J. C. PEWTHER.

FEEDING AND TIMING MECHANISM FOR CENTRIFUGAL GUNS.

APPLICATION FILED JUNE 5, 1918.

1,289,895. Patented Dec. 31, 1918.

Fig. 1.

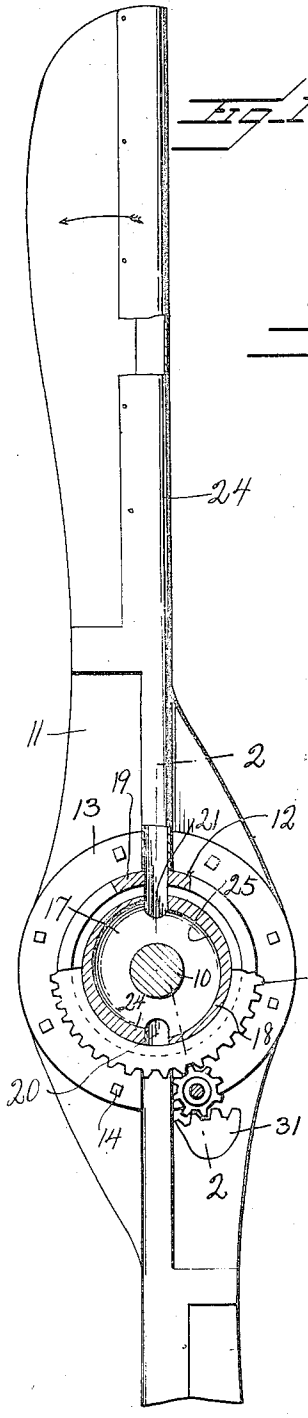



Fig. 2.

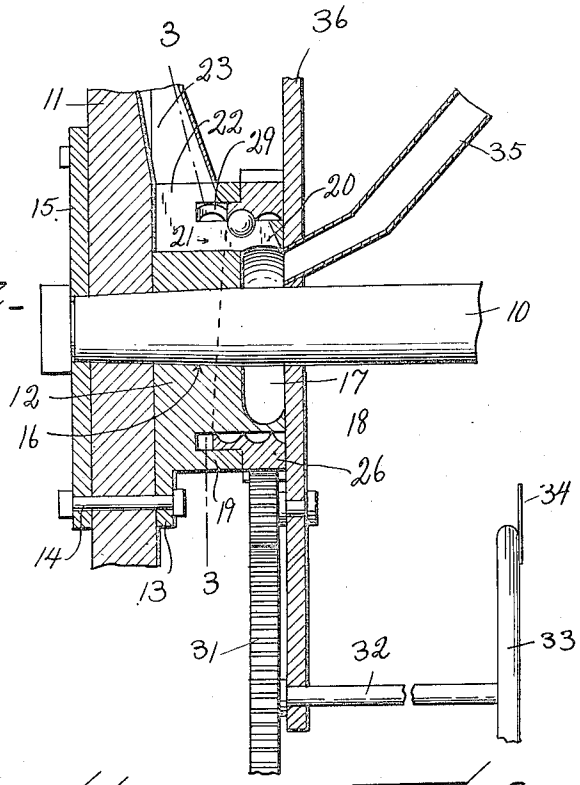



Fig. 3.

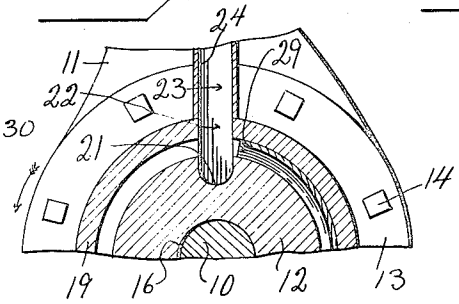



Fig. 4.

