Feb. 20, 1962 R. A. NYE 3,021,669

SECTIONAL FORMED COMBUSTION POWER CHAMBER FOR VARYING DRIVING IMPULSES FOR JET MOTORS

Filed March 4, 1957 4 Sheets-Sheet 1

Fig. 1.

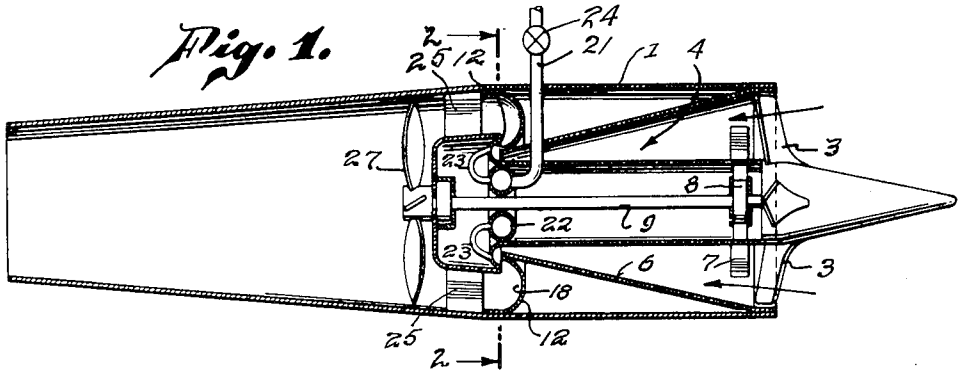


Fig. 3.

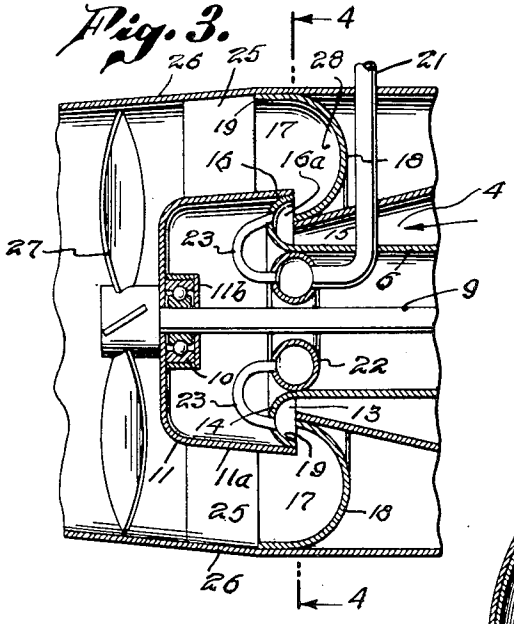


Fig. 2.

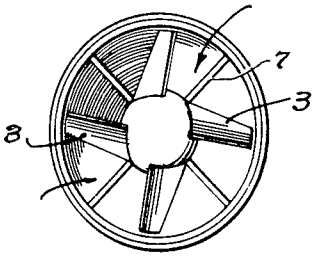


Fig. 4.

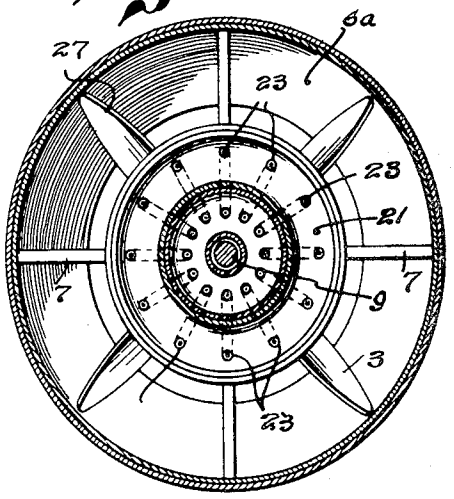
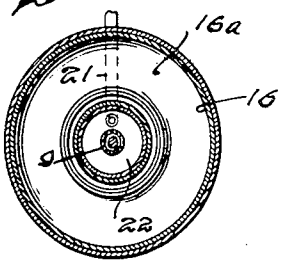


Fig. 5.



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Fig. 6.

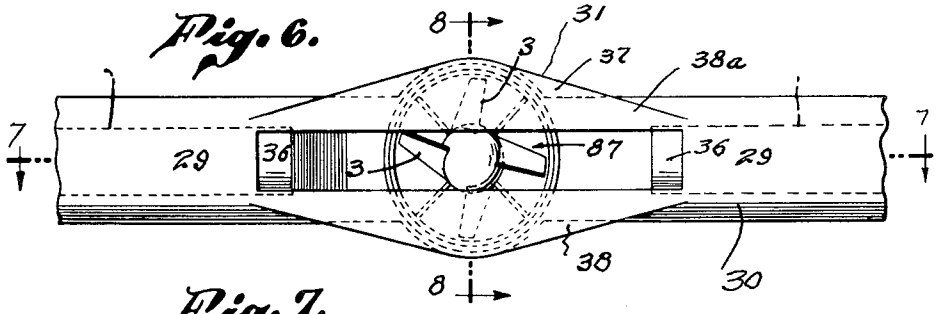


Fig. 7.

