Dec. 19, 1944. F. A. COOLEY 2,365,392

MAGAZINE FOR FIREARMS

Filed April 13, 1942 5 Sheets-Sheet 1

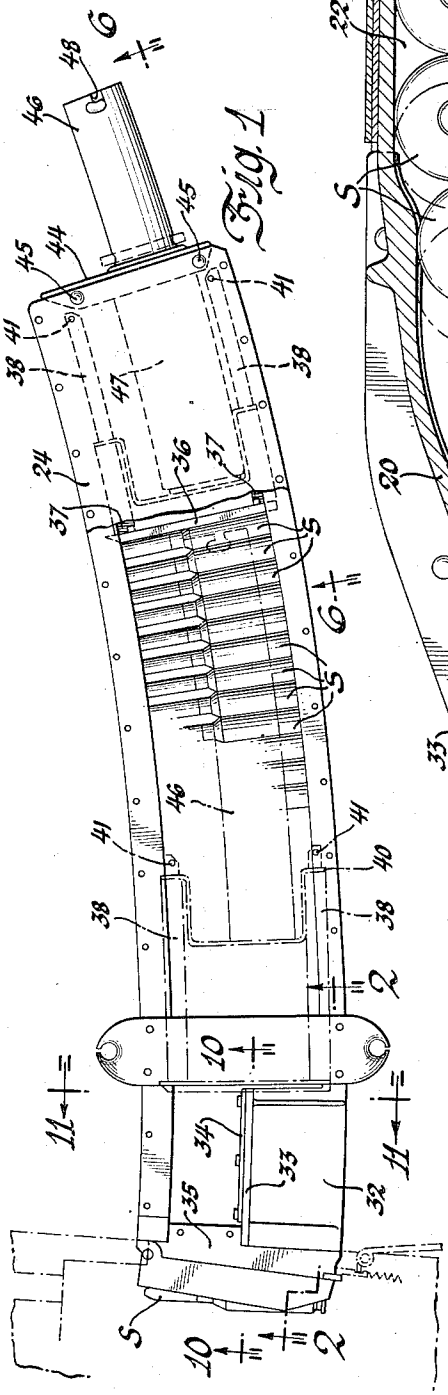


Fig. 1

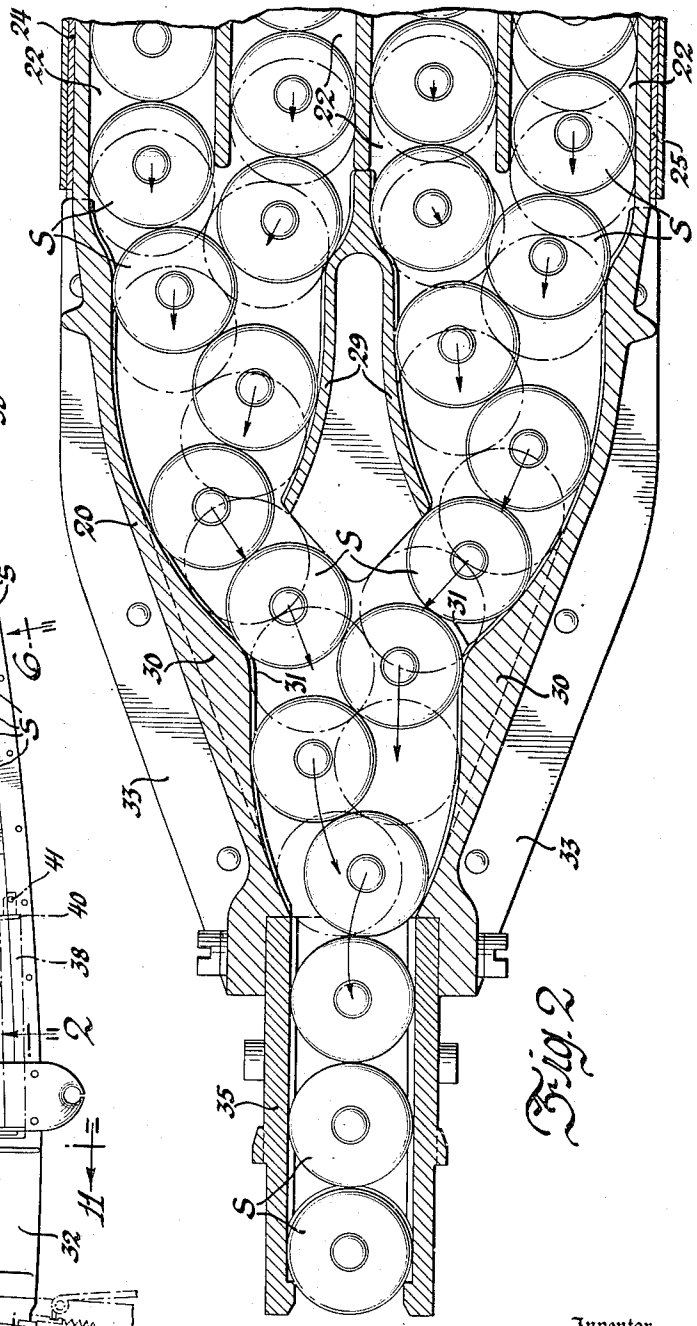