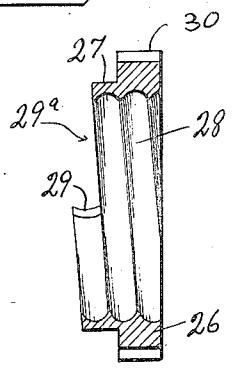
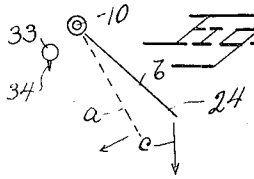



Fig. 5.




Inventor

J. C. Pewther

By Watson E. Coleman

Attorney

# UNITED STATES PATENT OFFICE.

JUDSON C. PEWTHER, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO THE PEWTHER GUN CO., OF DENVER, COLORADO, A CORPORATION OF COLORADO.

## FEEDING AND TIMING MECHANISM FOR CENTRIFUGAL GUNS.

1,289,895. Specification of Letters Patent. Patented Dec. 31, 1918.

Application filed June 5, 1918. Serial No. 238,329.

*To all whom it may concern:*

Be it known that I, JUDSON C. PEWTHER, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Feeding and Timing Mechanism for Centrifugal Guns, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to centrifugal guns, that is, a gun in which projectiles are ejected by centrifugal action, and particularly to means whereby the discharge of the projectile may be timed and thus the direction of the projectile, to some degree, controlled.

One object of this invention is to provide improved means for feeding projectiles to the rotating barrel or barrels of the gun and to provide very simple means whereby the time of discharge of the projectile into the barrel of the gun may be regulatably controlled so as to thereby control the direction in which the projectiles will be ejected from the barrels.

A further object is to so construct this feeding and timing mechanism that there will be no chance of the projectile jamming or choking in the passage through which it travels, and in this connection to provide a feeding and timing device so formed that while the projectile is left free to travel without any chance of jamming or choking, yet it will be positively fed to the point of discharge into the barrel.

A further object is to combine with the blades of an aeroplane propeller, gun barrels rotatable with the blades around the axis of the propeller and provide very simple means whereby the projectiles may be discharged from a hopper or other source of supply into the chamber and be carried from thence to said barrels, and provide means controllable by the aviator for causing the discharge of projectiles from each barrel as it reaches a certain predetermined point.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is an inside face view of an aeroplane propeller with my centrifugal gun mounted thereon, the feeding and timing mechanism being partly in section;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary section on the line 3—3 of Fig. 2;

Fig. 4 is a diametrical section of the annular collar 26; and

Fig. 5 is a diagrammatic view illustrating the position of a gun barrel at the time of receiving and of discharging the projectile.

Referring to these drawings, 10 designates a shaft or rotatable member which is illustrated as the shaft of an aeroplane propeller and 11 designates the blades of such a propeller. These blades may be of any suitable construction and the showing in the drawings is purely illustrative of the fact that this invention may be used on the blades of the propeller though not limited to such use.

Mounted upon the shaft 10 for movement therewith and with the blades 11 is a body 12 which, as illustrated, forms a part of the hub of the propeller and is provided with an outwardly extending flange 13 through which bolts 14 pass engaging the clamping plate 15 holding the blades of the propeller in place upon the shaft. The body 12 is formed with a centrally disposed bore 16 for the shaft 10 and concentric to this bore and upon its outer face the body is formed with a central chamber 17. Exterior to the circumferential wall 18 of this chamber is a circumferential wall 19 spaced from the wall 18 and lower than this wall. The wall 18 is formed at diametrically opposite points with outlet openings or ports 20, which are circular in form and which extend down to the bottom of the chamber 17, these ports opening into longitudinally extending grooves 21 formed in the wall 18, these grooves in turn opening at their inner ends into radially extending ports or channels 22. Each exit opening or throat 22 discharges into the enlarged somewhat funnel-shaped inner end 23 of a barrel 24. Two of these barrels are shown attached to the two blades 11 but I do not wish to be limited to this number or to the use of a plurality of barrels. These barrels 24 are intended to be made of light metal and attached in any manner to the exit edge of a blade.