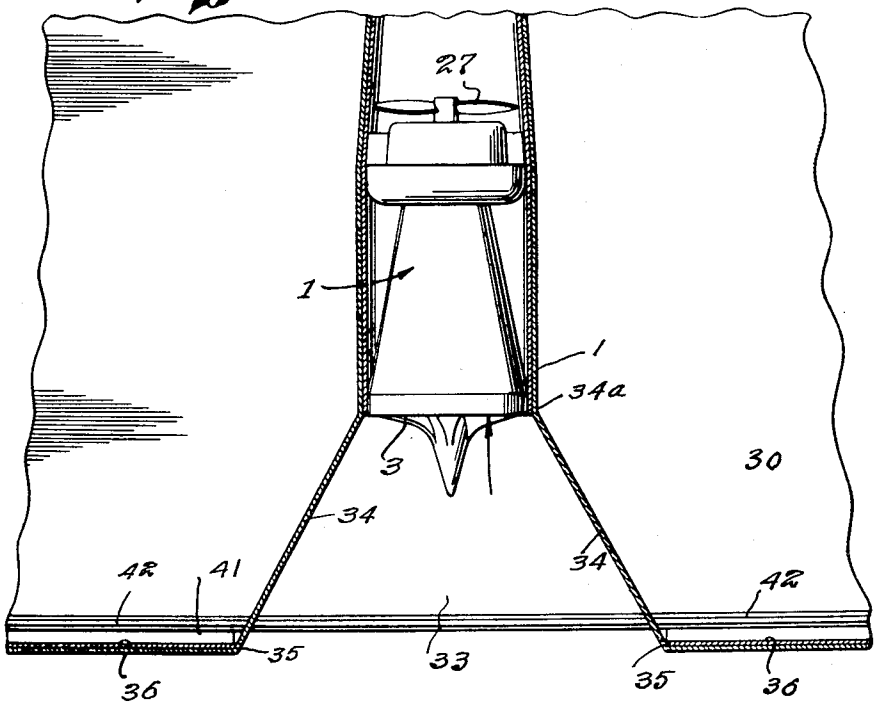
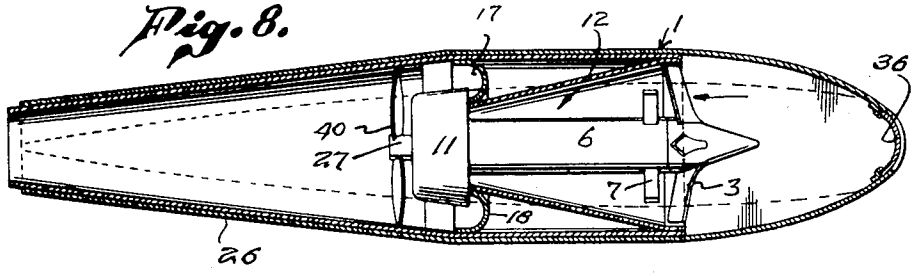


Fig. 8.



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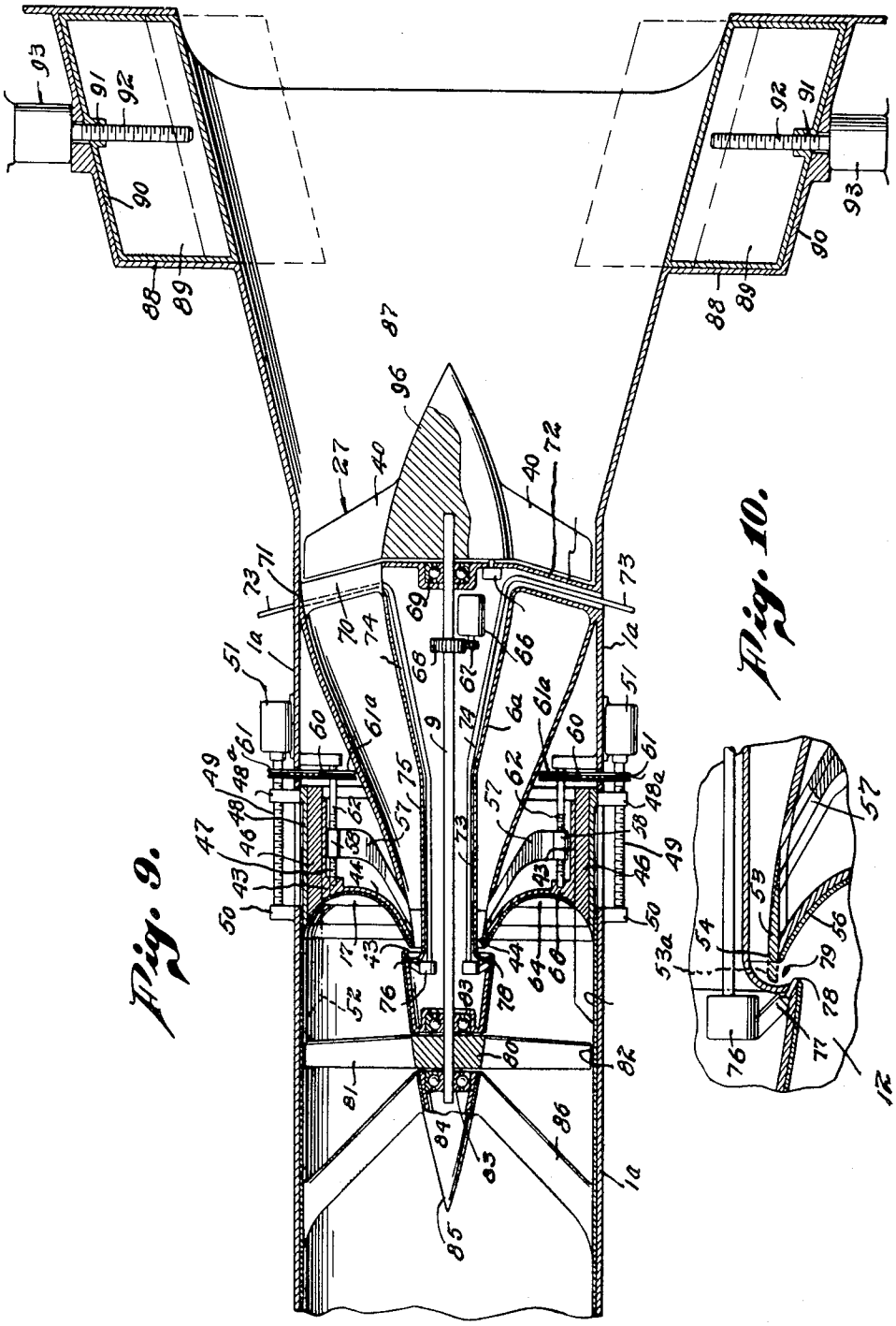


Fig. 9.

Fig. 10.

