W. P. THOMPSON.

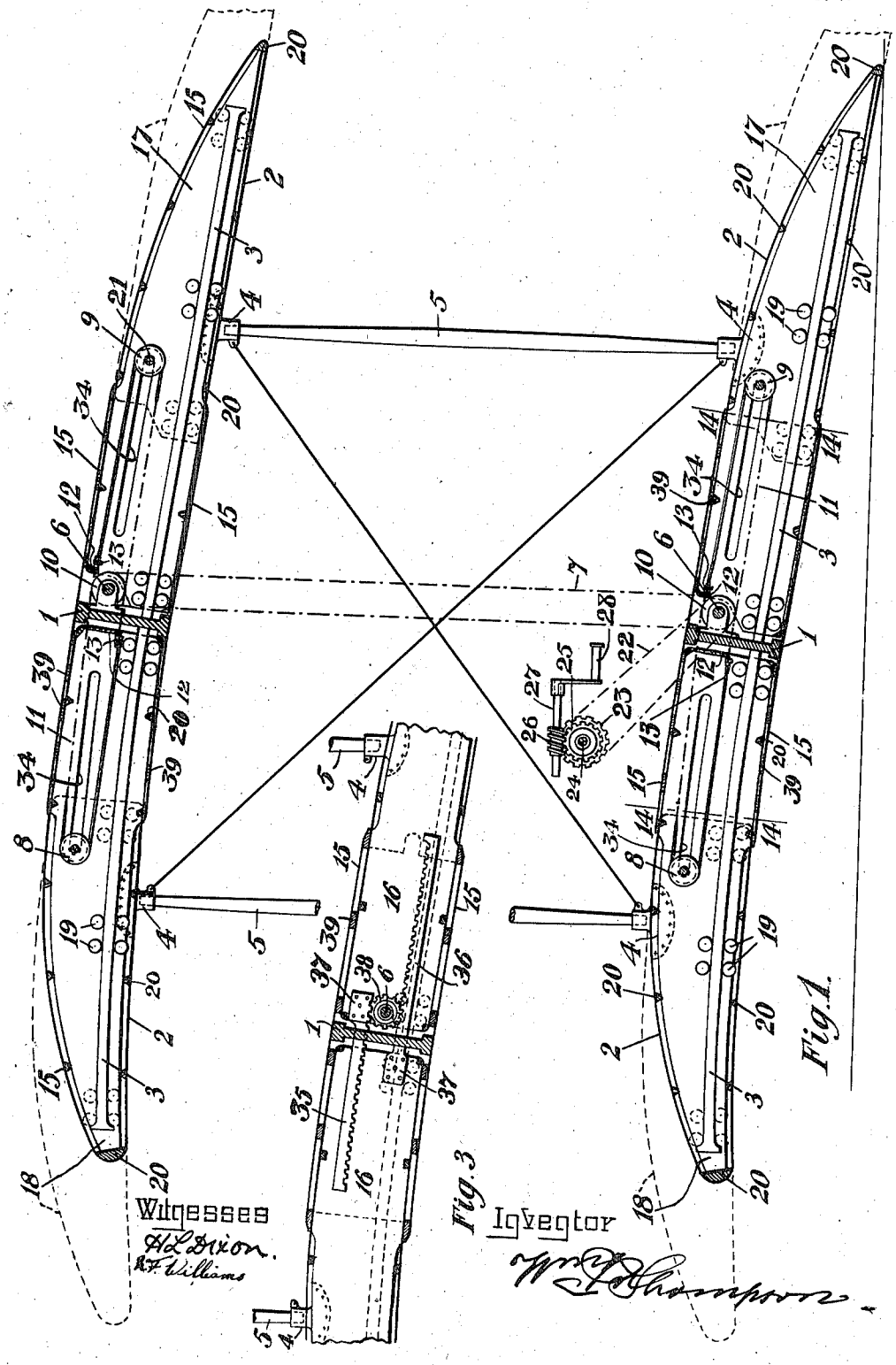
WING PLANE OF FLYING MACHINES.

APPLICATION FILED APR. 11, 1917.

1,291,260.

Patented Jan. 14, 1919.

