

April 15, 1952

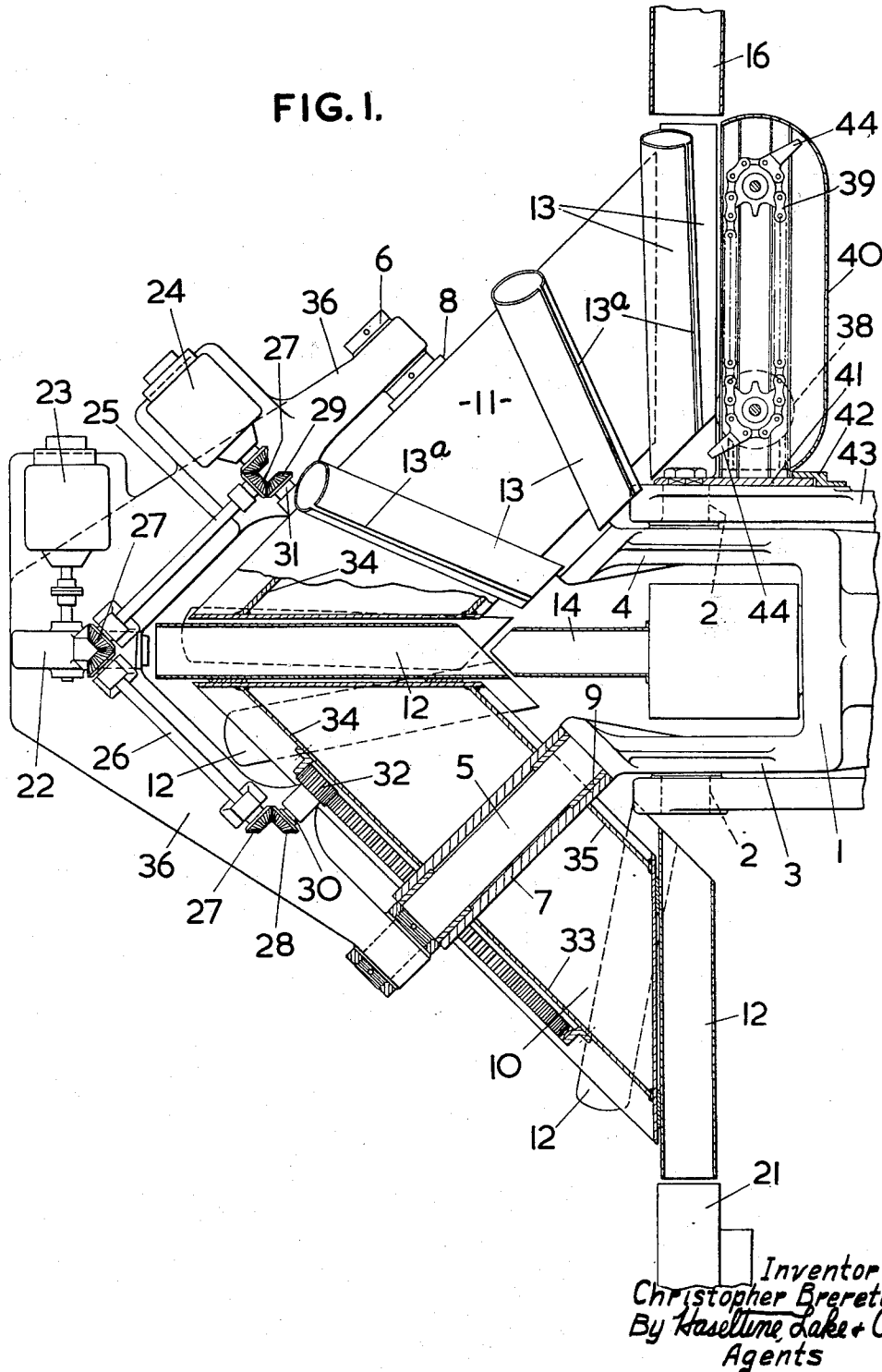
C. F. BRERETON
GUN LOADING MECHANISM

2,592,790

Filed Sept. 3, 1947

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FIG. 1.