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SECTIONAL FORMED COMBUSTION POWER CHAMBER FOR VARYING DRIVING IMPULSES FOR JET MOTORS

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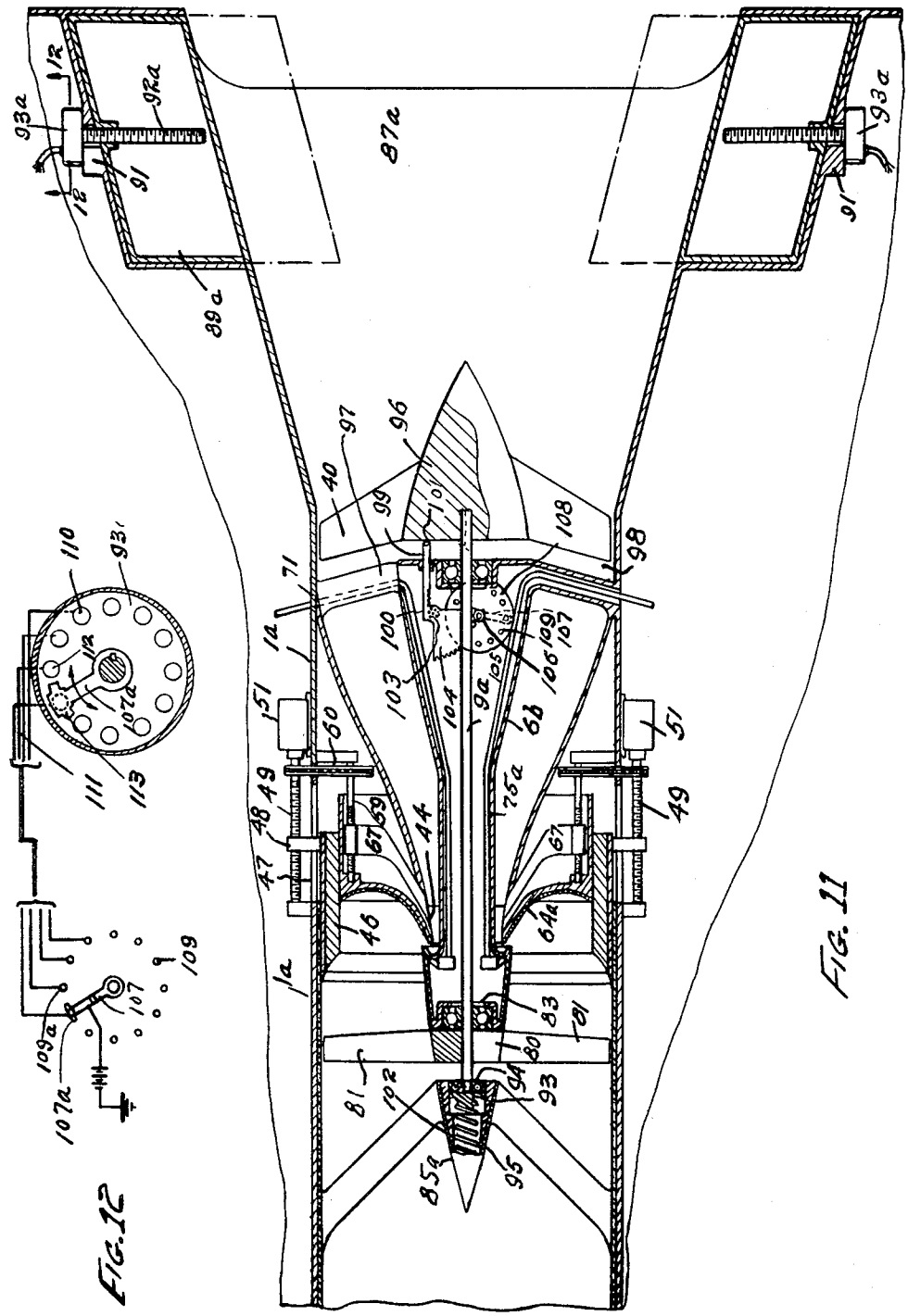


FIG. 11

FIG. 12

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3,021,669

SECTIONAL FORMED COMBUSTION POWER CHAMBER FOR VARYING DRIVING IMPULSES FOR JET MOTORS

Ralph A. Nye, Los Angeles, Calif.

Filed Mar. 4, 1957, Ser. No. 643,701
6 Claims. (Cl. 60—35.6)

This invention relates to airplanes and particularly to turbo-jet airplanes.

One of the objects of this invention is to provide means placed in an air duct disposed in a front and rear direction, which leads the air for combustion back to a point in the motor where the incoming air is directed into a combustion chamber; and to provide a forward wall for the combustion chamber to receive the pressure and propulsion effect of the gases of combustion, from which point the gases of combustion pass rearwardly on the axis of the motor to their point of exhaust in the jet at the rear end of the airplane; and to provide means including a duct of gradually reduced cross-section for compressing the incoming air in said duct before it is directed past the ignition means and into the combustion chamber.

In accordance with my invention, I provide a concavo-convex forward wall for the combustion chamber which presents a relatively large projected area on a plane at right angles to the longitudinal axis of the motor; and in accordance with my invention, the rear edge of this concavo-convex wall is located adjacent to the point of admisssion of the fuel and air admitted for its combustion.

Another feature of this invention is the provision of a movable annular outer wall for the combustion chamber which, in its foremost position, presents a rear concave face, which in this position, is then located in register with the outer and rear edge of the concavo-convex forward wall of the combustion chamber that extends from the point of ignition out to the inner face of the outer annular wall of the combustion chamber.

In this position for the outer wall, a maximum area is presented for the combustion chamber which, of course, will give the motor its greatest forward thrust for propelling the plane.

In accordance with my invention I provide means whereby this outer annular wall of the combustion chamber can be shifted rearwardly by manual control.

In practice the intake for the combustion air is elongated transversely at the forward end of the motor, and one of the objects of this invention is to provide abutments at the ends of this intake mouth with means for effecting changes in their position to regulate the quantity of incoming air that can pass them.

