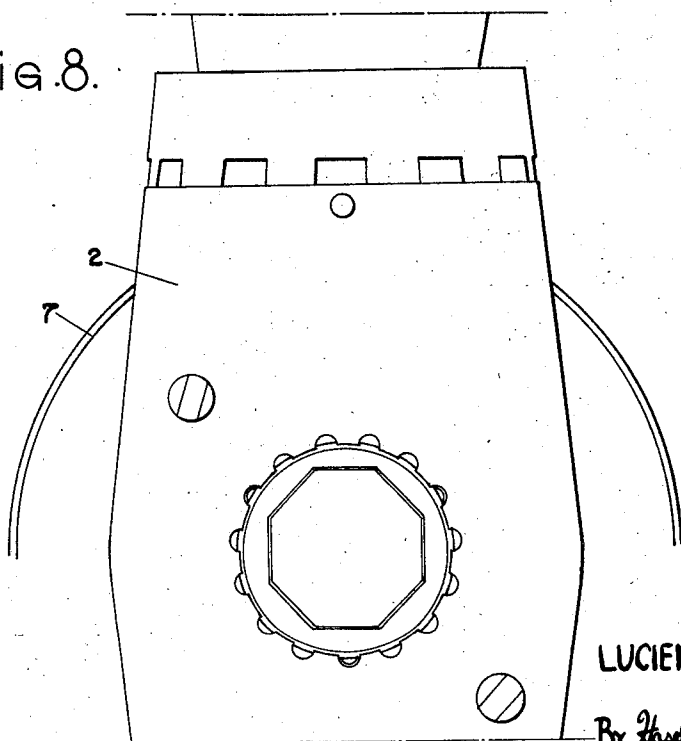


Fig. 8.



INVENTOR:
LUCIEN EDOUARD
CHAUVIERE
By *Haseltine, Lake & Co.*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,138,339

AIRSCREW HAVING A VARIABLE PITCH

Lucien Edouard Chauvière, Paris, France, assignor to Société Anonyme: Forge et Usinage de Métaux Légers (Hélices Métalliques Chauvière), Vitry-sur-Seine, France

Application June 17, 1936, Serial No. 85,757
In France June 20, 1935

10 Claims. (Cl. 170—163)

The present invention relates to an improved air-screw, the pitch of which may be varied during flight, and of the type in which the variation of the pitch of the blades is controlled by the rotation of the airscrew itself, employing an intermediate system of the epicyclic type combined with braking means and effecting the driving of devices, such as worms and worm gears directly controlling the inclination of the blades.

The technical problem, for which a solution is given by the present invention, consists in ensuring a great stability and the locking of the blades on the hub in all positions, while automatically limiting the amplitude of the variations of the pitch to predetermined values without risk of damaging the driving members.

The airscrew, according to the invention is characterized in that the transmission of movement to the devices controlling directly the inclination of the blades is effected by means of pinions which are journaled in a casing secured to the hub of the airscrew and are in constant mesh with a ring gear actuated through the medium of rocking members pivoted to said ring gear and having nose portions adapted to engage grooves in a ring gear constantly in mesh with one of the sets of teeth of double plane pinions whereof the other set of teeth is in engagement with the teeth of a driving gear keyed to the shaft of the airscrew, this assemblage forming an epicyclic system. The movable equipment of this epicyclic system is connected, on the one hand, rigidly to the first of a pair of drums and, on the other hand, through the medium of gears driven by said driving gear, to the second or idle drum. The inclination of the blades is varied in one direction or the other by applying a brake to one or the other of the drums.

In a form of construction, the improved airscrew comprises three units, firstly the hub and the devices controlling directly the inclination of the blades, secondly a casing enclosing all the gears and mechanisms and, thirdly, a relay allowing the pilot to control the brake from a distance.

These three units are substantially separate, which greatly facilitates the assemblage, adjustment, inspection and replacement of certain parts.

According to a particularly important feature of the invention, the rocking members, for driving the ring gear meshing with the pinions actuating the devices directly controlling the inclination of the blades, are combined with abutments acting as cams which render these rocking members inoperative in order to limit the displacements of the blades independently of the actuating mechanism.