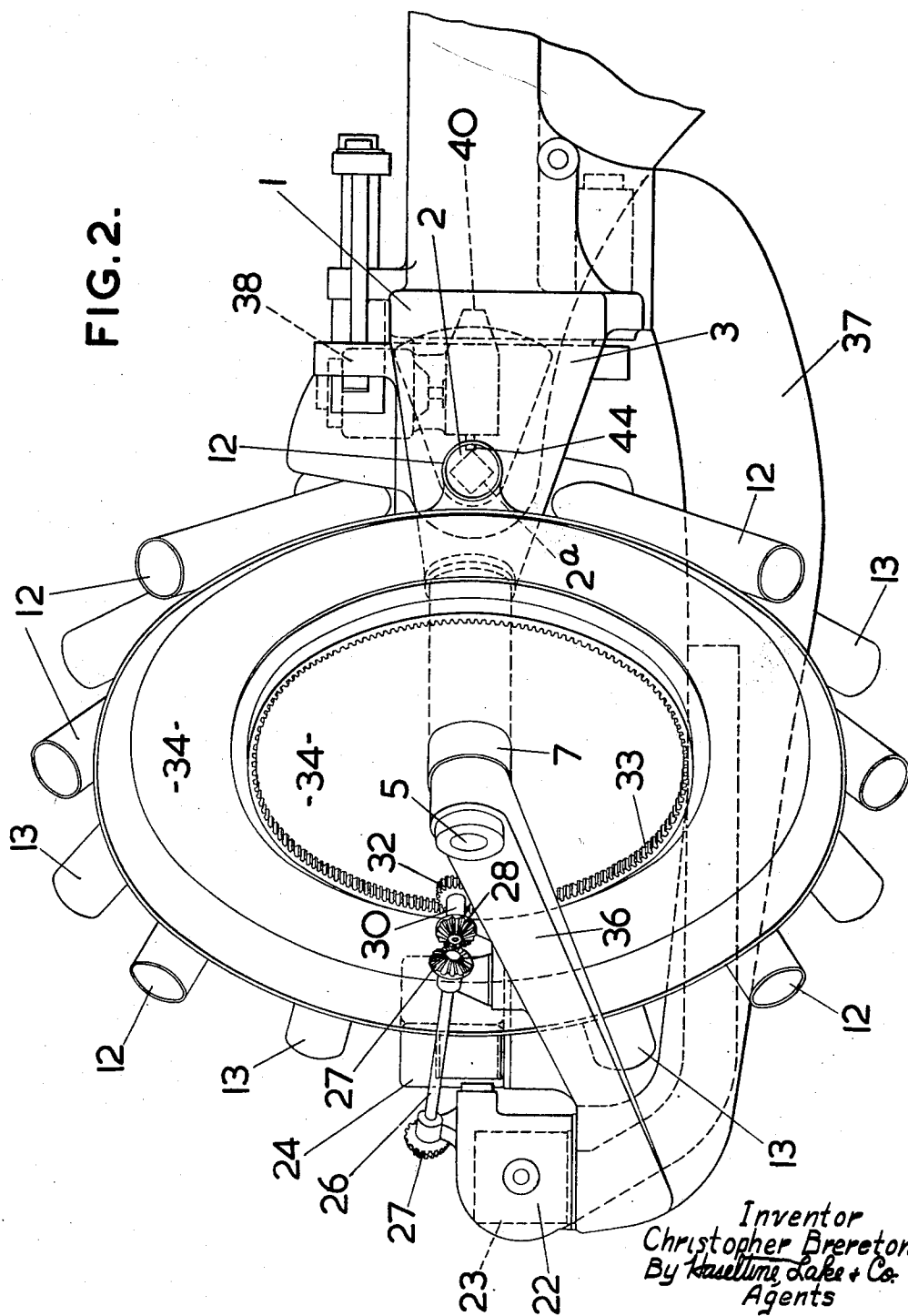
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April 15, 1952