Also in accordance with my invention, an annular valve is employed, preferably located at the inner edge of the concavo-convex forward wall of the combustion chamber, said valve being capable of moving into the annular space, for affecting the area of flow for the combustion air as it passes the ignition jets.

Another object of the invention is to improve the general construction of turbo-jet motors and to simplify the same and reduce the number of parts necessary to enable the airplane to be operated at full speed either full power or at half speed with the motor developing less than full power.

Further objects of the invention will be evident from a careful reading of the accompanying specification and a study of the drawings.

The invention consists in the novel parts and combinations of parts to be described hereinafter, all of which contribute to produce an efficient sectional formed combustion power chamber for varying driving impulses for jet motors.

A preferred embodiment of the invention is described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

In the drawing:

FIGURE 1 is a horizontal section taken through the nacelle or housing for the motor and illustrating features of my invention; the rear portion of the housing being broken away.

FIGURE 2 is a cross-section taken about on the line 2—2 of FIGURE 1.

FIGURE 3 is an enlarged view of the rear portion of the motor shown in FIGURE 1, further illustrating details illustrated in FIGURE 1 on a smaller scale.

FIGURE 4 is a cross-section taken on the line 4—4 of FIGURE 3 and further illustrating details illustrated in that figure.

FIGURE 5 is a vertical section taken about in the plane of the section line 4—4 in FIGURE 3 in a plane passing through the edge of a bonnet that supports a collar for effecting the reversal of the direction of flow of the air for combustion to direct it forwardly and against the forward wall of the combustion chamber and at the location of the fuel inlets.

FIGURE 6 is a front elevation of the airplane illustrated in FIGURE 1 herein and particularly illustrating the abutments that operate as controlled gates at the ends of the intake opening for the air, and used for reducing the flow of air into the motor. The lateral portions of the airplane in this view are broken away.

FIGURE 7 is a horizontal section taken on FIGURE 6 on the line 7—7, and further illustrating two gates or shutters that are guided in the wing to be slid into the intake mouth to reduce its effective area.

FIGURE 8 is a vertical section taken in the plane of the line 8—8 on FIGURE 6, and further illustrating details, and particularly the form of the guided gates located at the forward edge of the airplane wing.

FIGURE 9 is a horizontal section, similar to FIGURE 7, showing the use of box form abutments that can be used instead of the gates illustrated in FIGURES 7 and 8, that are capable of moving into the ends of the inlet mouth of the intake to reduce its effective area.

FIGURE 10 is a fragmentary view broken away and illustrating an enlargement of the parts located in the vicinity of the point of ignition of the fuel and air for combustion as they pass into the combustion chamber.

FIGURE 11 is a view similar to FIGURE 9 but differs from FIGURE 9 in that the parts of the combustion chamber and valve are shown in the relation that they have when the motor is operating at reduced power.

FIGURE 12 is a diagrammatic view illustrating an electric switch and a synchronized motor the movements of which are controlled by the switch. This view is of a diagrammatic nature. In reading this view, the synchronized motor illustrated at the right of FIGURE 12 may be considered as shown on the section line 12—12 of FIGURE 11.

Before proceeding to a more detailed description of this invention it may facilitate its disclosure to say that in its simplified form, as shown in FIGURE 1, the motor is mounted in a housing of tubular form and located adjacent the forward portion of the airplane.

At its forward end the motor is provided with a conical tip which operates as a hub of a propeller having a plurality of radial blades which, in the present instance, are four in number. This propeller is located at the circular intake core located at the forward end of a conical air duct the rear end of which is much smaller in diameter and cross-section than the forward end, and presents an annular opening in which the rear end of a cylindrical core is located coaxially in the annular opening.

As indicated in FIGURES 1 and 2, four struts 7 are provided that extend in radially from the wall of the cylindrical housing 1, and through the wall of a conical core 6, to a point adjacent the longitudinal axis of the motor where their inner ends support a forward bearing 8 for a motor shaft 9.

Referring now to FIGURES 1 and 3, the motor shaft 9 extends rearwardly through a rear bearing 10 supported on a cup-form bonnet 11 having a forwardly extending outwardly flared side wall 11*a*, the forward end of which is slightly larger in diameter than the rear end of the conical air duct 4 that also includes the outer wall for the compression chamber 12.

The relatively small end of the duct 4 is disposed toward the after part of the airplane and the duct is unobstructed throughout its entire length. In this way an annular inlet port 13 is formed, the inner wall of which is formed by an annular inlet collar 14 of cup-shaped cross-section as shown in FIGURE 3.

While this collar 14 may be formed as a separate piece it is illustrated as made integral with the rear end of the cylindrical core-piece 6, by bending its rear end out and then forward on a small radius. In this way the desired cup-form cross-section is obtained with a circular center line as an axis located about in line with the tip of the wall of the compression chamber 12.

So, as the air for combustion is forced back by the forward propeller fan blades 3 through the narrowing neck 15 its density is increased before it impinges against the bottom of the concave inner surface of the collar 14, which directs the air outwardly and forwardly in the direction in which the outer lip 16 of this collar extends (see FIGURE 3). The result is that collar 14 reverses the direction of flow of the air stream coming into it and delivers it through an annular inlet port 16*a* into an annular combustion chamber 17 the forward wall 18 of which is cup-shaped, that is, concavo-convex.

The annular outer lip 19 of the wall 18 is welded to the inner face of the tubular housing 1, and its inner lip 20 laps over the outer portion of the collar 14, and is welded to the outer face of the tip 13 of the conical wall 4 of the compression chamber 12.

Liquid fuel is delivered by pipe 21 from a tank (not shown), on the airplane, which connects to a fuel ring 22 on the forward side; and small arcuate bent tubes 23 on the after side deliver the fuel at a plurality of points through the "bottom" of the cup-shaped collar 14.

The direction of this delivery is somewhat outward and radial so as to project the fuel through the annular fuel feed opening between the inner tip 20 of the combustion chamber wall and the outer tip 16 of the collar 14.

In practice the interior of the annular cup-shaped collar 14 functions as a mixing chamber for the fuel, and the air intake or for combustion admitted through the air inlet at the outer tip 18 of the collar.