The peripheral face of the chamber 17, as will be noted from Fig. 1 is not concentric to the axis of the shaft 10 but is so formed as to provide a stop 24 on one side of each port 20. In order to provide this stop and to guide the projectile to the port openings

20, I provide eccentric surfaces 25 by forming the wall 18 relatively thick at each point 24 and gradually decreasing the thickness of the wall from the point 24 to the opposite port 20. Thus the centrifugal action will cause the projectile to be guided by this eccentric surface 25 to the port 20 and then the stop 24 will prevent the further movement of the projectile circumferentially and the projectile will be thrown out of the port 20 into the slot 21 and the barrel.

It is necessary to provide means for positively feeding the projectiles from the port 20 to the port 22 in a path approximately parallel to the axis of the shaft 10. To this end I dispose around the wall 18 the collar 26, which collar is formed with a flange 27 engaging in the space between the wall 18 and the body 12. The inner face of this collar 26 as illustrated in Fig. 4 is formed with a relatively shallow spiral groove 28. This groove is approximately two-fifths the depth of the projectile and the flange 27 is cut away as at 29 to provide a termination of this groove, this termination being slightly beveled outward. This termination 29 is the discharge point for the projectile and the position of this termination 29 of the spiral groove determines the direction of discharge of the projectile. For the purpose of adjustably rotating the collar 26, so that the gun may be aimed, I may provide any suitable mechanism but I have shown for this purpose the collar as formed with exterior gear teeth 30 operatively engaged by a pinion 31 mounted upon a shaft 32 adapted to be operated by hand and carrying a hand wheel 33 for this purpose having thereon a pointer 34, this pointer being so arranged that when the pointer is pointed at the objective, the gun will discharge in that direction.

While I do not wish to be limited to any particular means for feeding the projectiles into the chamber 17, and any suitable means may be used for this purpose, I have illustrated for this purpose a feed chute 35 disposed through the supporting plate 36 extending across the chamber 17 and which plate also supports the shaft 32. This plate 36 may form one of the bearings for the propeller shaft, and in aeroplanes may be in the form of a brace.

In operation the projectiles are discharged into the chamber 17 from the chute 35 and inasmuch as the body 12 is rotating at a high speed, the projectiles will also be caused to travel around with the body and will be urged radially outward by centrifugal force and will therefore bear against the curved inner face 25 of the chamber 17. When the projectile comes in contact with one of the stops 24, the circumferential movement of the projectile is stopped and the radial movement of the projectile will carry it out through the port 20 and against the spiral track or groove 28. The walls of the slot 20 will cause the projectile to travel around with the body 12, but the centrifugal force will urge the projectile out against the spiral track and hence the projectile will be fed toward the port 22 until the projectile reaches the termination 29 of the track. Here the projectile leaves the track and the centrifugal force will carry it into the throat 23 of the barrel 24 and out of the barrel with a force depending upon the speed of rotation of the barrel and the length thereof.

It will be noted that it is only when the throat of the barrel reaches the terminal 29 that a projectile can be discharged into the barrel. In effect, the flange 27 of the collar 26 is cut away at the point $29^a$ to thereby leave an opening or gate which, when it alines with the throat 23 permits the discharge of the projectile. It will be obvious, therefore, that the point of discharge of the projectile into the barrel will depend upon the rotative adjustment of the feeding and timing collar 26.

Now by reference to Fig. 5, it will be seen that if the projectile be discharged into the throat of the barrel when the barrel is in the position indicated at *a*, the projectile will be discharged from the barrel when the barrel is in the position *b* and the projectile will be discharged in the direction of the arrow *c*. The barrel therefore moves through the arc of about 345°, before the projectile is discharged from the barrel. The angular distance therefore between the radial direction of the cut-away portion $29^a$ and the point at which the barrel is disposed when it discharges is approximately 345°. The pointer 34 is, therefore, set at an angular distance of 345° in advance of the terminal portion 29 of the spiral track. Of course this angular distance between the point of discharge into the barrel and the point of discharge from the barrel will depend upon the length of the barrel and the speed of rotation. It will thus be seen that by rotating the hand wheel 33 until the pointer 34 points in the direction of the objective, the collar 26 will be rotated to such position that the projectile shall be discharged from the barrels as each barrel reaches a point where the projectile on leaving the barrel will travel toward the objective.