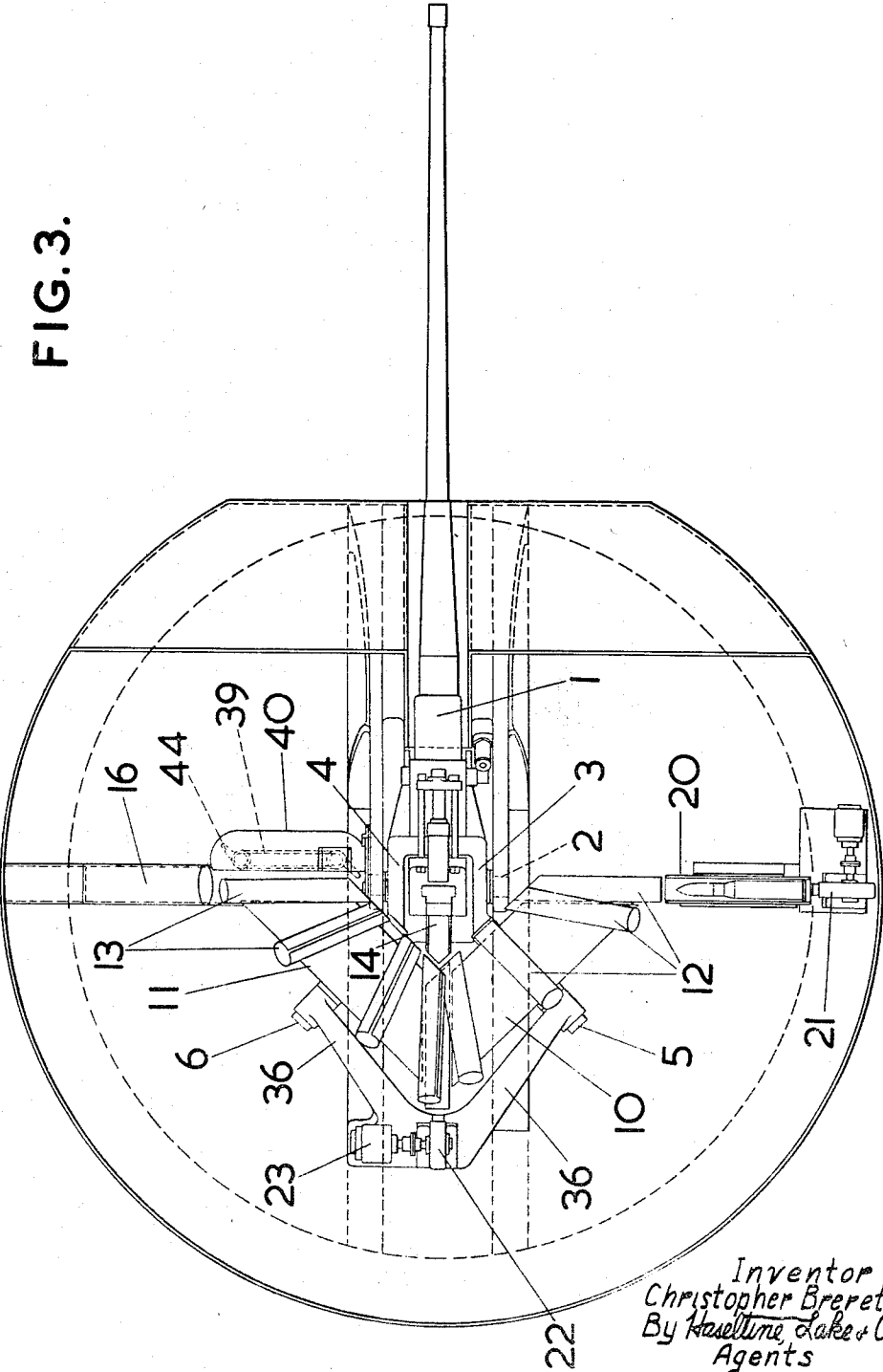
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Filed Sept. 3, 1947

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FIG. 3.