2 SHEETS—SHEET 1.



Witnesses
H. L. Dixon.
R. F. Williams

Inventor
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Fig. 1.

Fig. 3

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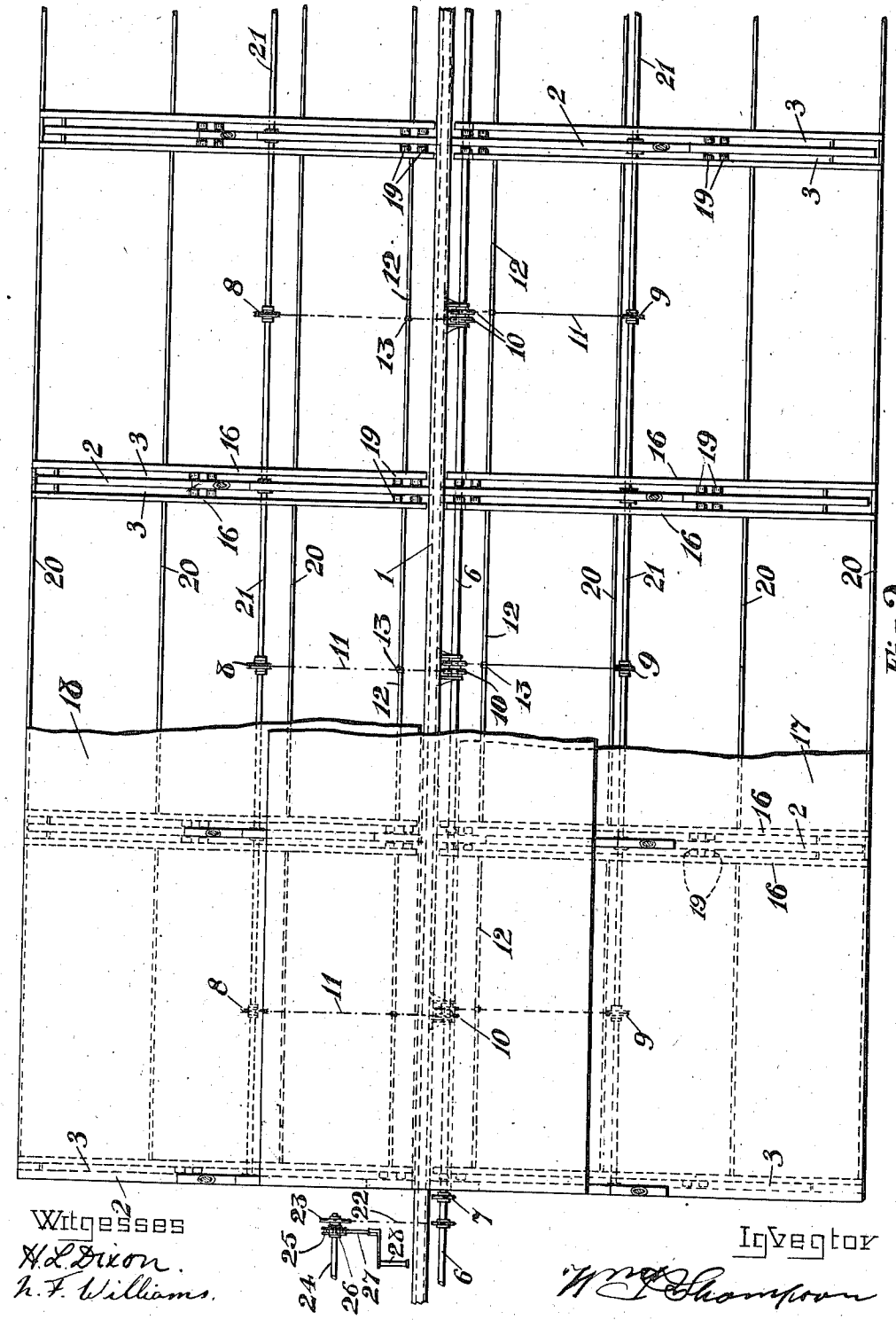

Fig. 2.

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UNITED STATES PATENT OFFICE.

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WING-PLANE OF FLYING-MACHINES.

1,291,260. Specification of Letters Patent. Patented Jan. 14, 1919.