Preferably two locking members acting respectively in one direction and in the other are used in combination with two pairs of abutments acting as cams; the first pair limiting the displacement of the blades to the position of the pitch for cruising flight or of the taking off pitch, and the second pair limiting the displacements to the feathering position or braking position; the first pair being mounted on a rocking lever whereby they may be rendered inoperative in order to allow the range of adjustment to be extended to the limits set by the second pair.

The invention further relates to other particular points which will appear from the following description, with reference to the accompanying drawings, given by way of example only, and in which:

Fig. 1 is an axial longitudinal section of a variable pitch airscrew according to the invention, this section being made according to line I—I of Fig. 2.

Fig. 1a is a section of a modification along a line which corresponds only with the line I—I of Fig. 2.

Fig. 2 is a left-hand side view corresponding to Fig. 1, with section made according to line II—II of this figure.

Fig. 2a is a rear view of the brake mechanism illustrated in Fig. 1.

Fig. 3 is a section made according to line III—III of Fig. 1.

Fig. 3a is a section made according to line IIIA—IIA of Fig. 1.

Fig. 3b is a section made according to line IIIB—IIIB of Fig. 1.

Fig. 3c is a perspective view showing the assemblage and operation of the pawls more particularly illustrated in Figs. 3 and 3a.

Fig. 4 is an elevation, with partial axial section, of a form of construction of a control device.

Fig. 5 is a section made according to line V—V of Fig. 4.

Fig. 6 is a front view of the manual control device arranged on the instrument board of the pilot.

Fig. 7 is an axial longitudinal section of another form of construction of a variable pitch airscrew according to the invention.

Fig. 8 is a corresponding front view.

Fig. 9 is a cross section of the control device illustrated in Fig. 7, this section being made on

an enlarged scale according to line IX-IX of said Figure 7.

The airscrew the pitch of which is variable during flight, and more particularly illustrated, comprises two blades the roots 1 of which are fitted into corresponding arms of the hub 2 which is rendered angularly rigid with the driving shaft 2^a. The roots 1 of the blades are so fitted up as to be capable of rotating and they bear upon an inner shoulder 2^b of the hub 2 through the medium of ball bearings 3. The roots 1 are rendered rigid with worm gears 4 through the medium of teeth or flutes 1^w provided on the gears 4 and of flutes 1^k provided on the periphery of flanges 1^a formed at the ends of the roots 1. These flutes 1^w and 1^k fit into each other for rotatively connecting the roots 1 and the worm gears 4. Each worm gear 4 is actuated by a worm 5, cut in a shaft 5^k one of the ends of which is fluted at 5^r for fitting into corresponding flutes 5^a provided with pinions 8. These latter are journaled in bearings 8^a rigid with a member 7, constituting a casing for the control box and which is rendered angularly rigid with the driving shaft 2^a. The number of pinions 8 is equal to that of the worms 5, these pinions constantly meshing with a gear 10. Moreover, the pinions 8 are held stationary in translation on the bearings 8^a by nuts or rings 9 mounted on the ends of the pinions arranged outside the casing 7.

On the gear 10 are pivoted, through the medium, of pins 11, two rocking or locking members 12 set in reverse directions and the noses of which engage with flutes 13^a provided in a wheel or gear 13 loosely mounted on a sleeve 13^r surrounding the hub 7^m of member 7. The locking members 12 can be caused to rock in the direction F¹², for releasing the noses from flutes 13^a, when their heel pieces come in contact with abutments 29 and 31 acting as cams.

The two abutments 29 are adjustable in position, in an arcuate slide 29^a and can limit the extreme positions of the blades, for placing the latter for instance in the wind's eye position or in a braking position.

The two abutments 31 are adjustable in position in an arcuate slide 31^a and allow of limiting the position of the blades for instance for cruising flight and for taking off.

For allowing both rocking or locking members 12 to pass beyond the two positions limited by the two abutments 31 and for causing the abutments 29 to act if desired, the two abutments 31 can be retracted. For that purpose, use is made of a roller 32 journaled on a lever 32^a provided with an extension for receiving a counterweight 32^b adapted to balance centrifugal force. The lever 32^a is rigid with a stud 33^a journaled in a support 33^b secured on the member 7. On the stud 33^a is secured a lever 33, the nose of which engages with a lever 34^a rigid with a stud 34^b journaled in member 7. The shaft 34^b is rigid with a lever 34 carrying the arcuate slide 31^a for the abutments 31. It will be noted that the arcuate slide 29^a for the abutments 29, is provided in member 7.