Fig. 2

Inventor
Floyd A. Cooley
By Blackmore, Spencer & Hurt
Attorneys

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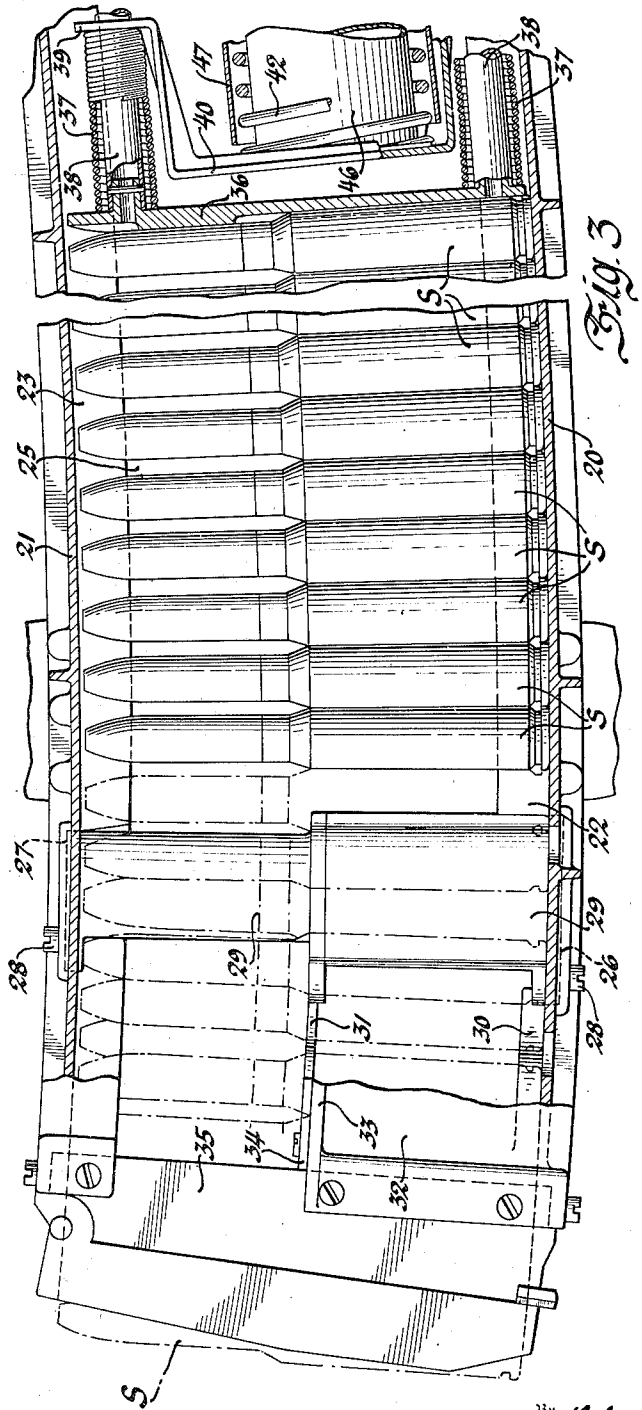