Application filed April 11, 1917. Serial No. 161,205.

To all whom it may concern:

Be it known that I, WILLIAM PHILLIPS THOMPSON, a subject of the King of Great Britain, residing at 6 Lord street, Liverpool, in the county of Lancaster, in the Kingdom of England, have invented certain new and useful Improvements in the Wing-Planes of Flying-Machines, of which the following is a specification.

At the present time nearly all flying machines have their critical speed relative to the wind, beyond which they cannot go except by a great amount of extra power, and this speed is largely governed by the width of the wing plane; machines with broad wing planes having a slow critical speed but are capable of quickly rising from the ground, and of descending safely, whereas machines with narrow wing planes are difficult to rise from the ground, and descend safely, but go at greater speed than the broad plane ones.

Now my invention is designed to have all the advantages of a broad wing plane with those of a narrow wing plane, the wing plane being capable of expansion and contraction in the direction of the line of flight, so that when rising or alighting it shall have its full width, and when flying high in the air can have its breadth of wing plane reduced, and its speed increased to a very great extent.

In my experiments with other machines invented and patented by me, I found that by adding an addition in width to the wing plane at the posterior edge, I obtained much greater ease in rising and flying, but the machine was considerably slowed in consequence, and I abandoned the idea then, as the adding of the extra width in front or in rear completely altered the trim of the machine, and hence was of very little service. By however enlarging or lessening the breadth of wing plane both at the anterior and posterior sides the trim is not altered or so very slightly altered that the ordinary controlling devices are quite sufficient to control it. In practice in my experiments I found that to get a perfect trim the expansion ought to be both in front and at the rear, but a little greater at the rear than at the front. The extreme flexibility however of the coverings at present used, militate somewhat against this invention, as they either have to be rucked up when furling, which causes great resistance to the air, or they necessitate complicated devices for rolling them up. In order therefore to avoid this difficulty, I make the surface of the wing planes of sheet aluminium or its light alloys especially those like duralumin (said to be not acted on by salt water) or other like hard tough sheet material hereafter spoken of generally as aluminium plates. I find I can get in England sheet aluminium of about .1 lb. to the square yard rolled to 18 inches in breadth or 3 lbs. to the square yard for considerable breadths.

These aluminium plates before being applied, I submit to a slight sand blast so as to make the exposed surface finely roughened. I also prefer to paint the propeller, wooden and other exposed parts not coated with aluminium with aluminium powder mixed in oil or varnish, as by this means the machine has about the color and the light reflection of the clouds, and is hence on a cloudy day almost invisible.

My wing planes are formed of three parts transversely a central fixed portion attached to the fuselage in the usual manner and an anterior and a posterior member telescoping into the central member.

The invention is best described by aid of the accompanying drawings, in which:—

Figure 1 shows a cross section of the wing planes of a biplane with the fuselage which is of ordinary type removed.

Fig. 2 a plan of a portion of the lower wing plane, with portions of the covering removed.

Fig. 3 a side view partly in section of a modification of the telescoping device.

In these, 1 is the longitudinal girder attached to the fuselage which can be of any ordinary description. I have shown the girder I form in section.

At any required distance apart, I place cross girders 2, firmly attached and bracketed to the main girder 1. These cross girders have on each side of them (except in the case of the outside ones) a rail or flange 3, extending the whole length or nearly so. They also have at two points a considerable distance apart a saddle bracket 4 firmly screwed on to the girder, each bracket carrying attachments for the usual tension tie wires and a socket for the usual vertical pillars 5 of streamline cross section. If the upper wing plane is to be telescopic it is arranged similar to the lower plane, except that the saddle bracket is attached to it be-

low instead of above. 6 6 are the actuating shafts running the whole length of the wing plane. The actuating shafts of the upper and lower wing plane are connected by gearing such as sprocket wheels and chain 7 as shown. 8, 9 and 10 are sprocket wheels having sprocket chains 11 connecting them as shown. The sprocket wheels 10 10 are close together but usually of slightly different diameter as it will be found in practice that the hind movable member 17 hereafter described should have a little greater travel than the anterior member 18. 13 are small brackets on the sprocket chains each attached to a bar 12 forming a part of the movable member hereafter described. The top and bottom of the girders 2 are parallel between the lines 14 and 14, and have screwed to them above and below aluminium or aluminium alloy such as duralumin plates or other stiff strong covering 15. These plates can have supporting ribs stretching from girder 2 to girder 2. The end of the plate is screwed to the rounded bar or rib just below. The girders and the covering plates connecting them constitute the fixed member of the wing plane.