A very vital point of my invention lies in the fact that the distance between the inner end wall of the slot 21 and the crests of the spiral track 28 is greater than the diameter of the projectile, so that, for instance, were it not for centrifugal force which throws the projectile out against the spiral track, the projectile would roll from the port 20 along the slot 21 to the port 22 without obstruction. The projectile, therefore, is only held to the track 28 by centrifugal force and is

perfectly free, therefore, to move along the track without jamming or choking. This would not be the case was the distance between the end of the slot 21 and the crests of the spiral track 28 less than the diameter of the projectile, as in this case the projectile would be liable to bind and the gun would jam. It is only by leaving the projectile perfectly free to move along the track and be discharged therefrom that I secure this freedom from jamming or choking.

It will be seen that the collar 26 provides means for feeding the projectile parallel to the axis or shaft 10 to a point where centrifugal force can carry it into the barrel and also provides means whereby the point of discharge of the projectile can be predetermined.

I wish it particularly understood that while I have illustrated my invention as applied to barrels which are mounted upon and rotatable with the blades of an aeroplane, I do not wish to confine my invention to such use as the barrels might be rotated by any rotatable element, driven by any suitable power. Of course it is obvious that projectiles cannot be aimed with any extreme accuracy, but nevertheless it is possible, as I have found by careful tests, to predetermine the discharge of projectiles, so as to provide a zone of fire through which the projectiles pass.

It is to be noted that the slot 21 extends transversely to the thread or track 28 on the annular collar 26 and that the slot is only wide enough to accommodate one projectile at a time or, in other words, the width of the slot is slightly greater than the diameter of the projectile. Therefore, only three projectiles can be accommodated at one time in the slot, each one resting in one thread or groove of the track. By no possibility, therefore, can one projectile pass out of the port 22 immediately after or so closely following another projectile as to cause the projectiles to choke or jam in the port 22 or in the slot 21. The annular collar 26, therefore, acts to feed the projectiles, time their ejection, and yet hold them in proper spaced relation.

Furthermore, it is to be noted from Fig. 2 that the edge of the flange 27 at 29 is spaced from the bottom wall of the space within which the collar 26 operates a distance greater than the diameter of the projectile, and I find that this is necessary in order to prevent choking or jamming. I have heretofore referred to the fact that the termination 29 of the groove 28 should be disposed a distance of approximately 345° from the point at which the projectile is ejected from the barrel. This angular distance between the position of the barrel when receiving a projectile and when discharging the projectile is based upon a barrel having a length of approximately four feet, that is, the length of the ordinary propeller blade of a flying machine, but it is to be understood that where the barrel is less than four feet, a corresponding less angular distance will be required between the point of reception of a projectile and the point of ejection and that if the barrel be over four feet, it will require very nearly a full revolution of the barrel, in order for the projectile to travel along the barrel. With a barrel four feet in length, and having 1500 R. P. M., the muzzle velocity of the projectile will be 890 feet per second, if the barrel be straight, that is, radial to the center of motion, but if the barrel be curved, to follow the path of movement of the projectile through space as it travels outward from the center to the circumference of the gun, this velocity will be decreased about 40%. In other words, by using the straight barrel I secure an increase of about 40% in the muzzle velocity of the projectile.