Fig. 3

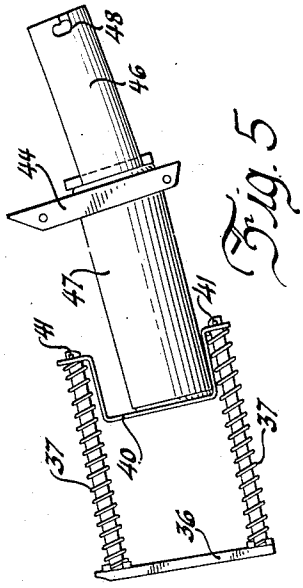


Fig. 5

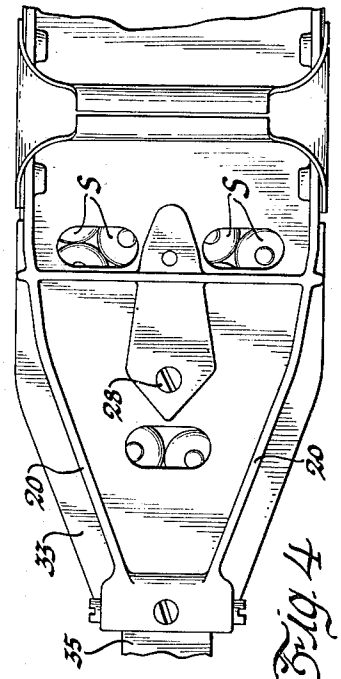


Fig. 4

Inventor
Floyd A. Cooley

By Blackmore, Spencer & Flint
Attorneys

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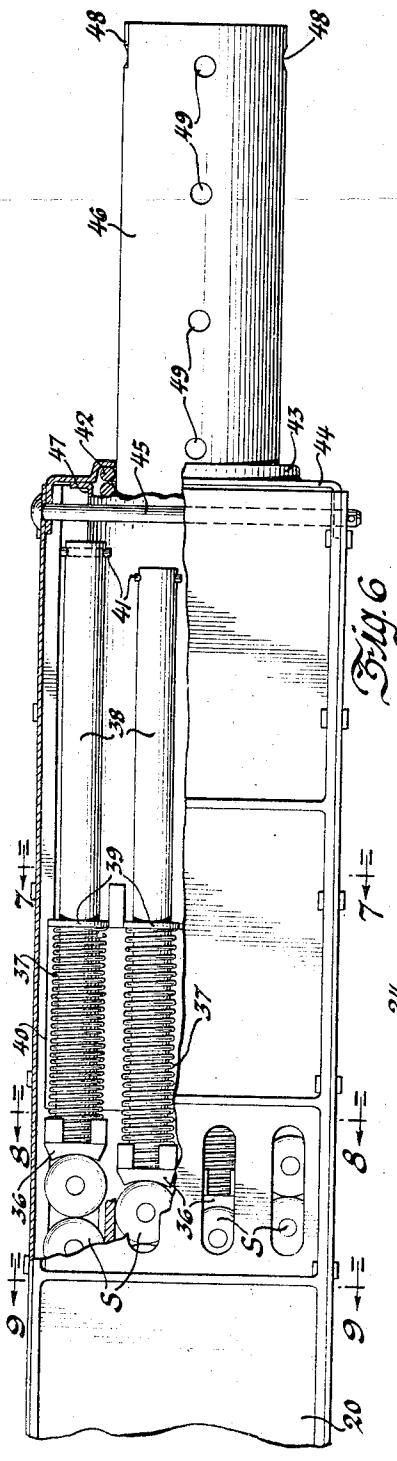


Fig. 6

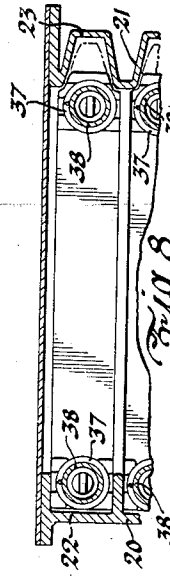


Fig. 8

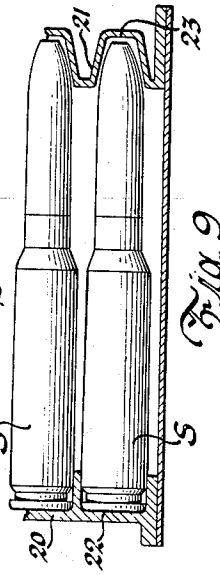


Fig. 9

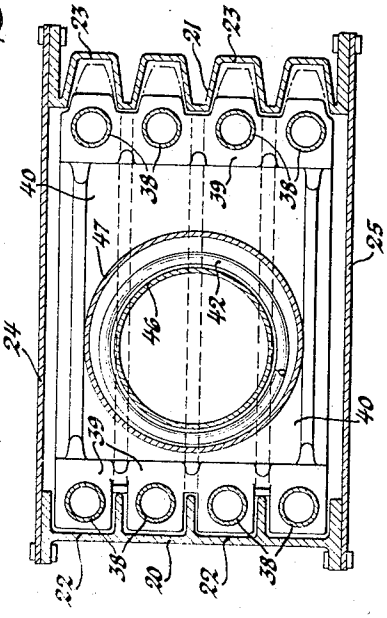


Fig. 7

Inventor
Floyd A. Cooley
By Blackmore, Spence & Flint
Attorneys

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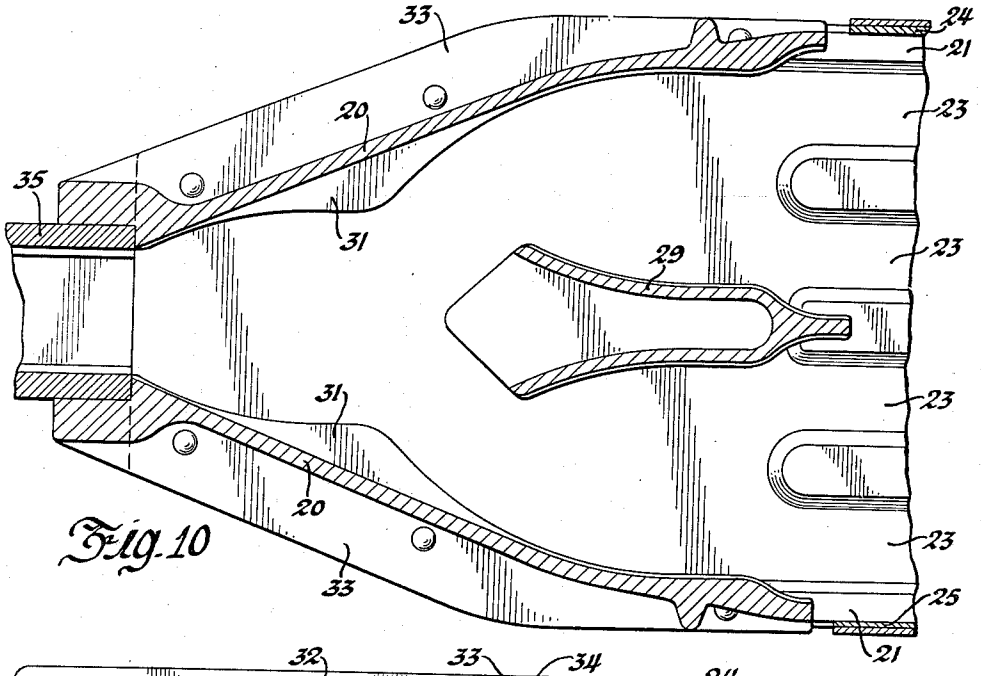