In order to avoid complexity of drawing the coverings are in large part removed. 18 and 17 are the front and back movable members consisting each of a board (or skeleton girder) 16 on each side alongside the girders 2 and their covering plates. These boards carry a series of pivoted pulleys or runners 19 running on the flange 3 and supporting and guiding the movable member. The movable members 18 and 17 are each formed of these boards, and a covering uniting the boards and supported by slats 20 here and there from board to board so as to make a strong framework. These boards with their coverings slide under the covering of the central part extending below the latter and beyond its outer extremity for a few inches horizontally even when the wing plane is fully expanded. These sliding members with their coverings are slightly less in depth, but similar in shape to the girders 2 so as to just slide under the covering of the central portion. The entire strain of the sliding or telescopic members comes on the runways and not on the stationary covering or member, and thus the telescopic members can be run out almost clear of the stationary covering and yet be well supported. The girders 2 are united by spacing tie rods 21 extending the whole length of the wing plane and passing through slots 34 on the side boards of the movable members. These tie rods can be made of ash or somewhat flexible steel so as to give slightly with the straining of the machine. On these tie rods, preferably near the center between the girders 2 are placed the sprocket wheels 8 and 9 running freely on the tie bars, and held in one position by collars and pins on each side in well known manner. These tie rods pass through slots in the side plates 17 and 18.

The main shaft 6 of the lower wing plane is connected by a sprocket wheel 10 and chain 22 to a sprocket wheel 23 on a small shaft 24 in the fuselage. A worm wheel 25 on this shaft is in gear with a worm 26 on the crank shaft 27 which carries crank 28 and is carried in a bearing, not shown, on the fuselage.

Fig. 3 shows a modification in which racks and pinions are used instead of sprocket gear for telescoping. In this 35 and 36 are racks each bolted by bolts or screws 37 to the side board 16 of its respective movable member 17 and 18; these are propelled in and out by two pinions 38 on shaft 6. They are shown nearly the same size but I prefer the one actuating the hind shutter to be rather longer and the pinion actuating it rather larger than that of the front shutter or moving member. If as I prefer the two movable members are propelled somewhat unevenly there can be two pinions side by side each propelling a rack and one of the racks instead of being bolted to board 16 direct can have spacing blocks between the rack and board 16 so that the rack can come opposite its pinion.

The mode of action is as follows:—The aviator when he wishes to rise from the ground turns the crank 28 thus by sprocket gear simultaneously moving outward the fore and aft movable members 17 and 18 to their full extent. The engine is set in motion and the wing plane being wide the machine rises easily but slowly. As it gets to a convenient height the aviator winds the movable members in again by crank 28 and thus the critical and actual speed is greatly increased. If it be desired to hover as when going slowly against the wind or when it is desired to alight the movable members are telescoped out to their full extent.

In conclusion I do not absolutely bind myself to this exact method and apparatus for telescoping the movable members as there are many methods and apparatus already well known for telescoping one body into another, but after trying racks and pinions and pneumatic devices I have found these sprocket devices the most simple and convenient.

I declare that what I claim is:—

1. A wing plane of a flying machine formed of a framework of main girders and cross girders and three widths of covering, the anterior and posterior covering widths traveling on ball or other like races on the sides of the cross girders of the framework, and the center width of covering attached rigidly to the cross girders.

2. A wing plane of a flying machine built up of main and cross girders and fore and

aft coverings sliding on races on and between the cross girders, said coverings being strengthened where necessary, the central part of the central covering being stationary and firmly attached to the cross girders, and the fore and aft coverings movable and traveling by means of friction balls on ball races on the sides of the framework, and means for sliding them.

3. In a wing plane formed of three parts, the fore and aft ones being movable, a differential gear for moving these parts, whereby one part can be moved synchronously with the other, but slightly faster than the other.