The lever 33 is constantly urged in the required position for locking lever 34^a and, consequently, lever 34, through the medium of a spring 33^d wound on the stud 33^a.

For releasing lever 34^a, the roller 32 is acted upon through the medium of a cam 32^k pivoted about a fixed pin 32^r in order to move the lever 32^a in the direction of the arrow F³². Conse-

quently, the lever 33 moves in the direction of the arrow F³³, in antagonism to the action of the spring 33^d and by disengaging from lever 34^a, so that the rigid unit formed by lever 34^a, shaft 34^b and lever 34 is released.

Under the action of centrifugal force, the lever rotates with its shaft 34^b and the lever 34^a in the direction of the arrow F³⁴, in order that the abutments 31 should no longer be situated in the path of the heel pieces of the rocking members 12.

When the blades return towards their normal position, the lever 34^a and, consequently, lever 34, as well as the abutments 31 are automatically restored to the position shown in Fig. 2 by a finger 35 acting as cam. In fact, the finger 35, which is tapered at one end for constituting a cam, is moved in translation in the direction of the arrow F³⁵ by a cam 36 (see also Fig. 1) belonging to the ring gear 10, this finger being restored, to its position of rest as soon as the cam 36 ceases to act thereon, by a spring 35^a. The cam 36 acts in the same manner for both abutments 31 and its action can be exerted in both directions for moving in translation the finger 35 in the direction of the arrow F³⁵. The action of this finger 35 which is positively controlled by cam 36 compels lever 34^a and, consequently lever 34, to return to its position shown in Fig. 2, in antagonism to the action of centrifugal force. As at this moment cam 32^k no longer acts on roller 32, the unit formed by arm 32^a and arm 33 returns, under the action of spring 33^d to the position of Fig. 2 for locking lever 34^a as shown in this Fig. 2. The lever 34^a is then automatically locked by the nose of lever 33, the roller 32 being no longer subjected to the action of cam 32^k. The finger 35 is constantly urged to retracted position by a spring 35^a and it is moved in the direction of the arrow F³⁵ by a cam 36 provided on gear 10, as indicated.

The gear 13 is provided, independently of the flutes 13^a with teeth 13^k with which constantly mesh the double planet pinions 15 journaled in a crown 17 loosely mounted on sleeve 13^r. The planet pinions 15 also mesh with a gear 14 rendered rigid with the driving shaft 2^a.

The gear ratios of both sets of gears 15 and 14 on the one hand, and 15, 13 on the other hand, are but very slightly different so as to give a very high gearing down ratio.

The crown 17 is kinematically connected to a co-axial crown or drum 21 loosely mounted through the medium of planet pinions 37 rigid with the double planet pinions 15.

Fig. 1a shows a constructional modification of Fig. 1. The description of Fig. 1 is entirely applicable to Fig. 1a, except concerning the double planet pinions 15 and the planet pinions 37. In the case of Fig. 1a, on the crown 17 is rigidly secured, by means of bolts 24^b, a bevel gear 24^a. In this form of construction, the crown 17 is kinematically connected to the co-axial crown or drum 21 loosely mounted through the medium of bevel pinions 24 which are constantly meshing with the bevel gear 24^a and corresponding teeth provided on the drum 21.

For obtaining small variations of the pitch of the blades, as will be indicated later on, use can be made of two pawls 19^c and 19^{c'} arranged in reverse directions. The pawl 19^c is more particularly illustrated in Fig. 3, and pawl 19^{c'} is shown in Fig. 3a. The pawl 19^c can act on ratchet teeth 17^a provided on crown 17, whilst the pawl 19^{c'} can act on ratchet teeth 17^c also

provided on crown 17. The teeth 17^a and 17^c are set in reverse directions.

The pawls 19^c and 19^{c'} are respectively pivoted about shafts 19^a and 19^{a'}. These shafts are respectively rigid with bell crank levers 19^a—19^b and 19^{a'}—19^{b'}, respectively pivoted about fixed shafts 19^c and 19^{c'} mounted on member 7, through the medium of bearings 19^d forming supports.