Fig. 10

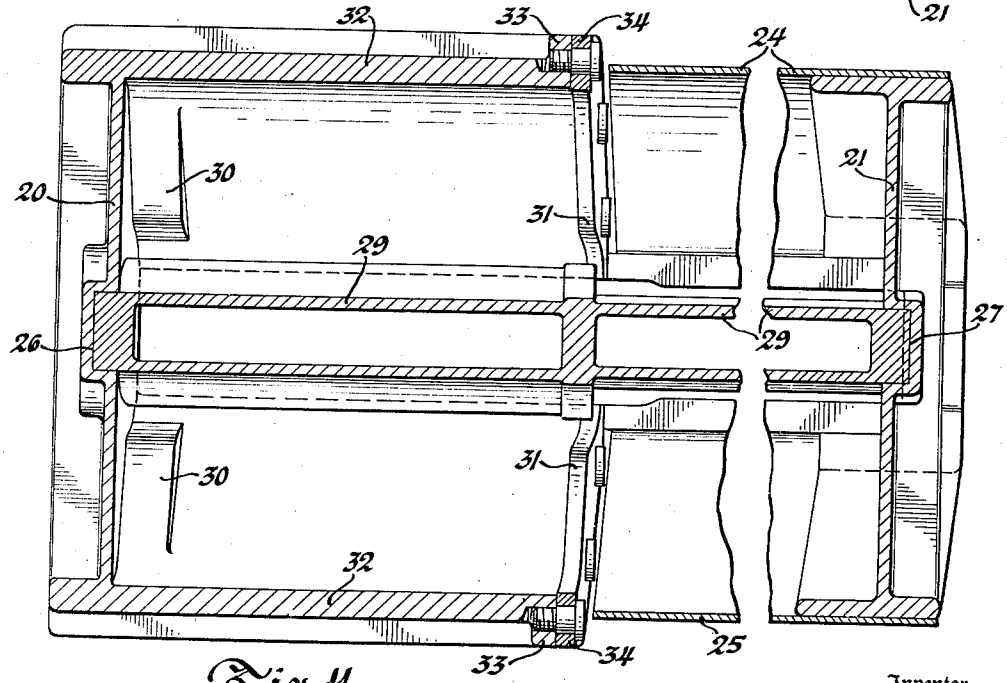


Fig. 11

Inventor

Floyd A. Cooley

By Blackmore, Spencer & Hurt

Attorneys

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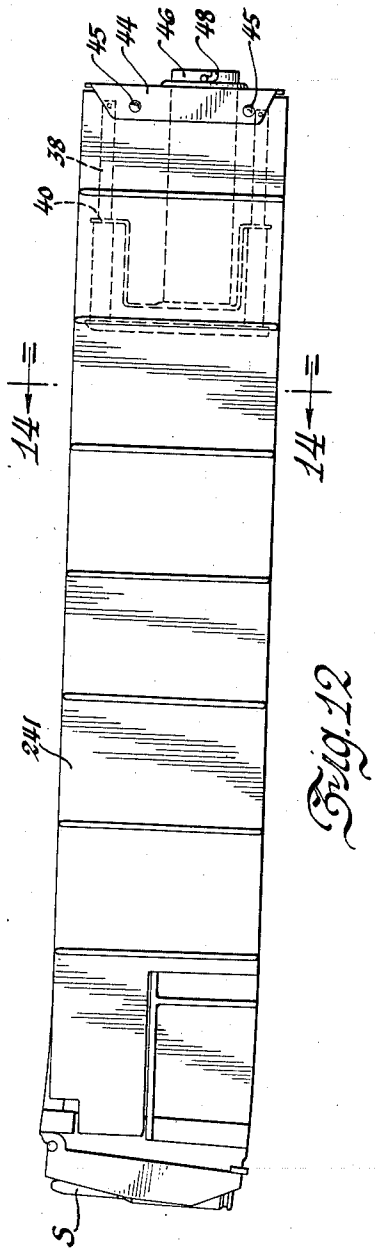