April 15, 1952

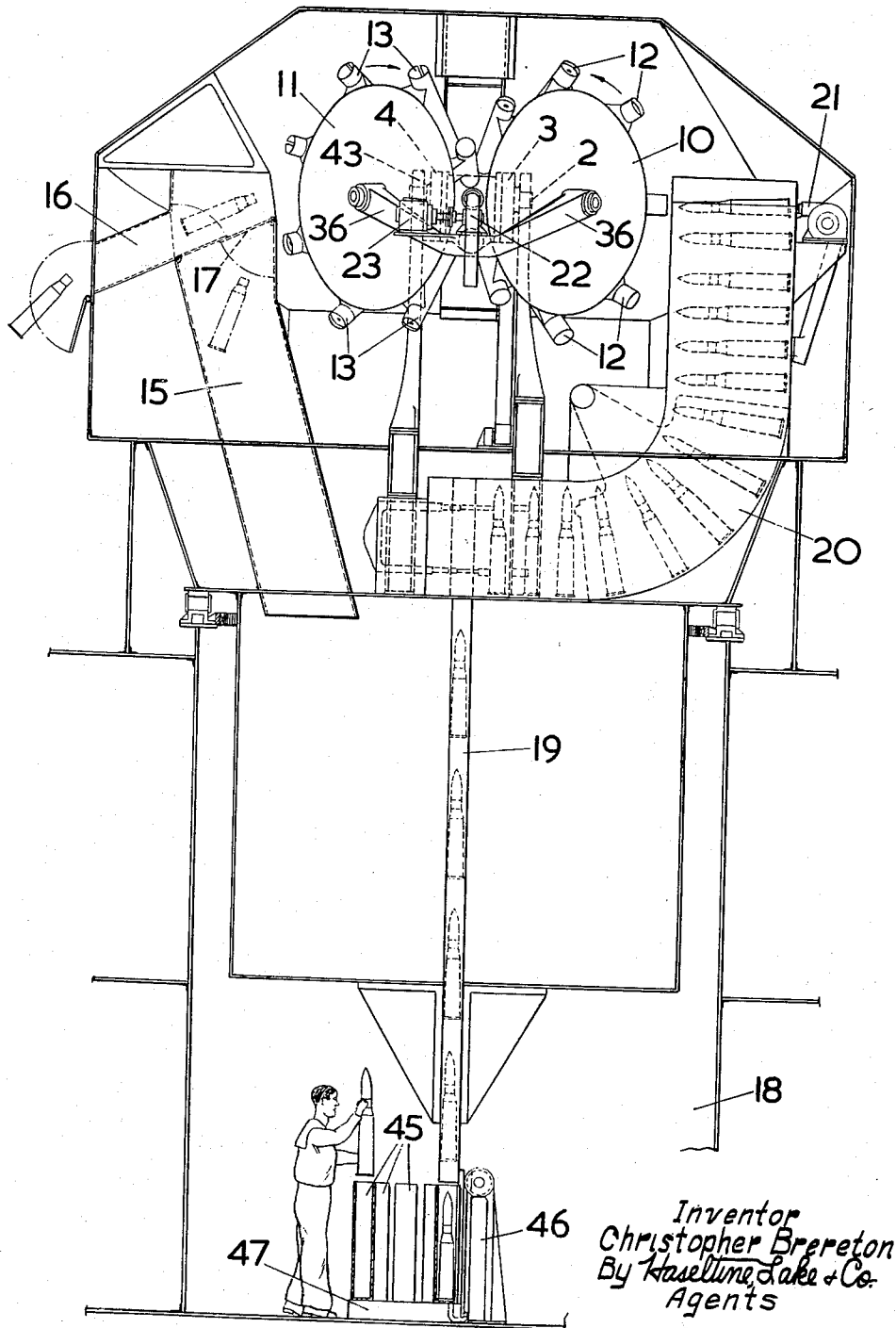
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Filed Sept. 3, 1947

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FIG. 4.



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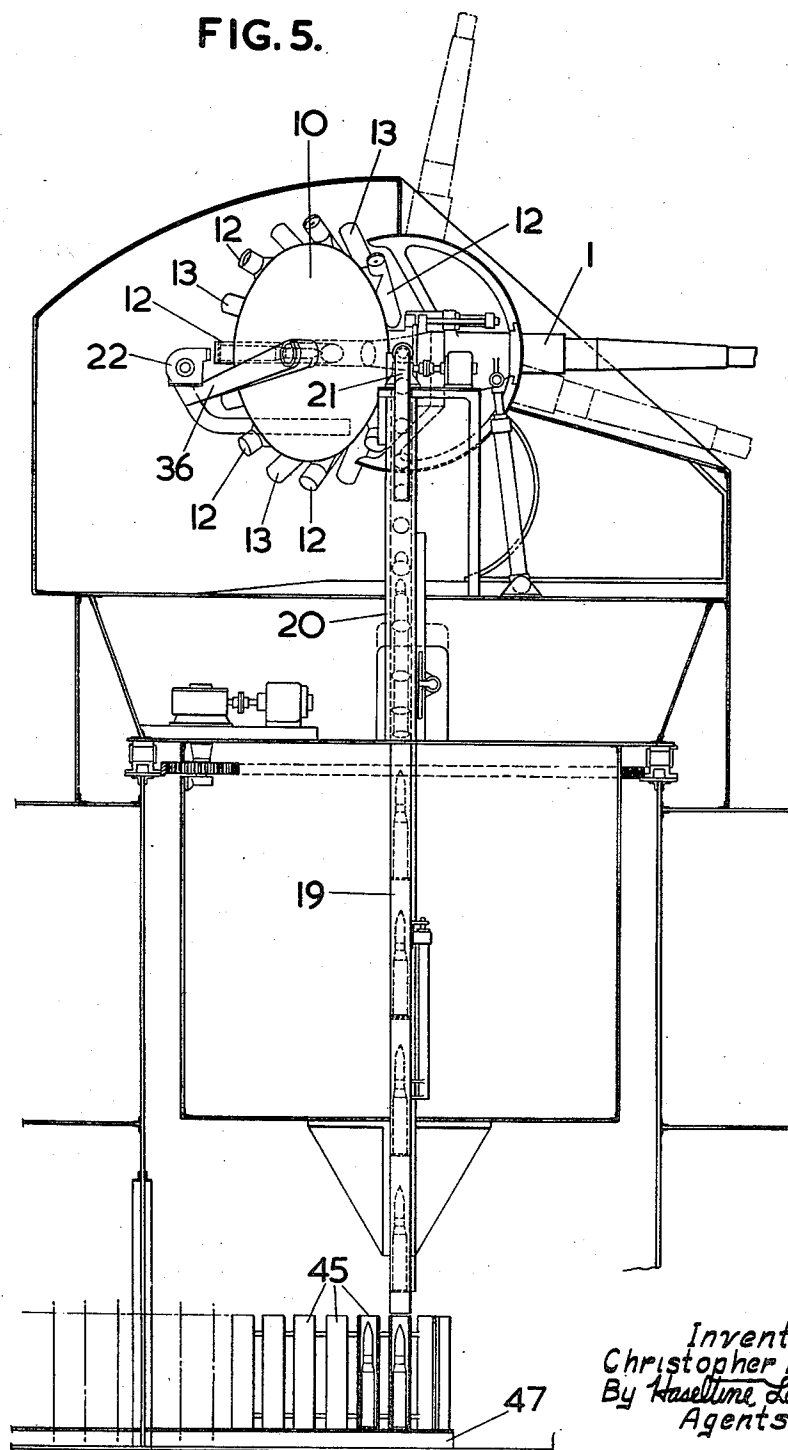
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2,592,790