The pipe 21 is provided with a valve 24 for feeding the liquid fuel to the fuel ring 22.

Associated with the annular cup-shaped ring 16, spark plugs would be spaced circumferentially from each other around this collar, and located adjacently to the points of admission of the fuel from the small U-shaped tubes 23. However, these spark plugs are not illustrated in FIGURE 3.

Struts 25 are provided to support the bonnet 11, the outer portions of which are secured to a rear extension 26 from housing 1; and their inner ends are secured to the cup-shaped bonnet 11, which houses a disc form body 11*b* that carries the bearing 10 for the rear end of the shaft 9. And to the rear of the disc body 11*b* a propeller 27 is carried on the shaft 9.

In the operation of this mechanism just described the fuel becomes ignited as it passes out of the mixing chamber 16*a* and enters the combustion chamber 17. Of course, the ignition of the fuel in the combustion chamber immediately occurs, producing a great volume of

gases of combustion that exert a considerable pressure upon the concave rear inner face portion 28 of the wall 18 of the combustion chamber. This, of course, exerts a great thrust force that impels the airplane forward.

Also, as the gases of combustion pass rearwardly to form the jet that is to be projected aft of the airplane they rotate the propeller 27, and the torque developed by it in the shaft 9 rotates the compressor fan having the blades 3, which fan is mounted at the forward end of the tubular core-piece 6.

Referring now to FIGURES 6, 7 and 8, the leading edge 29 of the wing 30 is preferably rounded, that is, its surface is struck on an arc with a small radius, forming a rounded nose that connects up with fair lines to the upper portion 31 and the lower portion 38 of the nose of the nacelle.

At the leading edge of the wing, and directly in front of the motor, forwardly diverging intake walls 34 form an air intake mouth 33, as shown in FIGURE 7. The side walls 34*a* are connected at their rear ends to the housing 1 for the motor. At their forward ends these walls 34*a* are provided with slits 35 through which platform gates 36 are guided to slide inwardly in a transverse plane toward the axis of the nacelle. They function when advanced through the slits 35 to reduce the effective area of the intake mouth 33 which, as shown in FIGURE 6, is of rectangular form.

Here are provided an upper cowl 37 and a lower cowl 38, in FIGURE 6 each formed of a cover plate 38*a* that fits over and conforms to the upper and lower sides of the housing 1, and extending rearwardly on a fair line; and merging their rear areas into the angles 39 indicated by dotted lines in FIGURE 6 at the junction of the circumferential wall of the motor housing 1 and the upper face of the wing. By extending the mouth of the intake laterally as shown in FIGURE 6 a desirable stream line effect is attained that favors greater efficiency in flight.

With this mechanism shown in these FIGURES 1 to 8 it will be evident that as the gases of combustion in the jet rush rearwardly into the rearwardly tapered conical rear portion 26 of the housing 1, to pass finally into the atmosphere, and past the propeller 27 having the blades 40, which have the same character of pitch as the pitch of the blades 3 of the forward propeller already described. Hence, as the propeller 27 rotates, due to its pitch, and high velocity of rotation, it will give an impetus to the gases composing the jet as it passes toward the tail portion 26, of the motor housing.

Referring again to the plates 36 as shown in FIGURE 8, they are formed in an arc to conform to the inner face of the rounded nose 29 at the front of the nacelle and their upper and lower edges 41 are disposed back of guides 42 which hold them in place at the opening 33 and permit them to be slid through the slots 35 already referred to.

Referring now to FIGURES 9 and 10, it should be understood that the showing in these figures illustrates substantially the same mechanism illustrated in FIGURES 1 to 8 already described, but FIGURES 9 and 10 include some features not shown in FIGURES 1 to 8. In FIGURE 9 an annular valve 32 is shown that is mounted to slide forward and back on the cylindrical outer face of the inner wall 31V of the conical air duct or guide 4 for the inflowing air. This valve 32 can be projected more or less across the admission throat C as shown in FIGURE 10, by rotating the adjusting screws 30R and 30L by closing direction control circuits through the electric motors 20R and 20L.

These features are related to means provided to enable the forward thrust generated by the gases of combustion filling the combustion chamber, which enable the effective thrust and the horse power that is impelling the plane forward, to be regulated. In other words, the wall of the combustion chamber that takes the thrust

of the jet is formed in two sections, an inner section 43 having a concavo-convex wall 44 and a cylindrical forwardly extending apron 48, the cylindrical outer face of which acts as a guide for an outer annular section 46 that forms part of the two-wall combustion chamber wall.

This is a construction illustrated in FIGURES 9 and 10 where it will be noted that the outer annular section 46 is mounted and guided back and forth at a clearance opening 47 that extends longitudinally in the wall of the housing 1*a*. Through this slot a post 48*a* extends upwardly and in this post is mounted an adjusting screw 49, at each side, the rear end of which is mounted in a bearing block 50 that projects up from the wall of the housing at the rear end of the slot. The screw 49 is actually an extension of the shaft of a synchronized motor 51 which can be driven in a step-by-step movement by an electric switch wired in circuit to the synchronized motor 51.

As illustrated in FIGURES 11 and 12, the switch that controls the synchronized motor 51 may be actuated automatically by a fore-and-aft shift in the position of the forward propeller to effect actuation of the control switch, which, in turn, will effect a rotation of the rotor of the synchronized motor 51 to keep it synchronized with the switch lever.

This will rotate the regulating screw 49 and thereby effect movement of the post 48 along the clearance slot 47, thereby shifting the annular outer portion of the combustion chamber wall toward the rear.

Such a shifted position is shown by the dotted lines 52 in FIGURE 9. However, the dotted lines illustrate a rather extreme shifted position for the annular portion of the combustion chamber wall, but it does illustrate the fact that when this outer section is shifted toward the rear the concavo curved face of the annular section will have been moved away out of line with the concave face of the inner section 43 of the combustion wall.