Fig. 12

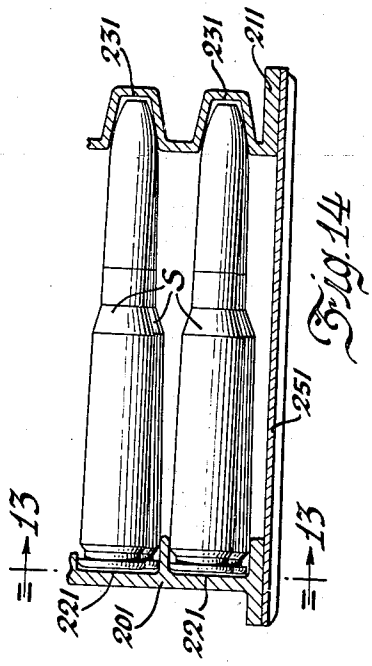


Fig. 14

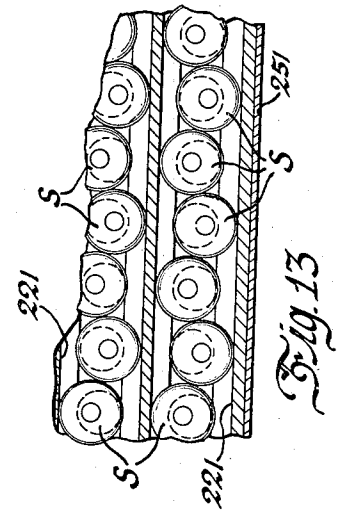


Fig. 13

Inventors
Floyd A. Cooley

By Blackmore, Spencer & Flick
Attorneys

Patented Dec. 19, 1944 2,365,392

UNITED STATES PATENT OFFICE

2,365,392

MAGAZINE FOR FIREARMS

Floyd A. Cooley, Detroit, Mich., assignor to Ternstedt Manufacturing Company, Detroit, Mich., a corporation of Michigan

Application April 13, 1942, Serial No. 438,765

7 Claims. (Cl. 89—34)

My invention relates to magazines for supplying cartridges to automatically operating rapid fire guns designed particularly for use upon airplanes; and the object thereof is to provide a magazine having large cartridge holding capacity, due to the fact that the cartridges are arranged in several tiers one above another, and are combined into a single forwardly moving column as they approach the gun. The magazine herein disclosed is designed to be arranged lengthwise of a wing of an airplane and to supply cartridges to a gun arranged to fire in the general direction of movement of the plane, although the gun may, of course, be stationary, as when used on the ground for repelling attacks of enemy aircraft. The magazine herein is designed particularly to supply cartridges of 20 mm. caliber, they being around six inches long, although it may be used to supply cartridges of other sizes to a gun.

With the above and other objects of invention in view my invention consists in the improved cartridge magazine for automatically operating rapid fire guns illustrated in the accompanying drawings and hereinafter described and claimed; and in such variations and modifications thereof, within the scope of the concluding claims, as will be obvious to those skilled in the art to which my invention relates.

In the drawings accompanying and forming a part of this specification and wherein the preferred form of my invention is illustrated:

Figure 1 is a schematic view showing my invention in plan and illustrating the general features thereof.

Figure 2 is a fragmentary view upon a larger scale than Figure 1, and showing the left hand end of the magazine in section and upon a vertical plane indicated by the line 2—2, Figure 1.

Figure 3 shows the magazine with its top cover plate removed. This view and Figure 2, and Figures 10 and 11 serve particularly to illustrate the feeding of cartridges from the right hand end of the magazine through a cam throat device thereof at its left hand end and to receiver of the gun.

Figure 4 is a fragmentary view showing the left hand end of the magazine in side elevation.

Figure 5 is a fragmentary view drawn to the same scale as Figure 1, and illustrating various of the elements concerned with the feeding of cartridges through the magazine.

Figure 6 is a side view of the cartridge feeding mechanism as seen from vertical plane indicated by the line 6—6, Figure 1, and upon a larger scale than they are shown in that figure.

Figures 7, 8 and 9 are views (fragmentary as regards 8 and 9) showing sections upon transverse vertical planes indicated by the lines 7—7, 8—8 and 9—9, Figure 6.

Figure 10 is a fragmentary sectional view showing certain cam throat features adjacent the left hand discharge end of the magazine, taken upon a vertical longitudinally extending plane indicated by the line 10—10, Figure 1.

Figure 11 is a view taken upon a transverse vertical plane indicated by the line 11—11, Figure 1, looking toward the discharge end of the magazine, and showing certain features located within the cam throat shown in Figure 10 and involved in the feeding of cartridges therethrough and to the receiver of the gun.

Figure 12 is a plan view showing the magazine as straight instead of curved slightly, as in Figures 1 and 3.

Figures 13 and 14 are fragmentary sectional views upon transverse planes indicated by the lines 13—13 of Figure 14, and 14—14, Figure 12, looking as indicated by arrows at the ends of those lines.

In my improved magazine the cartridges are arranged in four separate rows or tiers within the right hand end thereof, and are forced toward the left hand end thereof by spring mechanism as will hereinafter appear; and as the cartridges pass through the cam throat as shown in Figure 2 the two uppermost rows and the two lowermost rows, are combined into two forwardly moving rows of cartridges; which last two are then merged into and become a single column from which cartridges are fed separately to the receiver of the gun. This provides a magazine of large capacity and at the same time one of short length, the capacity of the one herein contemplated being around 125 cartridges of 20 mm. caliber, around six inches long.