Filed Sept. 3, 1947

5 Sheets-Sheet 5

FIG. 5.



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UNITED STATES PATENT OFFICE

2,592,790

GUN LOADING MECHANISM

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Application September 3, 1947, Serial No. 771,909
 In Great Britain August 19, 1946

Section 1, Public Law 690, August 8, 1946
 Patent expires August 19, 1966

16 Claims. (Cl. 89—33)

1

This invention relates to mechanism for loading guns and/or discharging spent cases therefrom and has for its object to provide means whereby a substantially continuous supply of ammunition and/or discharge of case can be maintained to and/or from the gun, when the gun is of the type which normally hitherto has depended upon individual loading of the ammunition into the breach directly or by the feed of the rounds into a trough located in the rear of the breech, and more particularly the invention is intended to provide means for the supply of ammunition to and/or discharge of cases from medium or like type naval fortress or tank gun in such manner that a substantially continuous supply of ammunition is maintained for all angles of elevation of fire. In this connection, it is known to feed the rounds automatically in succession from a removable clip on the smaller type of anti aircraft or field gun, but hitherto with most forms of guns e. g. those employing conveyors or hoists for feeding the ammunition to the loading trough or guns or tanks or the like this continuous supply has involved problems which combined with heavy and complicated machinery has discouraged the use of what can be regarded as magazine type of feed to the breech.

According to this invention the rounds are fed into the breech in co-axial alignment with the gun, and a rotary carrier is provided for carrying the rounds in succession to the loading position, such carrier being adapted to receive its supply of ammunition in a direction at an angle with respect to the axis of the gun. Alternatively, or in addition, the carrier can act as a receiver for spent cases to convey the cases automatically in succession from the breech to a discharge point.

In order that the invention may be clearly understood and readily carried into effect drawings are appended hereto illustrating an embodiment thereof, and wherein:

Figure 1 is a part-sectional view on the plane including the axes of the gun barrel and trunnions,

Figure 2 is a side elevation view of Figure 1,

Figure 3 is a plan view to a smaller scale showing a suitable disposition of the gun loading means in a single gun turret,

Figure 4 is a part sectional rear elevation view of Figure 3, and

Figure 5 is a sectional side elevation view of Figure 4.

Referring to the drawings the cradle 1 of the gun is carried in trunnion bearings 2, the cradle at the breech end of the gun having a rectangular

