April 22, 1958 D. DARDICK 2,831,401

BREECH MECHANISMS FOR OPEN-CHAMBER GUNS

Filed Sept. 27, 1955 3 Sheets-Sheet 1

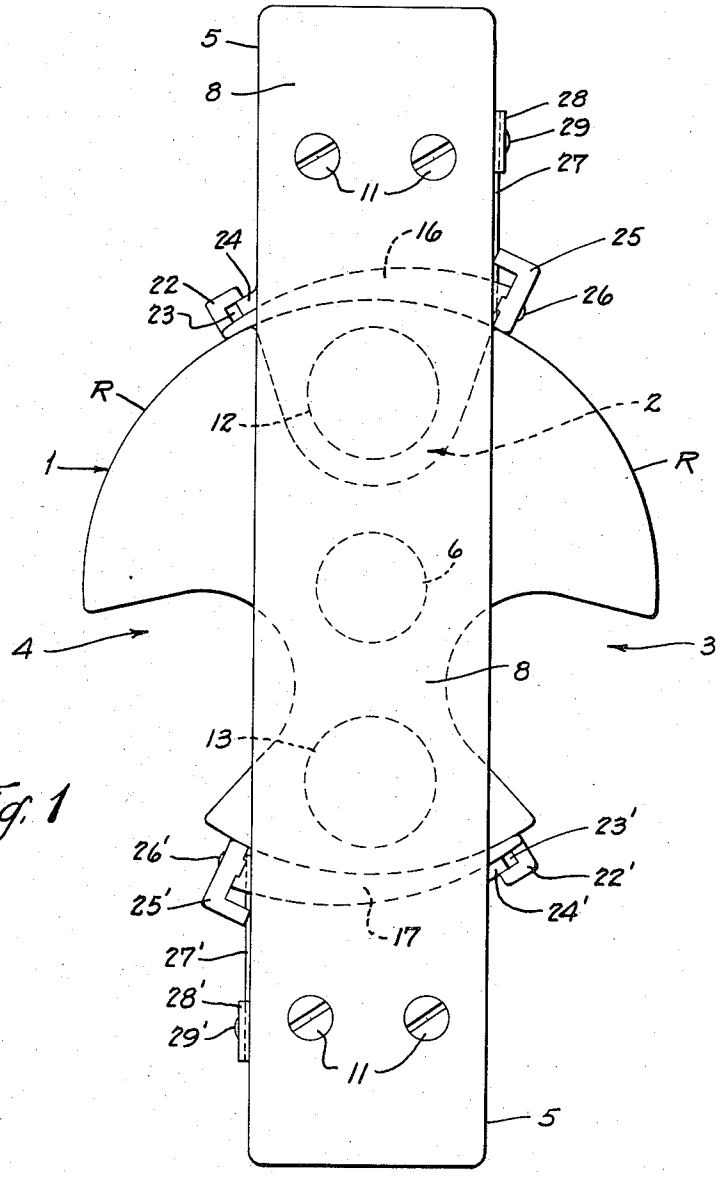

Fig. 1