My improved magazine comprises an oblong box-like structure having oppositely disposed longitudinally extending cast metal side plates 20, 21, one having four longitudinally extending internal grooves 22 within and along which the head ends of cartridges S move, and the other having similar grooves 23 within and along which the bullet ends move, as shown in Figure 3 and Figure 7, the side walls of which several grooves serve to keep the rows out of contact with one another and to keep the cartridges in line as they move forward toward the gun.

The side plates are connected with one another

by thin sheet metal top and bottom plates **24, 25** which are fastened to the upper and lower ends of the side plates by screws as shown in Figure 1. The upper and lower edges of the side plates are parallel throughout the greater part of their length, but are inclined toward one another as they approach the left hand end of the magazine, see Figures 2, 4 and 10, to provide the cam throat portion thereof, hereinbefore mentioned, through which the cartridges pass to the receiver of the gun; and whereby the four rows of cartridges in the right hand end of the magazine are combined first into two rows, and these two rows in turn merged into a single advancing column from which individual cartridges are fed to the receiver of the gun. The grooves **22, 23** run out at the beginning of the cam throat portion aforesaid, that is, there are no such guiding grooves in that part of the magazine which functions to combine the several layers or tiers into a single forwardly moving column of cartridges.

Located within the left hand end or cam throat portion of the magazine and extending across, and the ends of which enter recesses **26** and **27** formed in walls of the side plates **20, 21** and are held in place by screws **28**, is a cam member **29** the right hand end of which serves to keep the cartridges of the two upper rows separate from those of the two lower rows as all four rows are forced through the magazine, by spring mechanism as will hereinafter appear. Thereafter and as the whole mass of cartridges moves forward (still referring to Figure 2) those which comprise the two upper rows, and those which comprise the two lower rows, are combined and merged into a single row of forwardly moving cartridges by upper and lower protuberances **30, 30** on the wall member **20** located within cam throat portion aforesaid and adjacent to the side wall **20** (and by similar protuberances **31, 31** to be next referred to); from which single row, individual cartridges are fed to the receiver of the gun not shown.

The left hand end of the side wall **20** for a length corresponding, approximately, with the length of the cam throat portion of the magazine, has a box-like portion **32** extending laterally to about the middle of the magazine, as shown in Figure 3, through which the heads and powder containing shell portions of the cartridges S pass on their way to the gun; and the numeral **33** designates a flange at the free end of this box-like projection to which two cam plates **34** are secured as shown, portions of which cam plates extend inward and are shaped to provide the protuberances (cams) **31, 31** hereinbefore referred to; which last named protuberances and the protuberances **30, 30** guide the cartridges at their heads and at the ends of their shells or powder containing cases as they pass to the receiver of the gun as will be understood.

The left hand end of the side plate **200** or, more definitely stated, of the box-like lateral extension **32** thereof, and of the side plate **21**, are so shaped as to embrace a conduit or trough **35** through which cartridges are supplied to the gun and to which trough they are secured by screws as shown and through which trough the magazine may be fastened to the gun when it is in use and from which it may be detached when empty and the gun needs a new supply of ammunition; this by any suitable latch mechanism which latch mechanism, however, is not disclosed in detail as it forms no part of the invention to which this present application relates.

In the second form of my invention illustrated in Figures 12 to 14 the magazine is straight, instead of curved slightly as in the preferred form hereinbefore described. The same form of cam throat features for combining four layers of cartridges into two, and for merging the cartridges of these two into a single forwardly moving column is made use of as in the form hereinbefore described at length; and the same spring mechanism for moving all the cartridges toward the gun is used as the one used in the curved form, which mechanism will be next described.

In the straight form of magazine the grooves **221** in the side plate **201** along which the heads of the cartridges move have to be wider than the grooves **22** in the curved form hereinbefore described; because the powder containing chambers of cartridges S are made slightly tapering (so that they can be moved into and extracted from the firing chamber of the gun) instead of cylindrical in form. This slightly tapering form results in that in a straight form of magazine the head ends of abutting cartridges have to be offset relative to one another along the length of the grooves along which their heads move, and the axes of abutting cartridges are oppositely inclined relative to the planes of the paths of movement of their head ends; this offsetting being permitted by providing slightly wider grooves the side walls of which serve as stops to restrain lateral movement of the head ends, as shown in Figures 13 and 14. In the preferred slightly curved form, however, see Figures 3 and 9, lateral movement of the head ends of the cartridges S is prevented by the side walls of the narrower grooves **22**, and the axes of the cartridges are kept in parallel planes as they move along said grooves.

Movement of the cartridges through the magazine is produced by spring mechanism to be next described and it follows that unavoidable lateral movement of the head ends of the cartridges, in a straight form of magazine, results in considerable friction between the heads and the side walls of the grooves **221**; whereas in a slightly curved form of magazine there is little or no force tending to produce lateral movement of the heads and consequent friction between the heads and the side walls of the grooves **22** is eliminated or very materially reduced.