2

U configuration so as to produce two parallel side arms 3 and 4 carrying at their rear ends respectively shafts 5 and 6 whose axes produced meet the axes of the gun barrel and trunnions at their point of inter-section and on which rotate respectively sleeves 7 and 8, suitable bushes 9 being provided for bearings. The sleeves 7 and 8 carrying respectively truncated conical carriers 10 and 11 each provided with a plurality of radiating tubular receivers 12 and 13 respectively, these tubular receivers being equidistantly spaced about the truncated conical carriers 10 and 11 and arranged so that their axes meet the axes of the gun, the trunnions and the axis pins in a common point of intersection, the carrier for the set of receivers 12 being so related with the carrier for the receivers 13 e. g. after the manner of the teeth of a pair of bevel gears, that consequent on simultaneous step-by-step rotation of the carriers 10 and 11 at equal speeds such receivers will be brought successively and alternately into co-axial alignment with a loading tray 14 fixed to the breech and also into co-axial alignment with the trunnions. In the accompanying drawings an even number of receivers is shown on each of the carriers 10 and 11, but the use of an odd number is not excluded. The intended arrangement is such that rounds to be fired are fed into the receivers 12 when these are co-axial with the trunnions and transferred step-by-step by the rotation of the carrier 10 into alignment with the gun. They are then loaded into the gun and the carriers 10 and 11 rotated until a receiver 13 on the carrier 11 is aligned with the gun which may then be fired and the case ejected into the receiver 13, after which a further step-by-step rotation of the carriers 10 and 11 brings the receiver 13 into alignment with the trunnions when the case is discharged, e. g. into a return chute 15 (see Figure 4), which can have combined therewith at its upper end a branch chute 16 discharging on to the deck or other convenient position, selection as to the point of discharge being afforded by means of an adjustable shutter 17 in a bridge structure across the upper end of the chute 15.

The rounds are fed in succession into the successive tubular guides 12 of the carrier 10 from the magazine 18 (see Figures 4 and 5) or other convenient source of supply via a hoist 19 of known form and a part-arcuate guide 20 having at its upper terminal a power operated ram 21 for pushing each round into the appropriate tubular guide 12. The feed of ammunition along the hoist guide 19 and the movements of the ram

3

21 are synchronised with the movements of a chain-link type of ram 22 having an operating end co-axial with the breech and adapted to feed the round in the tubular guide 12 which is co-axial with the tray 14 into the breech, this ram 22 being operated from a motor 23 adapted to operate alternately with a motor 24 which drives both of the carriers 10 and 11 through the medium of two shafts 25 and 26 arranged with their axes at right angles to each other and provided with bevel gear wheels 27 which effect the desired transmission from the motor 24 to the carriers 10 and 11, by meshing with bevel gear wheels 28 and 29 respectively fixed on spindles 30 and 31 driving the carriers 10 and 11 through the medium of pinions 32 and annuli 33, the annuli 33 being carried by a pair of discs 34 which co-operate with another pair of discs 35 which connect the truncated conical carriers to the sleeves 5 and 8.

The motors 23 and 24 are carried by a V-shaped frame 36 which also carries the bearings for the shafts 25 and 26, this frame being provided at its ends with bearings for the sleeves 5, 7 and 8 about which rotate the carriers 10 and 11 the apex or rear-most portion of this frame being fixed to the trailing end of a stout strut 37 forming a cantilever projecting rearwardly from the cradle 1.

Following the alignment of the appropriate receiver 12 with the breech, the rotation of the motor 24 is stopped and the motor 23 brought into operation automatically to effect the ramming of the round into the breech, the rammer 21 at the same time transferring a round from the hoist 20 to the appropriate receiver aligned with it. Immediately upon retraction of the ram 22 by the reverse drive operation of the motor 23, the motor 24 is brought into operation to align one of the tubular guides 13 of the carrier 11 with the breech, whereupon the round is fired the gun recoils and the empty cartridge case is ejected into the tubular guide 13 co-axial with the breech at the same time and a fired case is removed, by a mechanism hereinafter described, from the appropriate guide 13 aligned with the trunnions. The motor 24 is again brought into operation to advance the carriers 10 and 11 to the desired extent to align one of the tubular receivers 12 with the breech for receiving the ram 22 for ramming the round home into the breech, and another with the rammer 21 to receive a round from the hoist 20.

It will be evident that it is a simple matter to control the operation of the motors 23 and 24 so that rotation of the carriers 10 and 11 only take place when the ram 22 is fully retracted, and also means is provided whereby the firing mechanism is locked against operation otherwise than when one of the empty cartridge case receiving guides 13 is aligned with the breech. This latter means is not shown but may comprise equidistantly spaced segmental abutments on the carrier 11 which obstruct firing movement of a part of the firing mechanism.

The discharge of the empty cartridge cases from the tubular guide 13 is effected automatically by bringing into operation at the period when the rammer 22 is operating a motor 38 driving an endless chain 39 accommodated within a hood 40 mounted with the motor 38 on the appropriate side of the gun breech, this hood 40 together with the motor 38 being carried upon a segmental plate 41 fixed to a squared extension 2a of the trunnion 2, the segment 41 being guided

4

in a segmental channel or angle plate 42 fixed to the trunnion bracket 43. The endless chain 39 carries a plurality of fingers 44 adapted to travel along longitudinal slots 13a provided in the guide tubes 13 so as to eject the empty cartridge cases into the chute 16.