The branches 19^a and 19^{a'} of bell crank levers project outside the member or casing 7 through apertures 19^e so that they can be moved, for branch 19^a, in the direction of the arrow F19 and, for branch 19^{a'}, in the direction of the arrow F19' through the medium of movable cams 30 and 30', respectively. The pawls then come in position, as shown in dot and dash lines in Figs. 3 and 3a, for angularly moving the crown 17 to the extent of one tooth in the direction of the arrow f, or of the arrow f', according as the pawl 19^c or the pawl 19^{c'} is acted upon.

It is possible to limit the amplitude of the displacements imparted to the crown 17 by the pawls. For that purpose, cams are provided which are rigid with the gear 10 and can be adjusted in position. In the example illustrated in Figs. 1, 2, 3, 3a, 3b and 3c, the cams 28 mounted on gear 10 act on projections 19^d or 19^{d'} of the pawls 19^c and 19^{c'} for causing lifting of the noses of the pawls which no longer act on the corresponding teeth 17^a and 17^c of the crown 17. Moreover, a braking device 26 can be interposed between the member or casing 7 and the crown 17, this braking device comprising a friction crown 26^a urged against the crown 17 by springs 26^b.

The crown wheels or drums 17 and 21 can be held stationary separately, but not simultaneously, by a brake 18 controlled, in one direction or the other, by a lever 27.

As more particularly illustrated in Fig. 2a, the two segments 18 constituting the brake 18 are pivoted about a common shaft 18^c and respectively about shafts 18^d and 18^e mounted on the control lever 27.

The brake 18 is fitted on the engine casing and the displacement of the lever 27 is effected from a distance, either by means of Bowden cables and handles, or, as illustrated in Figs. 4, 5 and 6, by means of two fluid-tight pistons 38 moving in cylinders 38^a into which is admitted a compressed fluid, such as air.

For controlling the admission or exhaust of compressed air, use can be made of any suitable means arranged within reach of the pilot. Fig. 4 shows a control cock provided with a slide or port face 40^a on which is always pressed, by the pressure, a rotary valve 39, the cock body being indicated at 40. An arcuate groove 39^a, provided in the rotary valve 39, allows exhaust of the cylinder to take place at dead center, or the exhaust of a cylinder to take place when the other is under pressure, exhaust taking place through a channel 50 provided in the cock body 40. On the latter are fitted two intakes 51 and 52 respectively communicating with the bottoms 53 and 54 of cylinders 38^a, these intakes being respectively in communication with channels 51^a and 52^a provided in the body 40, and controlled by the rotary valve 39. The latter is provided with a port such as 55 for allowing the admission, in either of channels 51^a, 52^a, of air under pressure supplied by a channel 56. The rotary valve 39 is rigid with a lever 60 restored to mean position by a spring 61, the displacements of this lever 60 being limited by abutments such as 62.

The lower end of lever 60 is engaged between the ends of the coil spring 61 curved according to a circumference, so that any displacement of this lever in one direction or the other takes place in antagonism to the compression of one or the other of the ends of the spring, compression which automatically restores the lever to its initial position, as soon as it is no longer acted upon. The lever 60 is actuated by a rocking member 64 rigid with the manual control 65.

The lever 27 is provided with a rod 68 to which are pivotally connected rods 70 and 71 of the piston 38.

The operation of the airscrew having a variable pitch during flight and which has just been described in its main lines is the following:

When the pilot desires to modify the pitch of the blades he acts on the rotary distributing the valve 39 through the operating lever, by actuating the same in one direction or the other, according to the desired direction of modification of the pitch.

The compressed air admitted into one of the cylinders 38^a, acts on brake 18 which prevents crown or drum 21, or crown or drum 17 from rotating. The wheel or gear 14, which angularly moves with the driving shaft 2^a causes the rotation of the planet pinions 15 which determine a slow rotary movement of gear 13 relatively to the driving shaft 3^a. This wheel or gear 13 drives, through the medium of the locking or rocking members 12, the gear 10 on which these members are pivoted. The relative displacement of this gear 10 causes the rotation of pinions 8, and, consequently, of the worms 5, worm gears 4 and finally of the blades. The blades can obviously be stopped in any desired intermediate position by ceasing to act on the operating lever 65. Any suitable indicating device can moreover be provided allowing the pilot to control the exact position of the blades.