Not only does a curved barrel decrease the muzzle velocity of the projectile but there is greater wear both on the projectile and on the barrel where the barrel is curved or spiral than where the barrel is radial. Where the projectile is discharged into a straight barrel, without having traversed a spiral course on a rotor, it is necessary to gradually deflect the projectile so as to decrease its radial movement and eject the projectile at a tangent to a circle concentric to the axis of motion of the rotatable gun and this causes the projectile to strike the barrel at a plurality of points and tends to alter the shape of the projectile materially and to very shortly wear out and score out the barrel. With my gun, however, using a straight barrel which is radial to the center of motion, the wear on the barrel is relatively slight, as the projectile is moving very rapidly through the barrel and constitutes a continually shifting load. This device is adapted to be used not only with aeroplanes, but also on tanks or as a machine gun for close work against masses of enemy. Due to the fact that it is impossible to secure absolute accuracy in the form of the projectiles themselves, in their density or absolute accuracy in the shape of the barrel, it is practically impossible to cause all of the bullets to be ejected at exactly the same point in space and to travel in exactly the same line but I have found in practice that with barrels four feet long attached to propeller blades, that it is possible, at a distance of one hundred yards, to secure a pattern approximately fifteen feet long and a foot wide within which zone all of the bullets from the gun will pass. It is, therefore, obvious that if this gun be used on an aeroplane, that a zone of fire will be created extending in a plane at right angles to

the line of flight, which will be very destructive at relatively short ranges and is particularly useful in attacking bodies of troops on the ground, and in attacking enemy aeroplanes flying parallel to the plane having a gun of this character mounted thereon. At the present time, it is impossible for two one-seater planes flying parallel to each other to attack each other, but with this gun it is possible to attack an enemy aeroplane whether it be above, below or to one side of the other, when the planes are flying parallel. It is, of course, obvious that the rotatably mounted barrels might be disposed to rotate in a horizontal plane as well as in a vertical plane or in any other plane at an angle to the horizontal.

While I have illustrated mechanism which I believe to be entirely effective for the purpose intended, which has few parts, and which is very simple in its operation, yet it will be obvious that this mechanism may be modified to suit it to various conditions, without departing from the spirit of the invention, as defined in the appended claims.

Having described my invention, what I claim is:

1. A centrifugal gun including a chambered element having a radial barrel, means for rotating the barrel and element together, the chamber of said element being concentric to the rotative axis of the element and barrel and having a port discharging into the barrel, and means for predetermining the point at which a projectile shall be discharged from the chamber into the barrel including a member disposed concentric the axis of rotation of the chambered element and barrel and having a discharge opening with which the barrel and port are adapted to aline, said member being rotatably adjustable, but being normally held from rotation.

2. A centrifugal gun including a rotatable chambered element having a barrel rotatable therewith, and means for predetermining the point at which the projectile shall be discharged from the chamber of said element into the barrel comprising an annular member disposed concentric to the axis of rotation of the chamber and having an opening with which the barrel is adapted to coincide, said annular member being normally held from rotation but being rotatably adjustable.

3. A centrifugal gun including a chambered element having a barrel extending therefrom, means for rotating the chambered element and the barrel, and means for adjustably predetermining the point at which a projectile shall be discharged from the element into the barrel, including a member having a helical track against which the projectile is urged by centrifugal force, said member being rotatively adjustable relative to the chambered element and the barrel.

4. A centrifugal gun including a chambered element having a radially disposed barrel and rotatable about a central axis, said element having spaced walls, there being a port leading from the chambered element through the wall thereof and a port leading from the outer wall into the barrel, and means for predetermining the point at which the projectile shall be discharged from the chambered element into the barrel comprising an annular member disposed between said walls and rotatably adjustable around the axis of the element, said member having a port with which the ports in the said walls are adapted to register, and means for rotatably adjusting said member.