The side plates **201** and **211**, the grooves **231** for the bullet ends, and the top and bottom plates **241** and **251** are the same, functionally, as the parts **20, 21, 23, 24** and **25**, except that they are curved slightly longitudinally of the magazine as will be understood.

Acting upon each row of cartridges is a follower **36** the ends of which enter the grooves **22, 23** and are guided by said grooves as they follow the rows of cartridges as they are moved toward the gun; and the ends of these followers are acted upon by springs **37**, eight in all, which act to keep the followers in contact with the initial right hand cartridge of the several rows of cartridges in the magazine. These springs surround guide tubes **38**, eight in all, which tubes are rigidly secured one adjacent the end of each follower; the positions of these tubes being adjacent the inner ends of the grooves as shown, and the springs and tubes being parallel with the grooves and extending longitudinally of the magazine as will be understood.

The right hand ends of all the springs **37** abut

against oppositely disposed flanges 39, 39 of a cup member 40 which flanges also enter the grooves 22, 23 aforesaid so as to be guided by them; and the tubes extend through holes in the flanges and have pins 41 for preventing them from becoming disengaged from said flanges.

The numeral 42 designates a coil spring which forces all of the rows of cartridges through the magazine and the cam throat portion thereof and to the gun, one end thereof abutting against the transverse end wall of cup member 40, and the other end being constrained by an annular seat 43 in a detachable cover 44, which serves as a closure for the right hand end of the magazine. This cover is held in place by readily removable pins 45 which, upon being removed, permit the entire spring mechanism which forces the cartridges through the magazine to be removed as a unitary assemblage of parts. This spring 42 is the source of power whereby the cartridges are forced through the magazine, and its stiffness exceeds the combined stiffness of all the springs 37, see Figure 3, so that all these last springs are in substantially collapsed conditions when the magazine is in use; the purpose of these springs 37 (which provide resilient force transmitting elements between the cup member 40 and the followers 36 and thus to the several rows of cartridges) being to permit individual cartridges to move laterally as they approach the cam throat portion and move therethrough as hereinbefore explained, and at the same time to keep always in contact with one another as will be understood from Figure 2.

The spring 42 is restrained against sidewise movement by concentric tubes 46, 47, the first being welded to the end wall of the cup member 40, and the second being flanged and held against the end of the magazine by the cover 44, as shown in Figure 6. The tube 46 will ordinarily be straight in the straight form of magazine, but it is preferably curved with the same curvature as the magazine when the preferred curved type of magazine is made use of. This tube normally extends beyond the cover 44 when the magazine is full of cartridges at which time it and the cup member 40 occupy positions in which they are shown in Figure 3, but both move into the magazine as cartridges are fired and finally assume positions near the cam throat portion of the magazine. At that time the magazine needs to be refilled, and it is unlatched and removed from the gun; the spring 42 is compressed by a tool having a cross pin at its end adapted to interlock with hooks 48 at the end of the tube 46, and held compressed by a pin inserted through one or another of oppositely located pairs of holes 49 in said tube, the pin bearing against the cover 44 as will be appreciated; the pins 45 are withdrawn; the entire spring mechanism is removed; and the magazine is refilled with cartridges. Reversal of the steps just above enumerated results in a filled magazine ready to be attached to the gun as will be understood.

In view of the premises it will be appreciated that my invention provides a magazine for fire arms which is adapted to contain a large number of cartridges and one which is thin as the cartridges lie in four vertically disposed layers or rows, and a magazine which may be arranged within and along the wing structure of an airplane; and that the cam throat portion of the magazine acts, as shown in Figure 2, to combine the cartridges of the two uppermost layers or tiers and likewise those of the two lowermost layers or tiers first into two forwardly moving rows, and these last two in turn into a single column as the cartridges as a whole move toward the receiver of the gun. The separate tiers or layers are pushed forward by independent springs acting one upon each row; and each separate cartridge acts in turn to block or arrest forward movement of all the rows until the forward one of all the cartridges is fed into the chamber of the gun. The contour of the throat portion of the magazine through which the cartridges pass is such that jamming of the rows and interruption of the feeding action cannot occur when the gun is in operation.

Having thus described and explained my invention I claim and desire to secure by Letters Patent:

1. A cartridge magazine for guns comprising oppositely located side plates connected together by top and bottom plates one side plate having four grooves along which the head ends, and the other having four grooves along which the bullet ends of rows of cartridges move, and a cam throat portion with which all of said grooves communicate and through which cartridges pass to the receiver of the gun; a centrally located cam member within said cam throat and having end portions which are secured to the side plates aforesaid, and which cam member acts to divide the two upper rows from the two lower rows of cartridges as all of said rows enter said cam throat; oppositely located pairs of protuberances within said cam throat portion and acting to deflect the cartridges which form said two rows laterally, to thereby combine said two rows into a single column of cartridges as they move toward the receiver of the gun; and spring mechanism for forcing said several rows of cartridges along said groves and through said cam throat and to the receiver of a gun.