If the pilot continues to act on lever 65, the pawl 12, which is in action, finally comes in engagement with one of the abutments 31 which renders it inoperative, the blades are then held stationary in the cruising or taking off position, these abutments 31 being adjusted for that purpose.

As previously indicated, the abutments 31 can be rendered inoperative by moving the cam 32^k; in this case, the abutments 29 limit the displacement of the blades, either to the wind's eye position, or to the braking position.

An extremely slow displacement of the blades can also be ensured by acting on the cams 30 and 30', as previously indicated.

In any position in which the blades are stopped, the latter are locked in position owing to a control effected by means of an irreversible device constituted by the worms 5 and worm gears 4, as well as by the planet-pinion reducing gear which is also irreversible.

Another form of construction of an airscrew the pitch of which is variable during flight is more particularly illustrated in Figs. 7, 8 and 9. This airscrew comprises wooden blades 1 fitted in sockets 100 of reinforced construction.

These blade roots each comprise a tubular part 101 externally screwthreaded at 102.

Referring to Fig. 7, it will be seen that the roots 100 are screwed in corresponding members 105 so formed as to constitute the worm gears 4.

Thrust bearings are provided at 106 and needle bearings at 107. The roots 100, rigid with the corresponding members 105, are fitted up as il-

lustrated for rotating under the action of the worms 5 meshing with the worm gears 4, these worms being rendered angularly rigid with the pinions 8 constantly meshing with a gear 10 provided with a side groove for receiving the locking or rocking members 12 pivoted about pins 11 rigid with the gear 10. These actuating locking or rocking members 12 are directed in reverse directions and the noses can engage with grooves 13^a provided in a gear 13 loosely mounted on a sleeve 13^r surrounding the hub 7^m of member 7.

This member 7 is rigidly secured on the hub 2 of the airscrew and carries the pinions 8. The locking members 12 can be rocked for releasing the noses from the flutes 13^a, when their heel pieces come in contact with the abutments 31 when the latter serve as cams. Both abutments 31 are adjustable in position in an arcuate slide 31^a of member 7 and allow, as in the first form of construction, of limiting the position of the blades for instance for cruising and for taking off.

The gear 15 is provided, independently of the flutes 13^a with teeth 13^r with which constantly mesh the double planet pinions 15 journalled on a loose crown wheel 17 constituting a drum 17^b.

The planet pinions 15 also mesh with a gear 14 rendered rigid with the driving shaft.

The gear ratios of both sets of gears 15, 14 on the one hand, and 15, 13 on the other hand, are but very slightly different so as to give a very high gearing down ratio.

Planet pinions 120, co-axial with planet pinions 15 and rigid with the latter, are journalled on the crown 17 and constantly mesh with a gear 121 rigid with a drum 21.

As in the first form of construction, the braking, either of drum 17^b or of drum 21, allows the moving of the blades either in one direction or the other.

It is obvious that the form of construction described and illustrated is given herein by way of indication only and not in a limiting sense. Any changes or modifications which do not alter in any way the main features above set forth and the desired result, remain included in the scope of the present invention.

It will be noted that, according to a very important feature of the present invention, the transmission of movement to the devices directly controlling the inclination or change of pitch of the blades, is effected through pinions 8 journalled in a box 7 rigid with the hub of the airscrew. These pinions 8 constantly mesh with a gear 10 controlled by means of rockers 12, pivoted on this gear 10 and the noses of which can enter flutes 13^a provided in a fluted gear 13. The latter constantly meshes with one set of teeth of planet pinions 15 which have two sets of teeth, the other set of teeth meshing with the teeth of a driving gear 14 rigidly secured on the shaft of the airscrew, the movable unit of the system of the epicyclic type thus constituted being rigidly connected, on the one hand, to a first drum 17^b and, on the other hand, through the medium of gears driven by said driving member, to a second loose drum 21.