In other words, when the annular outer section of this combustion chamber wall has been moved rearwardly, as described, its rear inclined face will lose much of its effectiveness as a functioning area of the combustion chamber wall; so that the effective functioning area of the combustion chamber wall will be confined to the area of the inner section of this wall projected upon a plane at right angles to the axis of the motor. Of course, when the concave face of the outer annular section is registered with the concave face of the inner section as shown these concave faces jointly form a substantially continuous concave surface on the rearwardly facing wall of the combustion chamber and the projected area of both of these faces upon a plane at right angles to the axis of the motor will be functioning to develop the maximum amount of thrust that the motor can develop for driving the airplane.

In addition to this feature just described, in accordance with my invention, I may provide a movable part also controlled by the same synchronized motor 51 to advance an annular valve member 53 (see FIGURE 10) which is, of course, of annular form. It has a rounded edge 54 which normally lies substantially in register with the rear edge of the inner section 56 of this wall, and this ring is carried on a plurality of bracket arms 57 (see FIGURE 9); these bracket arms converge in an inclined direction toward the axis of the motor where they are integral with the valve ring 53.

These bracket arms 57 each extend out from a hub 58 (see FIGURE 9) which is tapped to ride on the threads of a screw 59 similar to the screw 49 already described. These two screws 49 and 59 may be driven by the same sprocket chain 60 actuated by a sprocket wheel 61 on the shaft portion of the screw 49.

This sprocket wheel is illustrated in FIGURE 9 as driven by the synchronized electric motor 51 secured to the outer side of the tubular casing 1*a* which houses the motor.

The chain 60 runs over a sprocket wheel 61*a* attached to the forward end of a threaded screw 62 that is received in the threaded opening in the boss or integral hub on the outer end of each arm 57.

With this organization it will be evident that by controlling the synchronized motor 51 with the proper electric switch it can be rotated through any desired number of rotations to cause the outer annular member 46 to be advanced, for example, to the point indicated in the dotted lines in FIGURE 9, and at the same time to advance the valve to cut off the supply of air for combustion coming past its rounded edge at 53*a* to enter the combustion chamber 12. In order to give this considerable movement to the annular outer section 46 of the forward wall of the combustion chamber while the valve 53 is moving the short distance indicated in FIGURE 10 through which it will move to arrive at the position indicated by the dotted outlines 53*a*, it will be necessary for the pitch of the thread on the screws 49 and 59 to be much greater than the pitch of the thread on the screw 62.

In FIGURE 9 the wall of the inner section 43 is composed of a concavo-convex forward portion of ferrous material the forward face of which is covered with a conforming plate 64 of ceramic material which protects the ferrous material from the high heat generated by the ignited gases in the combustion chamber.

The ferrous part of this section of the wall of the combustion chamber is formed with a boss 66 to provide a socket for the rear end of the threaded regulating screw 62.

In FIGURE 9 an electric generator 66 is illustrated, the shaft of which carries a pinion 67 that meshes with the gear 68 on the shaft 9 to drive the generator. This generator will be in a circuit used in the airplane to light burners served with fuel through the U-tubes 23, but this circuit is not illustrated.

The forward end of the shaft 9 is mounted in a ball bearing 69 at the forward end of the motor at which point a spider 70 is shown having radial arms the outer ends of which are swept back and welded at 71 to the tubular housing 1*a*.

These arms 70 are shown in FIGURE 9 with longitudinal channels 72 which give opportunity to pass in fuel supply pipes 73 which should be flexible so as to enable them to be passed around an angle and then along the interior of the core member 6*a*, the forward end of which is belled out slightly to provide a rudimentary channel 74 to house the generator 66 and the gear 68.

The fuel pipes 73 pass rearwardly and lie against the inner face of a cylindrical section 75 forming part of the core piece 6*a*. They each extend rearwardly to a fuel head 76 as shown in FIGURE 9. These fuel heads shown in larger scale in FIGURE 10 have small delivery extensions 77 that terminate in small nozzles 78 that deliver the fuel into the throat 79 that leads into the interior of the combustion chamber 12.

These nozzles 78 incline in the direction in which the air flows past them when passing into the combustion chamber. This location and inclination for them enables the air for combustion which passes them to exert an atomizer effect on the fuel and draw it from its nozzles.

The rear end of the shaft 9 carries the hub 80 of the rear propeller having the blades 81 with clearance 82 at their tips.

There are two ball bearings 83 disposed respectively aft and forward of the propeller hub 80 and both of them and the fuel heads 76 are encased in a housing 84 which is streamlined toward the rear in a point 85 to reduce its interference with the jet as the jet moves away out of the combustion chamber.

This housing is supported at the rear on rearwardly swept arms 86 connected to the shell 1*a*.

The forward end of the motor casing in FIG. 9 is ex-

panded laterally to form an intake mouth 87 and the end walls of the casing at the mouth are provided with two sockets 88 of box form in which are housed box-form abutments 89, and these abutments perform the function of gates such as are referred to above in connection with FIGURE 8. The lateral outer wall 90 of each of these abutments is provided with a boss 91 that is threaded to receive a screw 92 and this screw constitutes an extension of the shaft of a synchronized motor 93 which is controlled by a synchronizing switch manually or by an automatic synchronizing switch device.

In order to accomplish this the rear end of the propeller shaft 9*a* is stepped in a piston 93 by means of a ball bearing 94, and back of the ball-bearing a spring barrel 95 is provided in the housing 85*a*. This spring is powerful enough to maintain the shaft 9*a* in a forwardly disposed position in which the hub 96 of the forward propeller is disposed forward of the frame member 97 so that a gap 98 exists between the rear face of the hub and the forward face of the frame 97.

Guided in the forward face of the frame 97 is a control pin 99 the rear end of which is provided with teeth to form a rack 100. The forward end of this control pin has a socket on its end which carries a hard steel ball 101 that is peened in.

Now when the forward propeller is shifted rearwardly, a coiled spring 102 in the spring barrel 95, engaging the rear side of the piston 93, normally holds the forward propeller in the forward position such as indicated in the FIGURE 11. But when pressure against the forward side of the forward propeller reaches its maximum, this pressure will force the propeller rearwardly into the gap 98, and the rack 100 will then rotate a pinion 103 carried on a small shaft mounted in the conical portion 6*b* of the cone piece 75*a*.