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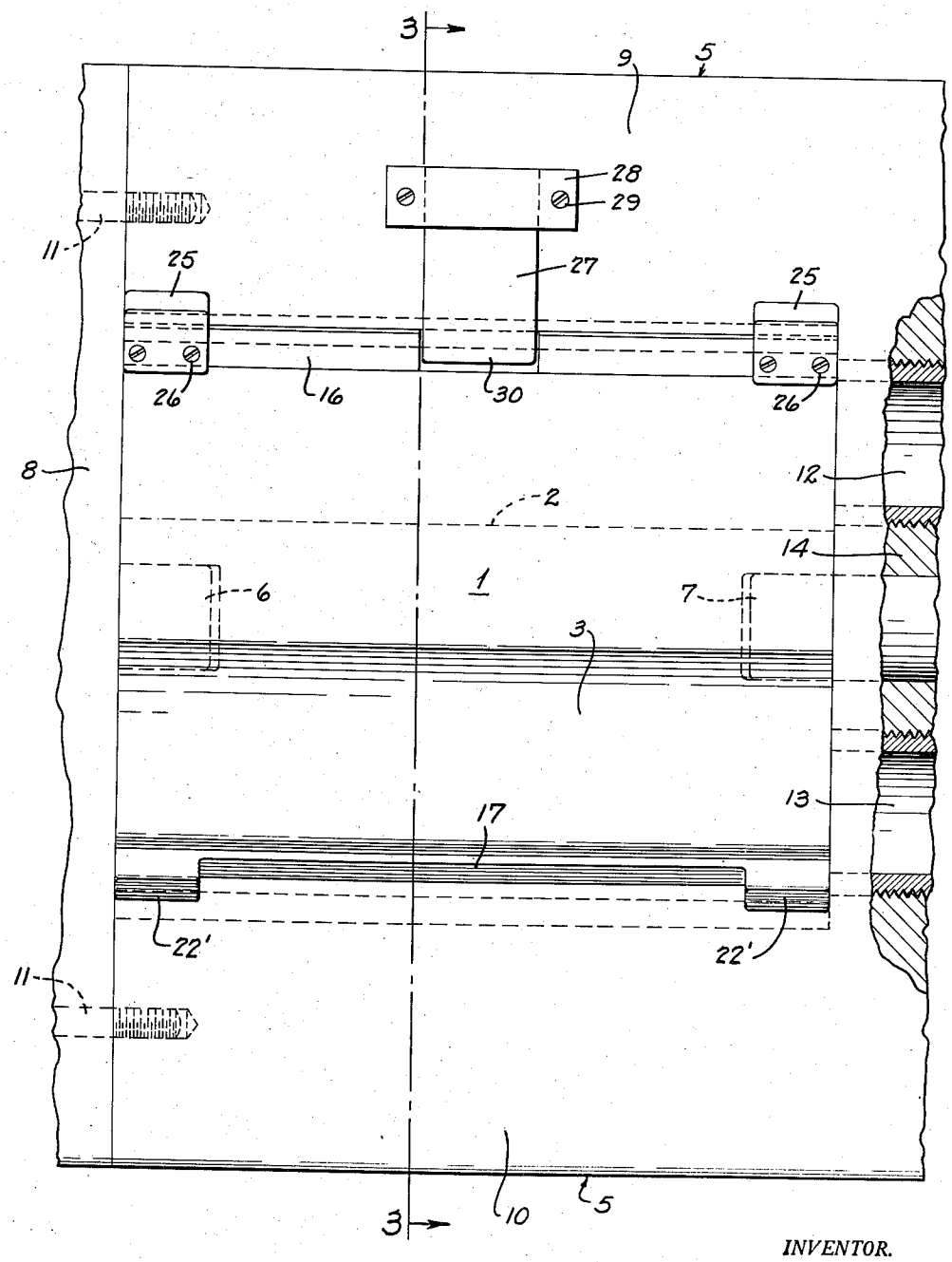

Fig. 2

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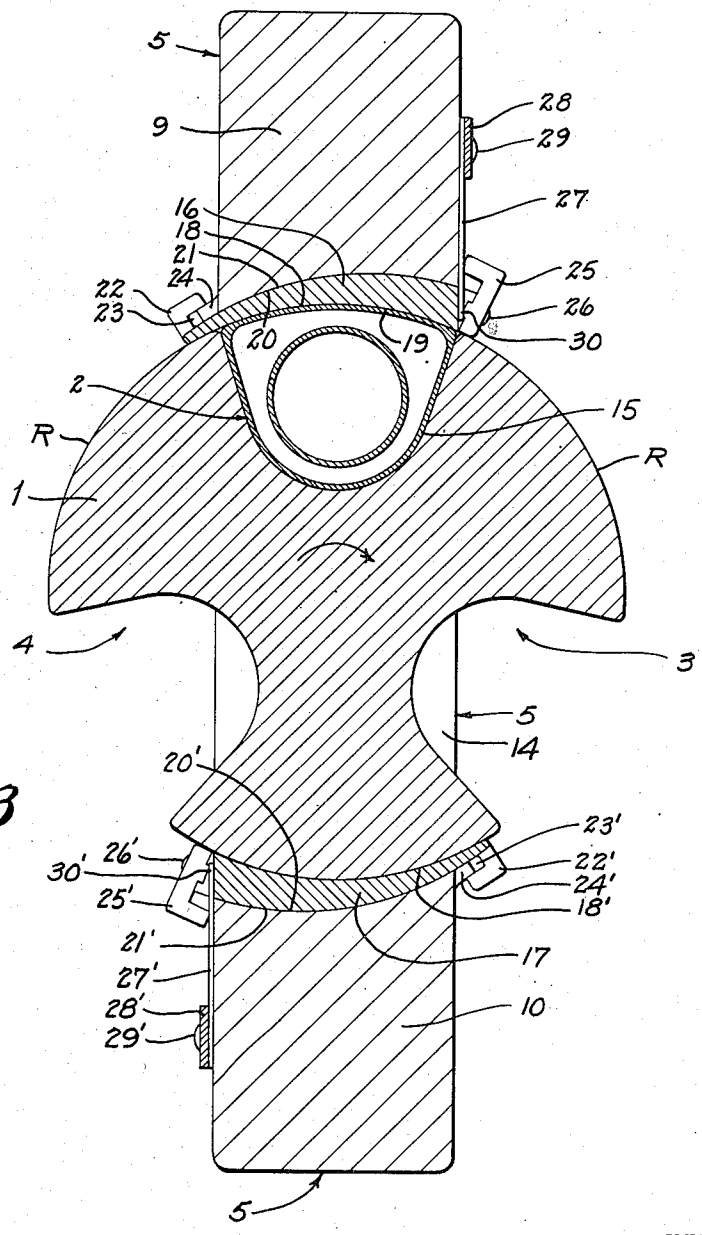