Moreover, the ratios of the two sets of gears constituted, on the one hand, by the fluted gear 13 provided with flutes for the actuation of the rockers 12 and the corresponding set of teeth of the planet pinions 15 and, on the other hand, by the teeth of the driving member 14 and the other set of the teeth of the planet pinions 15, are but very slightly different so as to give a very great

the pitches of the blades by means of the planet pinions 15, in each position of rest.

Both drums 17^b and 21 are co-axial and provide between them an annular space in which are arranged brake shoes 18^a capable of acting, either by moving inwardly, or outwardly, on either of the drums.

Having now fully described my invention, I claim:

1. In a variable pitch airscrew comprising a hub, blades rotatably mounted in said hub, worm gears rigid with the roots of said blades, worms meshing with said worm gears, said worms being rotatably controlled by the rotation of said airscrew for modifying the pitch of said blades, in combination: a casing rigid with said hub, pinions journalled in said casing and so shaped for meshing and being rendered rigid with the ends of said worms, a ring gear journalled in said casing co-axial to said hub and meshing with said pinions, so that the movement of rotation of said ring gear in said casing determines the rotation of said pinions, a fluted gear journalled coaxial to said hub and so shaped as to present a set of teeth, rockers pivoted on said ring gear, reversely arranged and so shaped as to constitute noses fitting in said flutes of the fluted gear for rendering it rotatably rigid with said ring gear, means effective upon attainment of predetermined limiting values of pitch to move said rockers out of engagement with said flutes, a member fast on the airscrew hub for constituting the driving gear, said member being so shaped as to present a set of teeth, a first drum journalled on said hub, gears journalled in said first drum and meshing, on the one hand, with the teeth of the fluted gear, and, on the other hand, with the teeth of the said driving gear for kinematically connecting with the driving gear, said fluted gear, a second drum loosely mounted on the hub, means for kinematically connecting the second drum with the last mentioned gears, means for braking one or the other of the drums but not simultaneously for causing the rotation of said fluted gear in one direction or the other and, consequently, through the medium of the rockers, that of the ring gear controlling the pinions fast on the worms meshing with the worm gears fast on the blades for modifying the pitch of the latter in one direction or the other.

2. In a variable pitch airscrew comprising a hub, blades rotatably mounted in said hub, worm gears rigid with the roots of said blades, worms meshing with said worm gears, said worms being rotatably controlled by the rotation of said airscrew for modifying the pitch of said blades, in combination: a casing rigid with said hub, pinions journalled in said casing and so shaped for meshing and being rendered rigid with the ends of said worms, a ring gear journalled in said casing co-axial to said hub and meshing with said pinions, so that the movement of rotation of said ring gear in said casing determines the rotation of said pinions, a fluted gear journalled co-axial to said hub and so shaped as to present a set of teeth, rockers pivoted on said ring gear, reversely arranged and so shaped as to constitute noses fitting in said flutes of the fluted gear for rendering it rotatably rigid with said ring gear, means effective upon attainment of predetermined limiting values of pitch to move said rockers out of engagement with said flutes, a member fast on the airscrew hub for constituting the driving gear, said member being so shaped as to present a set of teeth, a first drum journalled on said

hub, double planet pinions or having a double set of teeth, the first set of teeth of which meshes with the teeth of said fluted gear and the second set of teeth of which meshes with the teeth of the driving gear, a second drum loosely mounted on the hub and so shaped as to present a set of teeth, gears rigid with said double planet pinions and meshing with the teeth of the second drum, means for braking one or the other of the drums but not simultaneously for causing the rotation of said fluted gear in one direction or the other and, consequently, through the medium of the rockers, that of the ring gear controlling the pinions fast on the worms meshing with the worm gears fast on the blades for modifying the pitch of the latter in one direction or the other.

3. In a variable pitch airscrew as claimed in claim 1, the ratios of the two sets of gears constituted, on the one hand, by the ring gear and the first set of teeth of the double planet pinions and, on the other hand, by the teeth of the member forming the driving gear and the second set of teeth of the double planet pinions are but very slightly different so as to produce a very high gearing down ratio and lock the blades through the medium of the double planet pinions, in each position at any given pitch.