This pinion 103 is rigid with a quadrant 104 and the teeth 105 of this quadrant mesh with a pinion 106 that carries an arm 107 that is located at the center of a contact plate 108, provided with a plurality of circumferentially disposed contact points 109. The end of this contact arm 107 carries a contact plate 107*a* which, when the arm rotates, will brush across the contact points 109 and close a succession of circuits through electromagnets 110 (see FIGURE 12) the coils of which are carried in a succession of circuits corresponding to the correspondingly placed contacts 109 of the control switch. The synchronized motor 93*a* of FIGURE 11 has a construction shown diagrammatically at 93*a* in FIGURE 12. Referring still to FIGURE 12, when the arm 107 is rotated clockwise from the position in which it is shown and brushes the adjacent contact 109*a*, this closes a circuit through the circuit wire 111, passing through the coil of the next adjacent electromagnet 112. This will cause the magnet directly under the corresponding arm 107*a* of the synchronizing switch 93*a* to become energized and this will attract the armature 113 on the end of the arm 107*a*.

In this connection it is to be understood that the armature 113 is not long enough to bridge two of the electromagnets simultaneously so when the armature 113 is freed by the breaking of the circuit through the wire 111, the energized core of the electromagnet 112 will pull the arm over to it, and hold it there until another movement of the arm 107 occurs.

Referring now to FIGURE 11, this view, in addition to the features disclosed in FIGURE 9, includes means for automatically controlling the air valve 53 through the agency of a shifting longitudinal movement of the shaft 9*a* of the motor.

By reason of the features of construction that distinguish this invention, it is possible for a flyer to set the controls of the motor for full power in climbing to a high elevation, and when that level has been reached he can use his manually controlled switch such as shown in FIGURE 12, to actuate the synchronizing motors 93*a* to advance the abutments 89*a* into the intake 87*a*, which will cut down the air stream passing into the motor, and this will automatically reduce the fuel that will be atomized into the air being admitted into the combustion chamber.

This accomplishes another object of my invention which is to economize fuel consumption.

The shifting shaft movement that is described in this specification, to control the area of the intake mouth 33 or 87 of the airplane, operates most perfectly in level flight only. When the plane is rising to a higher elevation and is inclined upwardly at its forward end, the weight of the shaft 9 and the two propellers will cause the abutments 89 to be retracted and withdrawn into their housings so as to leave the intake unobstructed to admit the maximum quantity of air and thereby give the motor the necessary increased power for the plane's ascent; but when the airplane is in a dive, that is, in a downward inclined flight, the abutments 89 will move inwardly toward the longitudinal axis of the intake 87*a* as shown in FIGURES 9 and 11, to assume a position somewhat as that indicated in dotted lines. This of course reduces the air intake and would occur whenever the plane is advancing on a downwardly inclined course.

In connection with the operation of admitting the fuel and compressed air past the valve 53 (see FIGURE 10) it should be understood that the curved annulus deflects the air current in a reversed radial direction into the combustion chamber, that is, it is directed toward the forward end of the airplane. This occurs almost instantly, and before the expansion of the air after passing the valve 53 completely reverses its direction. So, when the ignition of the fuel occurs, accompanied as it is by a great increase in volume of the gases of combustion, these gases exert a great pressure force against the forward concave surface of the forward wall of the combustion chamber.

The rear face of the wall 63 is covered and protected by a sheet 64*a* of ceramic material, and the annular outer section of the wall of the combustion chamber is composed entirely of ceramic material. The use of this ceramic material protects the ferrous material of the wall from the heat due to the high temperature from the ignition of the fuel in the combustion chamber. The annular ceramic wall 46 gives considerable protection to the metallic housing 1*a* of the motor.

Many other embodiments of this invention may be made without departing from the spirit of the invention.

I claim as my invention and desire to secure by Letters Patent:

1. In a jet propelled airplane, the combination of a substantially tubular jet motor housing with an air inlet at its forward end, a rearwardly tapering conical guide tube within the tubular housing, open at its forward end to admit free air as the airplane advances in flight, and for conducting the same to its relatively small end disposed toward the after part of the plane, means cooperating with the said guide tube to define a compression chamber for the incoming air, an annular combustion chamber located adjacent to the rear end of said rearwardly tapering guide tube, said combustion chamber having a concavo-convex forward wall, an annulus having an outwardly flared surface that deflects the incoming air current and cause the incoming air current to move forwardly in a general radial direction and into the combustion chamber, means for admitting combustible fuel adjacent the said annulus for directing the fuel into air streams entering the combustion chamber where the ignition of the fuel in the presence of the incoming air is accomplished; and means for regulating the position of the forward wall of the combustion chamber with respect to the location of said fuel inlets and also the quantity of air admitted for combustion to the combustion chamber.

2. In a jet propelled airplane, the combination of a tubular jet motor housing having an air inlet at its forward end, and a rearwardly tapering conical air guide

extending longitudinally within the tubular housing, taking the air admitted through the air inlet, said conical guide having its relatively small end disposed toward the rear end of the airplane, said conical guide being substantially unobstructed throughout its entire length, the diameter of the smaller end being so reduced in cross section as to enable it to exert a compressing effect on the air passing through the same from the air inlet, said conical duct including an inner cylindrical wall at its rear end and having an annular air inlet throat leading into a circumscribing annular combustion chamber, an annular concave deflector plate receiving the air flowing through the throat from the smaller end of said conical guide duct and directing said air into the combustion chamber, means for delivering fluid fuel into the air entering the combustion chamber through said throat at a plurality of points spaced circumferentially around said concave deflector plate, said annular concave deflector plate directing the mixture of fluid fuel and air forwardly into the combustion chamber, said combustion chamber including a relatively fixed inner concave body wall portion having an outer cylindrical guide face, an annular relatively movable outer sleeve section surrounding said cylindrical guide face in sliding relation, said sleeve carrying at its rear end an annular concave wall portion constituting a part of said combustion chamber, means guiding said sleeve to slide forwardly and rearwardly on said cylindrical outer guide face, the annular concave wall portion of said sleeve having an inner edge portion registering with an edge of the fixed inner concave body wall portion of the combustion chamber in one position, thereby augmenting the area upon which pressure will be exerted by the gases of combustion when the fuel is ignited, means for adjustably moving the said outer sleeve section toward the rear end of the airplane thereby causing a reduction of the maximum area that is exposed to the pressure of the gases of combustion when the edges of the two sections of the concave wall are in register with each other, and thereby reducing the effective thrust force of the burning gases of combustion exerted to drive the airplane forward.