Fig. 3

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BREECH MECHANISMS FOR OPEN-CHAMBER GUNS

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Application September 27, 1955, Serial No. 536,895

11 Claims. (Cl. 89—17)

This invention relates to open-chamber guns and relates more particularly to open-chamber guns for use with so-called high pressure ammunition.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the combinations, improvements and instrumentalities pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements and combinations and improvements herein shown and described.

The accompaying drawings, referred to herein and constituting a part hereof, illustrate one embodiment of the apparatus for carrying out the invention, and together with the description, serve to explain the principles of the invention.

It is among the particular objects of this invention to minimize sticking, jamming and other difficulties attendant upon expansion of the cases of high pressure ammunition when fired in open-chamber guns, and to enable the open-chamber rotary drum of the gun to be rotated for ejection of expanded ammunition cases with the same ease and facility as it may be when loaded with unfired ammunition, and with substantially no greater power requirement for effecting the rotation.

In accordance with this invention, the frame of the gun which serves as a breech for the open-chamber rotary drum is constructed and arranged to provide in and as a part thereof, one or more displaceable breech portions. Each such breech portion is of a configuration to provide longitudinally of the drum's rotational axis a breech surface of cylindrical contour which is concentric with the drum and is suitably dimensioned in directions normal to and longitudinally of the rotational axis of the drum, to span an open-chamber of the drum from side-to-side and from end-to-end, when the chamber is in its battery or firing position. In accordance with this invention moreover, each such displaceable breech portion is also of a configuration to provide a bearing surface inclined suitably to the cylindrical breech surface and in sliding engagement with a complementary bearing surface of the frame, this arrangement of surfaces serving to permit the displaceable breech portion to be moved outwardly and away from the rotary drum in one direction and vice versa. To this end also, the mounting of the displaceable breech portion in the relatively stationary portion of the frame is such that the breech portion is capable of limited back and forth sliding movement relative to the stationary surface in a circular path concentric with the rotational axis of the open-chamber rotary drum of the gun. Thus, with a shell or cartridge case expanded in an open-chamber in battery position into tight frictional engagement with the breech surface, rotation of the rotary drum in one direction will be resisted by the wedging action of the displaceable breech portion but rotation in the opposite direction will effect a movement of the displaceable breech portion in the same direction along the inclined bearing surface and away from the expanded surface, thus eliminating the frictional resistance or drag of the expanded case on the breech at the very beginning of the rotation and freeing the case for easy mechanical ejection upon further rotation of the drum. Means are provided for yieldably opposing the freeing movement of the displaceable breech portion and automatically returning the breech portion to its normal starting position as soon as the expanded shell or case no longer exerts any frictional drag on it.