4. In a variable pitch airscrew as claimed in claim 1, both drums are co-axial in order to provide between them an annular space in which the braking means are arranged, said braking means comprising brake segments capable of acting, on either one of the drums, either by being drawn together or by being spaced apart.

5. In a variable pitch airscrew as claimed in claim 1, means for controlling from the pilot's seat, the means for braking the drums.

6. In a variable pitch airscrew comprising a hub, blades rotatably mounted in said hub, worm gears rigid with the roots of said blades, worms meshing with said worm gears, said worms being rotatably controlled by the rotation of said airscrew for modifying the pitch of said blades, in combination: a casing rigid with said hub, pinions journaled in said casing and so shaped for meshing and being rendered rigid with the ends of said worms, a ring gear journaled in said casing co-axial to said hub and meshing with said pinions, so that the movement of rotation of said ring gear in said casing determines the rotation of said pinions, a fluted gear journaled co-axial to said hub and so shaped as to present a set of teeth, rockers pivoted on said ring gear, reversely arranged and so shaped as to constitute noses fitting in said flutes of the fluted gear for rendering it rotatably rigid with said ring gear, means effective upon attainment of predetermined limiting values of pitch to move said rockers out of engagement with said flutes, a member fast on the airscrew hub for constituting the driving gear, said member being so shaped as to present a set of teeth, a first drum journaled on said hub, double planet pinions having a double set of teeth the first set of teeth of which meshes with the teeth of said fluted gear and the second set of teeth of which meshes with the teeth of the driving gear, a second drum loosely mounted on the hub and provided with a set of teeth, toothed pinions journaled on the driving gear and meshing with the teeth of the second drum, a bevel pinion in the shape of a crown rigid with the first

drum and meshing with said toothed pinions, means for braking one or the other of the drums but not simultaneously for causing the rotation of said fluted gear in one direction or the other and, consequently, through the medium of the rockers, that of the ring gear controlling the pinions fast on the worms meshing with the worm gears fast on the blades for modifying the pitch of the latter in one direction or the other.

7. In a variable pitch airscrew as claimed in claim 6, the ratios of both sets of gears constituted, on the one hand, by the fluted gear and first set of teeth of the double planet pinions and, on the other hand, by the set of teeth forming the driving gear and the second set of teeth of the double planet pinions are but very slightly different so as to produce a very high gearing down ratio and lock the blades through the medium of the double planet pinions, in each position at any given pitch.

8. In a variable pitch airscrew as claimed in claim 1, in combination: a first pair of abutments forming cams for rendering inoperative the rockers for limiting the displacements of the blades to the position of the pitch for cruising flight or of the pitch for taking off, a first pivoted lever adjustably carrying said first pair of abutments, said lever terminating in a finger, a second pivoted lever provided with a roller, and with a counterweight and having one of the ends thereof formed into a hook for said finger, a pivoted cam capable of being moved by control means from the pilot's seat into the path of said roller for rocking the second lever and releasing the first lever and causing same to move outwardly under the action of centrifugal force in order to shift said first pair of abutments from the path of the rockers, a tapered finger capable of being moved by a projection of the ring gear and which can restore the locking finger and, consequently, the first lever to its initial position, and a second pair of cams adjustably mounted for rendering the rockers inoperative when the first pair of abutments is rendered inoperative, this second pair of abutments acting as cams limiting the displacements of the blades to the feathering position or braking position.

9. In a variable pitch airscrew as claimed in claim 1, in combination: pawls pivoted on the casing and set in reverse directions, the first drum on which the double planet pinions are journaled being so shaped as to prevent two sets of ratchet teeth set in reverse directions and on which the pawls act, and cams controlled from the pilot's seat so as to be shifted into the path of the pawls for moving the drum tooth by tooth, either in one direction or in the other.

10. In an installation for a variable pitch airscrew as claimed in claim 1, the braking means are controlled from the pilot's seat through the medium of means comprising in combination, a source of fluid under pressure, a cylinder, two pistons movable in translation in said cylinder, means for connecting said pistons to said means for braking the drums and a distributor for controlling the admission and escape of a compressed fluid admitted in said cylinder, a multiway cock for controlling the admission of the fluid under pressure between said source and the cylinder and for controlling the escape of said fluid.

LUCIEN EDOUARD CHAUVIERE.