3. In a jet propelled airplane, the combination of a tubular casing of a jet motor housing disposed on an axis extending in a fore-and-aft direction, an annular combustion chamber mounted coaxially within the tubular casing and located rearwardly of the forward end of the same, said combustion chamber having a forward wall composed of an inner annular body section and an outer annular body section each of which includes a rearwardly facing concave wall portion, said inner annular body section having a cylindrical outer guide face on which the outer annular body section can slide forwardly and rearwardly, the concave wall portion of said outer annular body section and the concave wall portion of the inner annular body section being complementary and jointly defining a continuous concave surface for the forward wall of the combustion chamber when the sections are positioned with their adjacent edges in registry, said tubular casing having an air inlet mouth disposed forward of the airplane with an air duct for leading the air from said mouth rearwardly toward the combustion chamber, annularly disposed means at the rear end of said air duct for receiving air from the duct and for deflecting the same radially outwardly and forwardly against the concave face of said inner section of said forward wall of the combustion chamber, means for admitting liquid fuel into the incoming air that is admitted into the combustion chamber, means for moving the said outer annular section of said forward wall of the combustion chamber in a forward or in a rearward direction to enable the rear end of said outer section to be projected rearward past the concave face of said inner annular wall to decrease the effective area of the concave wall presented by the rearwardly facing concave wall portions of said inner and outer body sections, thereby to reduced the total pressure and thrust of the burning gases against the concave face of the combustion chamber and thereby control the speed of the airplane.

4. In a jet propelled airplane, the combination of a substantially tubular jet motor housing with an air inlet at its forward end, a rearwardly tapering tubular guide for the air admitted through the air inlet, and located within the tubular housing, with its relatively small end disposed toward the rear of the airplane, an annular collar with a cupped forwardly directed face, mounted within the housing coaxial with and spaced rearwardly from the rear end of the tubular air guide and operating to deflect the air from the air guide outwardly and forwardly through an annular discharge space provided between the rear end of the tubular air guide and said annular collar, a combustion chamber receiving said air, and of regular annular form coaxial with said tubular guide, located at the small end thereof, said combustion chamber having a wall with a concave face directed toward the rear, said jet motor housing cooperating with the concave faced wall to partially envelop the combustion chamber, said smaller end of the tubular air guide being located adjacent the inner edge of said concave face of the combustion chamber past which the air flows to the cupped face of the annular collar, valve means for controlling the axial extent of said annular discharge space and power actuated means for moving the valve means toward or from said cupped face of the inner collar to control the power developed by the ignition of the fuel in the air current entering the combustion chamber, and a plurality of fuel burners supported at said annular collar for delivering the fuel into the air current.

5. In an airplane jet motor, the combination of a tubular jet motor casing, a combustion chamber having a cylindrical body open at the rear and having a transverse forward wall, a tapered tubular air duct extending in a front and rear direction coaxially with the cylindrical body of the combustion chamber and having its larger end forward and provided with an air intake for delivering air to said air duct, said intake having an inlet mouth with outer side walls diverging in a horizontal plane, the smaller end of said air duct being disposed towards the rear, whereby in advance of the airplane in flight the air flowing in through the intake is forced back into the relatively small end of the tubular air duct, and thereby becomes relatively compressed due to the reduced cross section of the tubular duct, means for directing the air from the rear end of the tubular duct into the combustion chamber, means for discharging the fuel into the stream of air flowing from the tubular air duct into the combustion chamber, means for igniting the mixture of air and fuel, and a jet tube axially in line with the combustion chamber to the rear of the same, and annular valve means slidingly mounted on the rear end of said tubular air duct and guided to move in a fore-and-aft direction, and means for moving said valve member in a fore-and-aft direction, the rear end of said valve projecting into the air current that is flowing from the smaller end of the tubular air duct into the combustion chamber to regulate the power developed.

6. In a jet propelled airplane, the combination of a cylindrical jet motor housing; an air inlet at its forward end with side walls diverging forwardly, in a horizontal plane, a rearwardly tapering conical air duct within the tubular housing, the interior of which is substantially unobstructed throughout its length, and with its relatively small end disposed towards the after part of the plane, means including a central tubular core member disposed within and coaxially of said conical air duct and cooperating with the rear end of said duct to define a relatively small compression chamber into which the incoming air is forced by the current of air admitted through the air inlet, an annular combustion chamber located adjacent to the rear end of said conical air duct, said combustion

chamber opening rearwardly and having a rearwardly facing concave forward wall disposed transversely to the axis of said air duct, an annulus having a forwardly directed, outwardly flared surface positioned to deflect the incoming air current from the conical air duct forwardly and outwardly into the combustion chamber, means for discharging combustion fuel adjacent to said annulus and into the air stream entering the combustion chamber, an annular valve at the rear end of the compression chamber, means for mounting said valve for movement towards and from said annulus, means for moving said valve axially of the air duct to control the effective area of flow of air from the compression chamber into the combustion chamber and past the fuel inlets, and movable abutments mounted at the forward end of said air inlet in the diverging side walls thereof, said inlet side walls having openings in which said abutments are located, means for moving said abutments outwardly and inwardly through said

openings transversely of the axis of the air inlet to project the inboard ends of said abutments more or less into the cross section area of said inlet to control the effective area of the same for admitting the incoming air to the inlet to the tapering guide duct.

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