Of the drawings:

Fig. 1 is a view in end elevation of the breech and rotary drum of a two barreled open-chamber gun embodying this invention, as seen from the breech end of the gun;

Fig. 2 is a fragmentary view in side elevation with parts in section of the embodiment of Fig. 1; and,

Fig. 3 is a view in section taken along the line 3—3 of Fig. 2, but with a shell or cartridge in an open-chamber of the gun in upper battery or firing position.

It will be understood that the foregoing general description and the following detailed description as well are exemplary and explanatory of the invention but are not restrictive thereof.

Referring now more particularly to the drawings, a rotary drum 1 of cylindrical contour having open chambers 2, 3 and 4 is mounted for rotation in a strong and rigid rectangular stationary frame 5 which serves as a breech for the open chambers. Aligned stub axles 6 and 7 carried by the frame 5 at front and rear serve to support the drum for rotation on its cylinder axis. The breech frame 5 as shown is provided with a removable breech rail 8 firmly secured to the top and bottom rails 9 and 10, respectively, as by bolts 11, for facilitating assembly of the rotary drum in the stationary frame but it will be understood that the frame may be of unitary integral construction.

Upper and lower gun barrels 12 and 13, respectively, are screwed into the front rail 14 of the frame, the respective axes of the barrels and the cylinder axis of the drum lying in a common plane.

The open chambers 2, 3 and 4 of the rotary drum are suitably equally angularly spaced from each other so that as drum is rotated in a clock-wise direction as viewed in Fig. 1, a chamber will be brought into firing position in alignment first with one and then the other of the barrels. As shown in Fig. 3, the chamber 2 is in firing or battery position in alignment with the upper barrel, a shell or cartridge having the case 15 being situated in the chamber. In such case, chamber 3 is in position to be loaded and chamber 4 is in position for the ejection of a discharged shell (not shown).

The breech frame 5 is constructed and arranged to provide in and as part of its upper rail 9, a displaceable breech portion 16, a corresponding displaceable breech portion 17 being provided in the lower rail 10.

The displaceable breech portion 16 is of a configuration to provide a breech surface 18 of cylindrical contour which is concentric with the rotary drum 1 and is dimensioned in directions normal to and longitudinally of the rotational axis of the drum, to span the open chamber 2 when aligned in battery position with the upper gun barrel 13, as shown in Figs. 1 and 3. It will be understood that the breech surface 18 has a radius of curvature only slightly larger than the radius of curvature R of the drum 1 so that the opposing surface 19 of the shell case 15 will be in substantially wiping engagement with the breech surface 18 before firing. After firing, the expansion of the case 15 may result in the case surface 19 being in tight frictional engagement with the breech surface 18, particularly with high pressure ammunition.

The displaceable breech portion 16 is also of a configuration to provide a bearing surface 20 inclined to the breech surface 18 and in sliding engagement with a complementary bearing surface 21 of the top rail 9 of the stationary frame 5. Thus, the displaceable breech portion 16 is tapered from side-to-side and forms a wedge disposed slidably between the shell case 15 and the breech frame 5 of which it forms a part. The inclined bearing surface 20 as here preferably embodied is a portion of a circular arc having, preferably, substantially the same radius of curvature as the drum 1, but a different center. The complementary bearing surface 21 of the frame has substantially the same radius of curvature as the breech surface 20 so as to obtain a smoothly sliding fit between the two surfaces.

Means are provided for limiting the extent of movement of the breech portion 16 in either direction of rotation. For convenience, the thick edge of the tapered breech portion may be referred to as the leading edge and the thin edge as the trailing edge. As here preferably embodied, the trailing edge of the breech portion is of a configuration to provide a pair of U-shaped groove-forming portions 22, one at each end and preferably integral therewith, whose grooves 23 slidably receive a pair of stationary tongues 24, one in each groove, integral with the upper breech rail 9. The mating surfaces of the grooves 23 and tongues 24 are suitably curved to permit free relative movement therebetween as the breech portion 16 is displaced on its rotational axis. Likewise the grooves 23 and tongues 24 are of a depth and length, respectively, such that clockwise movement of the displaceable wedge portion 16 is limited to a predetermined amount only sufficient to free the wedge portion from the underlying case 15 in chamber 2.