4. In a flying machine, mechanism for enlarging and contracting the width of the wing planes which consists in a more or less flexible shaft longitudinal with the wing plane, wheels thereon, and means whereby these wheels when rotated draw the planes closer together or farther away according as the shaft is rotated.

5. In a wing plane of a flying machine capable of being expanded in width, a central framework carrying a shaft capable of rotation parallel with the center line of the frame, an anterior and a posterior framework telescoping in the central framework, wheels on the central shaft and mechanism connecting these wheels with the fore and aft frameworks, whereby when the shaft is rotated in one direction both outer frameworks are telescoped inward and when rotated in the other direction both outer frameworks are telescoped outward.

6. In an apparatus for telescoping the wing planes of flying machines, in which there is a shaft longitudinal of the wing planes, wheels and gearing devices whereby when the shaft is rotated the fore and aft frameworks are telescoped relative to the central framework, the device for actuating it from the fuselage consisting of a wheel on the shaft, a wheel on a small shaft in the fuselage, a device for connecting the same so as to work synchronously, a worm wheel on the small shaft, and a worm gearing therewith whereby when the worm is worked in one direction the plane is closed up, and when worked in the other direction it is opened out and when it is not being worked, the worm acting as a stop on the mechanism to hold it in position.

7. In a flying machine formed of main and cross girders, a central portion of the covering firmly attached to those cross girders and two movable coverings on separate girders sliding on the cross girders one fore and the other aft, so that they can telescope into the central covering without having any strain on it, means for performing this telescoping from the fuselage and means for holding the device locked in position when not being actuated from the car.

8. In a wing plane of variable width formed of a main girder device and cross girders longitudinal to the line of flight, a central hollow structure attached to the cross girder system having open ends and anterior and posterior hollow structures sliding on the cross girders and telescoping into the central fixed covering without strain upon the latter, the plates or coverings of the moving members closely fitting between the plates of the central hollow structure, and races on the cross girders carrying the entire strains of the fore and aft members whereby the three coverings form almost a single line of covering only one thickness almost throughout with very slight overlapping, when expanded.

9. In a wing plane capable of being expanded in width and formed of three sections transversely, a fixed central section and two movable outer sections, apparatus for telescoping consisting of a flexible shaft longitudinal to the wing plane carrying wheels at intervals, a series of wheels in the telescopic members but carried on mechanism attached to the main girder and flexible wrapping conductors between these wheels, such wrapping conductors being connected to the telescopic members, and means for driving the shaft from the fuselage.

10. In a wing plane capable of being expanded in width and formed of a main girder and cross girders, plates attached to the cross girders forming a central telescopic member, and frameworks fore and aft telescoping relatively to the central framework, pulleys attached to the telescoping members running on runways on the cross girders, whereby the entire strain of the telescoping members comes on the runways and not on the stationary member.

11. In a variable area wing plane, the combination of a main longitudinal girder, side girders projecting out therefrom carrying the covering of the fixed portion, runways on each cross girder, movable members having rollers rolling in the runways and spacing tie rods passing through slots in the movable members uniting all the side girders together.

12. In a combination wing plane with fore and aft extensions varying its width, the combination of a main girder device, cross girders projecting therefrom, the movable members fore and aft traveling on these cross girders and telescoping when bearing on them into the principal covering, and a set of posts fixed by brackets to the cross girders of the plane above and the plane below with tie rods or wires carried by this row of posts and brackets.

13. The combination with a variable area wing plane for a flying machine having a main girder, side girders and movable members traveling on the side girders, of a spac-

ing tie rod uniting all the side girders on each side firmly together, and passing through slots in the movable members.

14. In a wing plane of a flying machine, a covering of thin "aluminium plates" such as described slightly roughened with a sand blast or the like whereby a dull reflecting surface is obtained.

15. A flying machine in which its parts observable from below are formed with a dull rough reflecting surface of aluminium or one of its alloys such as described, whereby light falling on the surface is dispersed and not reflected as from a mirror.

In witness whereof, I have hereunto signed my name this 20th day of March, 1917, in the presence of two subscribing witnesses.

WM. P. THOMPSON.

Witnesses:
WM. PIERCE,
J. MCCORMICK.