5. A centrifugal gun including a rotatable element having a centrally disposed chamber bounded by an annular wall and having an outer annular wall spaced from the first named wall, the inner wall having a radial port leading from it and the outer face of the inner wall having a longitudinally extending groove into which said port opens, the outer wall having a port into which said groove discharges, a radially extending barrel into which said second named port discharges, and means for carrying projectiles from the first named port to the second named port including an annular member disposed within said walls and having a spiral groove on its inside face, and an opening at its inner end with which the second named ports are adapted to register.

6. A centrifugal gun including a rotatable element having a centrally disposed chamber bounded by an annular wall and having an outer annular wall spaced from the first named wall, the inner wall having a radial port leading from it and the outer face of the inner wall having a longitudinally extending groove into which said port opens, the outer wall having a port into which said groove discharges, a radially extending barrel into which said second named port discharges, means for carrying projectiles from the first named port to the second named port including an annular member disposed within said walls and having a spiral groove on its inside face, and an opening at its inner end with which the second named ports are adapted to register, and manually controlled means for adjustably rotating said member to thereby angularly adjust the position of the opening in the member to thereby control the instant of ejection of the projectile from the barrel.

7. A centrifugal gun including a rotatable element having a centrally disposed chamber bounded by an annular wall and having an outer annular wall spaced from the first named wall, the inner wall having a radial port leading from it and the outer face of the inner wall having a longitudinally extending groove into which said port

opens, the outer wall having a port into which said groove discharges, a radially extending barrel into which said second named port discharges, means for carrying projectiles from the first named port to the second named port including an annular member disposed within said walls and having a spiral groove on its inside face, and an opening at its inner end with which the second named ports are adapted to register, the distance between the crests of the spiral track and the confronting face of the inner wall being greater than the diameter of the projectile.

8. A centrifugal gun including a rotatable chambered element having a barrel extending radially outward therefrom and rotatable therewith and disposed in a plane parallel to but offset from the plane of the chamber of the element, and means adjustable relative to the barrel and chambered element around the axis of the chambered element as a center for feeding projectiles one by one at uniformly spaced distances from the chamber parallel to the axis of the element and into the barrel.

9. A centrifugal gun including a rotatable chambered element having a barrel extending radially outward therefrom and disposed in a plane parallel to but offset from the plane of the chamber of the element, means for feeding projectiles one by one at uniformly spaced distances from the chamber parallel to the axis of the element and into the barrel, including a rotatably adjustable collar having an interior spiral groove, the wall of the chamber having a radial port and a longitudinally extending groove on the exterior of the wall into which the port opens, said longitudinally extending groove extending transverse to the spiral groove and discharging into the barrel.

10. The combination with a rotatable shaft, of a body mounted for rotation with the shaft and having radially disposed barrels rotatable therewith, the body having a central projectile containing chamber concentric to the shaft and through which the shaft passes, the shaft forming a central wall for said chamber, and means adjustable with relation to said chamber for directing projectiles from the central chamber into said barrels.

11. The combination with an aeroplane propeller having radial blades, of radially disposed barrels carried by the blades, and means constituting part of the propeller receiving projectiles and discharging them into the barrels.

12. A centrifugal gun including a rotatable chamber, a radial barrel rotatable therewith, and a member disposed between the chamber and the barrel and receiving projectiles from the chamber and discharging them into the barrel, said member having a spiral feed track against which the projectiles are held by centrifugal force.

13. A centrifugal gun including a rotatable projectile receiving chamber, a radial barrel rotatable with the chamber, and means for feeding projectiles one by one at uniformly spaced distances from the chamber into the barrel and controlling the point of discharge of projectiles from the barrel, comprising an annular member disposed between the chamber and the barrel and having a spiral track upon its inside face confronting the wall of the chamber, the bottom of said track being spaced from the wall of the chamber a distance greater than the diameter of a projectile, said member having a portion constituting the terminal end of the track disposed in the same plane as the barrel, said member being rotatably adjustable around the center of movement of the barrel.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

JUDSON C. PEWTHER.

Witnesses:

FREDERIC B. WRIGHT,

D. W. GALL.