It will be evident from the foregoing that the present invention provides means for automatically feeding rounds to and discharging cartridge cases from a gun for any position of elevation and affording a wide angle of movement in the elevating direction. It will be evident that the axes of the receivers 12 and 13 will always traverse a path intersecting the axis of the trunnions and also that of the gun, and that the correct alignment of the receivers with either trunnion or gun depends solely on the appropriate increment of rotation being given to the carriers 10 and 11 and not at all to the elevation of the gun.

In order to ensure that these operations take place in their correct sequence suitable interlocking devices may be provided.

To enable a high rate of fire to be maintained the hoist 19 has located adjacent its lower end a rotary or endless conveyor platform 47 embodying round receiving tubular guides 45 brought successively over a feeder 46 which process the rounds into the hoist in known manner.

It will be appreciated that only one rotary carrier need be employed, e. g. for loading the gun and if desired receiving in each receiver tube an empty case following the delivery from the appropriate empty receiver tube of the live round into the breech. Alternatively the single rotary carrier can act merely to receive spent cases.

It will be understood that the present invention is intended for use with guns of the larger medium or like type, as of course with light cannon or heavy machine guns the customary chain-link or replaceable magazine would be employed.

I claim:

1. In combination, a gun of the type in which the rounds are fed into the breech in a direction along the axis of the gun, a rotary carrier on one side of the gun for carrying the rounds in succession to the loading position so that each round has its axis located in the aforesaid direction, means to feed the rounds into the carrier in a direction at an angle with respect to the axis of the gun, means supporting the carrier for rotation on an axis located and extending between the directions of feed of rounds into and out of said carrier, a like additional carrier on the other side of the gun but adapted to receive spent cases from the gun and to convey them away from the gun, and means to discharge the spent cases from said additional carrier.

2. Mechanism according to claim 1 wherein the receivers are tubes open at both ends and each provided with an elongated slot, and the means for the ejecting of the empty cartridge cases therefrom comprises an endless chain having abutments projecting therefrom and adapted to traverse the said slots in succession.

3. Mechanism according to claim 2 wherein said chain has one track parallel with the conical periphery of the appropriate carrier, and a motor is provided to drive the chain, said motor being carried by a support fixed to a trunnion of the gun.

4. In combination, a gun of the type in which the rounds are fed into the breech in a direction along the axis of the gun, two rotary carriers disposed one each side of the gun, a set of receivers on each of said carriers, each said set of receivers

5

generating a conical surface as the associated carrier revolves so that for every complete rotation of the carriers the receivers are brought successively into alignment with the breech; a discharge guide on one side of the gun, the receivers of one carrier receiving spent cases from the breech and conveying the spent cases to a position opposite the discharge guide, means to discharge the spent cases into said discharge guide, and means to feed rounds into the receivers of the other carrier before the receivers reach alignment with the breech.

5. Mechanism according to claim 4, wherein the two carriers are disposed symmetrically with relation to the gun axis on opposite sides of the gun cradle and both carried off the gun cradle for rotation, the two rotary carriers being supported for rotation upon shafts having axes converging towards the point of intersection of the gun axis and the axis of trunnions.

6. Mechanism according to claim 5 wherein a frame is fixed relative to the gun carriage in rear of the carriers and also supports said shafts, and carries in alignment with the breech a loading rammer, two power units being mounted on said carrier adapted to drive the loading rammer and the two carriers, the tubular receivers of the two carriers being equidistantly spaced with respect to their carriers and the receivers of one carrier and those of the other carrier being adapted to be brought singly alternately into alignment with the gun breech.

7. Mechanism according to claim 6 wherein each rotary carrier is of truncated conical form carrying on its periphery the tubular receivers, and having at its larger diameter end a toothed annulus with which meshes a gear member driven off the appropriate power circuit of said frame.

8. Mechanism for conveying rounds into the loading position on a gun mounted in a cradle with trunnions about the axis of which the gun is adjustable for changing the angle of elevation, and in which the rounds are fed into the breech in co-axial alignment with the gun, comprising a rotary carrier mounted for rotation at 45° to, and intersecting the point of intersection of the gun barrel and trunnion axes, a plurality of equidistantly spaced tubular receivers supported by the carrier symmetrically relative to the axis of rotation of the carrier and with their axes converging to the said point of intersection and lying on the surface of a right-circular cone of semi-vertical angle of 45° also containing the barrel and trunnion axes, and means to guide rounds into the receivers along the axis of the trunnions.