The leading edge of the displaceable breech portion 16 is provided with a pair of stop members 25, one at each end of the breech portion, and preferably detachably connected to the leading edge as by screws 26. Advantageously, each stop member may be of L-shaped configuration, as shown, one arm of the L being disposed and arranged so as to abut against the stationary portion of the upper rail 9 in the normal at rest position of the breech member shown in Fig. 1.

A flexible resilient restoring member 27 is secured cantilever-wise between the stationary frame 1 and a removable clamping plate 28 by means of screws 29 passing through the clamping plate into the upper rail 9 of the frame 1, the free end 30 of the restoring member bearing against the leading edge of the breech portion and yieldably holding the breech portion firmly against clockwise movement as viewed in Fig. 2.

The lower displaceable breech portion 17 is in all respects identical with the upper breech portion 16 and serves in the same way to overcome jamming and sticking of an expanded case of a cartridge or shell against the breech frame 1 of the gun when the succeeding chamber 3 is loaded with a round of ammunition, the drum rotated clockwise to bring chamber 3 into firing position in alignment with the lower gun barrel 14, and the ammunication fired. Accordingly the corresponding parts of the breech portion 17 and its associated parts and members are designated by the same reference characters as are applied to the upper breech member 16, but with the reference characters primed.

In the operation of the open-chamber gun of Fig. 3, it may be assumed that the shell situated in the chamber 2 has been fired and the case 15 expanded so that it is not only in tight engagement with the walls of the chamber 2 but has its surface 19 in tight engagement with the breech surface 18 of the displaceable breech portion 16. Under these conditions a clockwise movement of the rotary drum 1 toward a position at which the chamber 2 would be completely uncovered so as to permit of ejection of the empty shell case therefrom, would initiate a simultaneous clockwise movement of the displaceable breech portion 16 by reason of the frictional drag exerted by the surface 19 of the expanded shell case 15 on the breech surface 18. This clockwise movement of the breech portion though yieldably opposed by the spring member 27 is accompanied by a radially outward movement of the breech portion as the inclined movable bearing surface 20 slides "downhill" on the complementary stationary bearing surface 21. This outward movement effectively frees the surfaces 18 and 19 from each other permitting the drum to be rotated freely to bring the chamber 3 into alignment with the lower barrel 13 and the chamber 2 into position for ejection of the empty case 15. The spring member 27 acting through its free end 30 on the leading edge of the breech portion 16 serves to return the latter automatically to its starting position so soon as the drag exerted by the expanded case drops below the restoring force exerted by the spring member on the breech portion. Movement of the breech portion is of course kept within predetermined limits clockwise by the stop members 22, and by the stop members 25 in the opposite direction.

It will be understood that suitable mechanical or electrical firing means (not shown) will be provided for firing the shells or cartridges as each is brought to rest in alignment with the upper or lower barrel as the case may be. Likewise suitable rotating and indexing means (not shown) are provided for effecting timed rotation of the rotary drum 1 into successive loading, firing and ejecting positions for the upper and lower barrels, alternately. Such means form no part of the present invention and are omitted for the sake of clarity. It will be understood also that although the embodiment of an open-chamber gun herein described and shown has two barrels, the invention is equally applicable to single barrel open-chamber guns and to multiple barrel open-chamber guns having more than two barrels.

The invention in its broader aspects is not limited to the specific combinations, improvements and intrumentalities described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What is claimed is:

1. In an open-chamber gun, a rigid breech frame and an open-chamber rotary drum of cylindrical contour journalled for rotation in said breech frame, said frame comprising a relatively stationary breech portion spaced from the cylinder surface of said drum, and a displaceable breech portion interposed in the space between said stationary breech portion and said drum, said displaceable breech portion having a breech surface of cylindrical contour concentric with and of substantially the same radius of curvature as said drum dimensioned to span an open chamber of the drum, when the chamber is in its firing position, and having a bearing surface inclined to said breech surface, said bearing surface being in sliding engagement with a complementary bearing surface of said relatively stationary breech portion.

2. In an open-chamber gun, a rigid breech frame and an open-chamber rotary drum of cylindrical contour journalled for rotation in said breech frame, said frame comprising a relatively stationary breech portion spaced from the cylinder surface of said drum, and a displaceable breech portion interposed in the space between said stationary breech portion and said drum, said displaceable breech portion having a breech surface of cylindrical contour concentric with and of substantially the same radius of curvature as said drum dimensioned to span an open chamber of the drum, when the chamber is in its firing position, and having a bearing surface inclined to said breech surface, said bearing surface being a surface of cylindrical contour eccentric to said drum and being in sliding engagement with a complementary bearing surface of said relatively stationary breech portion.