2. A cartridge magazine for guns comprising oppositely located side plates one having four grooves along which the head ends and the other having four grooves along which the bullet ends of rows of cartridges move, and a cam throat portion with which all of said grooves communicate and through which cartridges pass to the receiver of the gun; a centrally located cam member within said cam throat portions and acting to divide the two upper from the two lower rows of cartridges as all of said rows enter said cam throat; a hollow box-like element extending along the cam throat portion aforesaid and inwardly from one of said side plates part way across the magazine, and the inner side of which box-like element is open and along and through which cartridges pass; a pair of protuberances within said box-like element and located adjacent the side wall from which it extends, and a second pair of protuberances supported by and located at the free open end of said box-like element, and which two pairs of protuberances act to deflect cartridges from said two rows laterally, to thereby combine said two rows into a single column of cartridges as they move toward the receiver of the gun; and spring mechanism for forcing said several rows of cartridges along said grooves and through said cam throat and to the receiver of a gun.

3. A cartridge magazine for guns comprising oppositely located side plates one having a plurality of grooves along which the head ends and the other having a plurality of grooves along which the bullet ends of cartridges move, and a cam throat portion with which said several

grooves communicate and through which cartridges pass to the receiver of the gun; means associated with said cam throat portion for combining the cartridges of said several rows into a single column of cartridges moving toward the receiver aforesaid, said means including a hollow box-like element extending along the cam throat portion aforesaid and inwardly from one of said side plates part way across the magazine, and the inner side of which box-like element is open and along and through which cartridges pass; a pair of protuberances within said box-like element and located adjacent the side wall from which it extends, and a second pair of protuberances supported by and located at the free open end of said box-like element, and which two pairs of protuberances act to deflect cartridges from said two rows laterally, to thereby combine said two rows into a single column of cartridges as they move toward the receiver of the gun; and spring mechanism for forcing said several rows of cartridges along said grooves and through said cam throat and to the receiver of a gun.

4. A cartridge magazine for guns comprising oppositely located side plates one having a plurality of grooves along which the head ends and the other having a plurality of grooves along which the bullet ends of cartridges move, and a cam throat portion with which all of said grooves communicate and through which cartridges pass to the receiver of a gun; means associated with said cam throat portion for combining the cartridges of said several rows into a single column moving toward the receiver aforesaid; a movable member within the magazine; a spring acting upon said movable member to force said several rows of cartridges through the magazine; a fixed abutment against which said spring acts; and a plurality of independently yieldable spring devices associated one with each row of cartridges and with said movable member, and through which spring devices pressure is transmitted to said several rows.

5. A cartridge magazine for guns comprising oppositely located side plates one having a plurality of grooves along which the head ends and the other having a plurality of grooves along which the bullet ends of cartridges move, and a cam throat portion with which all of said grooves communicate and through which cartridges pass to the receiver of a gun; means associated with said cam throat portion for combining the cartridges of said several rows into a single column moving toward the receiver aforesaid; a movable member within the magazine; a removable cover for the magazine; a spring one end of which abuts against said cover and the other against said movable member, and which spring acts to force said several rows of cartridges through the magazine; a plurality of followers acting one upon each row of cartridges, and the ends of which followers enter into and are guided by the grooves aforesaid; and a plurality of springs acting between said movable member and the ends of said followers and through which several springs pressure is transmitted to said follower and to said rows of cartridges.

6. A cartridge magazine for guns comprising oppositely located side plates one having a plurality of grooves along which the head ends and the other having a plurality of grooves along which the bullet ends of cartridges move, and a cam throat portion with which all of said grooves communicate and through which cartridges pass to the receiver of a gun; means associated with said cam throat portion for combining the cartridges of said several rows into a single column moving toward the receiver aforesaid; a movable member within the magazine and having a plurality of laterally extending portions which enter and are guided by the grooves aforesaid; a removable cover for the magazine; a spring one end of which abuts against said cover and the other against said movable member, and which spring acts to force said several rows of cartridges through the magazine; a plurality of followers acting upon each row of cartridges and the ends of which followers enter into and are guided by the grooves aforesaid; a plurality of springs one acting between each end of each follower and a lateral portion aforesaid of said movable member, and through which several springs pressure is transmitted to said followers and to said rows of cartridges; and means extending from said movable member whereby said member may be moved against the action of said first mentioned spring.

7. A cartridge magazine for guns comprising oppositely located side plates one having means for guiding the head ends of a plurality of rows of cartridges in parallel paths of movement, and the other having means for guiding the bullet ends of a plurality of rows of cartridges in parallel paths of movement, and a cam throat portion with which all of guiding means communicate and through which cartridges pass to the receiver of a gun; means associated with said cam throat portion for combining the cartridges of said several rows into a single column moving toward the receiver aforesaid; a movable member within the magazine; a spring acting upon said movable member to force said several rows of cartridges through the magazine; a fixed abutment against which said spring acts; and a plurality of independently yieldable spring devices associated one with each row of catridges and with said movable member, and through which spring devices pressure is transmitted to said several rows.

FLOYD A. COOLEY.