9. Mechanism for conveying rounds into the loading position on a gun mounted in a cradle with trunnions about the axis of which the gun is adjustable for changing the angle of elevation, and in which the rounds are fed into the breech in co-axial alignment with the gun, comprising a rotary carrier mounted for rotation at 45° to, and intersecting the point of intersection of the gun barrel and trunnion axes, a plurality of equidistantly spaced tubular receivers supported by the carrier symmetrically relative to the axis of rotation of the carrier and with their axes converging to the said point of intersection and lying on the surface of a right-circular cone of semi-vertical angle of 45°, also containing the barrel and trunnion axes, means to guide rounds into the receivers along the axis of the trunnions and means supporting the said carrier from the gun cradle so that the car-

6

rier follows the elevation movements of the gun cradle.

10. Mechanism for feeding rounds into a gun of the type in which the rounds are fed into the breech in a direction along the axis of the gun and in which the gun is adjustable for elevation about the axis of trunnions, comprising a rotary carrier, and a receiver carried by said carrier for receiving singly rounds in a direction along the gun trunnion axis and adapted to transport the round therein to the loading position and thereafter to return to the round receiving position; said carrier rotating on an axis at 45° with respect to the gun axis, and the receiver lying on the surface of a right-circular cone of semi-vertical angle of 45°, and a further like rotary carrier having a receiver adapted to receive empty cartridge cases from the gun and to carry the cases to a discharge point, the two carriers being disposed symmetrically with relation to the gun axis on opposite sides of the gun cradle.

11. Mechanism for conveying rounds into the loading position on a gun mounted in a cradle with trunnions about the axis of which the gun is adjustable for changing the angle of elevation, and in which the rounds are fed into the breech in co-axial alignment with the gun, comprising a rotary carrier mounted for rotation at 45° to, and intersecting the point of intersection of the gun barrel and trunnion axes, a plurality of equidistantly spaced tubular receivers supported by the carrier symmetrically relative to the axis of rotation of the carrier and with their axes converging to the said point of intersection and lying on the surface of a right-circular cone of semi-vertical angle of 45° also containing the barrel and trunnion axes, means to guide rounds into the receivers along the axis of the trunnions, means supporting the said carrier from the gun cradle so that the carrier follows the elevation movements of the gun cradle, and a further like rotary carrier with a like arrangement of tubular receivers adapted to receive empty cartridge cases from the gun and to carry the cases to a discharge point, the two carriers being disposed symmetrically with relation to the gun axis on opposite sides of the gun cradle.

12. Mechanism according to claim 11 wherein means is provided for automatically ejecting empty cartridge cases from the tubular receivers of said further carrier following movement thereof through a predetermined angle away from the case receiving position.

13. Mechanism according to claim 11 wherein the two carriers, when rotated, alternate with each other in presenting a receiver in alignment with the breech.

14. Mechanism according to claim 11 wherein the two carriers are supported for rotation upon shafts having axes converging towards the point of intersection of the gun barrel and trunnion axes, said shafts being supported each at its end remote from the breech by a frame fixed to the cradle and extending beyond the rear of the carriers and carrying in axial alignment with the breech a loading rammer and also two power units adapted to drive the loading rammer and the two carriers.

15. Mechanism according to claim 11 wherein the tubular receivers adapted to receive the spent cartridge cases are each provided with an elongated slot, and ejector mechanism being fixed alongside the gun cradle and carrying an ejector abutment which it feeds along the said slot

7

of the adjacent receiver to eject the spent cartridge case.

16. Mechanism for conveying rounds into the loading position on a gun mounted in a cradle with trunnions about the axis of which the gun is adjustable for changing the angle of elevation thereof, and in which the rounds are fed into the breech in co-axial alignment with the gun; said mechanism comprising a rotary carrier, means rotatably supporting said carrier for movement with said gun so that the axis of rotation of the carrier always is disposed at an angle of 45° relative to the axes of said gun and said trunnions and intersects said axes at the point of intersection of the latter, at least one tubular receiver mounted on said carrier so that the longitudinal axis of said receiver lies in a radial plane extending through said axis of rotation of the carrier and is inclined at 45° relative to said axis of rotation of the carrier to pass through said point of intersection so that said tubular receiver is movable with said carrier between a

8

round receiving position aligned axially with the axis of the trunnions and the loading position aligned axially with the gun, and means to guide rounds into said receiver along the axis of said trunnions.

CHRISTOPHER FRANCIS BRERETON.

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