3. In an open-chamber gun, a rigid breech frame and

an open-chamber rotary drum of cylindrical contour journalled for rotation in said frame, said frame comprising a relatively stationary breech portion spaced from the cylinder surface of said drum, and a displaceable breech portion interposed in the space between said stationary breech portion and said drum, said displaceable breech portion being tapered to form a wedge, having a breech surface of cylindrical contour concentric with and of substantially the same radius of curvature as said drum dimensioned to span an open chamber of the drum, when the chamber is in its firing position, and having a bearing surface inclined to said breech surface, said bearing surface being in sliding engagement with a complementary bearing surface of said relatively stationary breech portion.

4. In an open-chamber gun, a rigid breech frame; an open-chamber rotary drum of cylindrical contour journalled for rotation in said frame, said frame comprising a relatively stationary breech portion and a displaceable breech portion, said displaceable breech portion being tapered to form a wedge, having a breech surface of cylindrical contour concentric with said drum and having a bearing surface inclined to said breech surface, said bearing surface being in sliding engagement with a complementary bearing surface of said relatively stationary breech portion; and, means for releasably maintaining said displaceable breech portion in a position of rest between said stationary breech portion and said open-chamber drum and for restoring the same to said position after displacement therefrom.

5. In an open-chamber gun according to claim 4, in which said maintaining-restoring means comprises flexible resilient means carried by said stationary breech portion and engaging said displaceable breech portion for yieldably opposing displacement of said displaceable breech portion in one direction from said position of rest and for restoring the same to said position after displacement therefrom.

6. In an open-chamber gun, a rigid breech frame; a pair of gun barrels carried by said frame in parallel relation to each other; an open-chamber rotary drum journalled for rotation in said frame, said drum having a plurality of open-chambers disposed and arranged therein for alignment respectively in firing position with said barrels alternately, said frame comprising a pair of stationary breech portions and a pair of displaceable breech portions, one for each of said stationary portions, said displaceable breech portions each being of a configuration to form a displaceable wedge positioned between the stationary breech portion associated therewith and said open-chamber rotary drum; and, means for releasably maintaining each said displaceable breech portion in its position between its associated stationary breech portion and said rotary drum and for restoring the same to said position after displacement therefrom, whereby on rotation of said drum friction between the case of a discharged shell or cartridge expanded between said drum and either of said displaceable breech portions may cause displacement of said breech portion to free said case for ejection from said drum.

7. In an open-chamber gun, a rigid breech frame and an open-chamber rotary drum of cylindrical contour journalled for rotation in said frame, said frame comprising a relatively stationary breech portion spaced from the cylinder surface of said drum, and a release wedge mounted in the space between said stationary breech portion and said drum for bodily displacement in said space relative to said stationary portion and said drum in a transverse plane at right angles to the rotational axis of said drum, said release wedge and said stationary portion having complementary surfaces providing bearing surfaces therebetween, and said release wedge having a separate breech surface of cylindrical contour concentric with and of substantially the same radius of curvature as said drum, said breech surface being dimensioned to span an open chamber of the drum when the chamber is in its firing position.

8. In an open-chamber gun according to claim 7, means carried by said relatively stationary portion fixing said release wedge against displacement in said plane in one direction from a position of rest between said stationary breech portion and said drum, and separate means also carried by said relatively stationary breech portion for releasably maintaining said displaceable breech portion in said position of rest and for automatically restoring it thereto after displacement therefrom.

9. In an open-chambered gun according to claim 7, said release wedge being tapered in said plane, and having its thick or leading edge disposed to advance in the normal direction of rotation of said drum.

10. In an open-chamber gun according to claim 7, said release wedge having an arcuate breech surface concentric with said drum.

11. In an open-chamber gun according to claim 10, said release wedge having an arcuate bearing surface separate from said arcuate breech surface and eccentric to said drum, and said stationary breech portion having a bearing surface complementary to said arcuate bearing surface and in sliding engagement therewith.

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