Oct. 2, 1962 D. H. HERBERT 3,056,623

STORE EJECTOR RACK

Filed Sept. 4, 1959 3 Sheets-Sheet 1

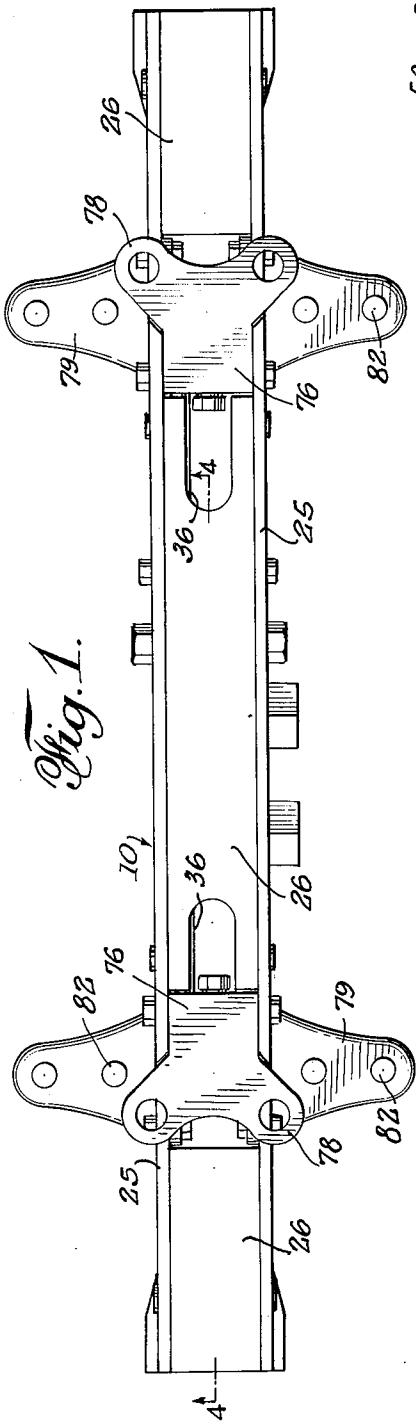


Fig. 1.

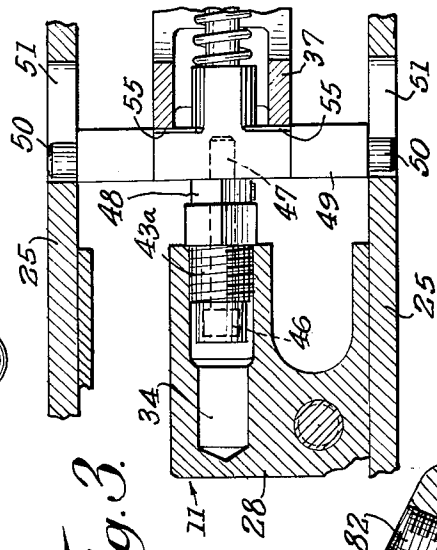


Fig. 3.

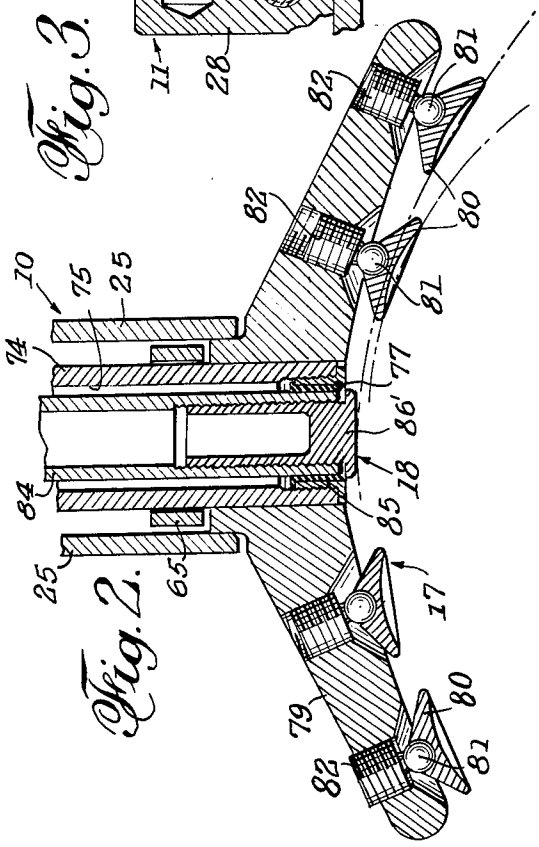


Fig. 2.

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Filed Sept. 4, 1959 3 Sheets-Sheet 2

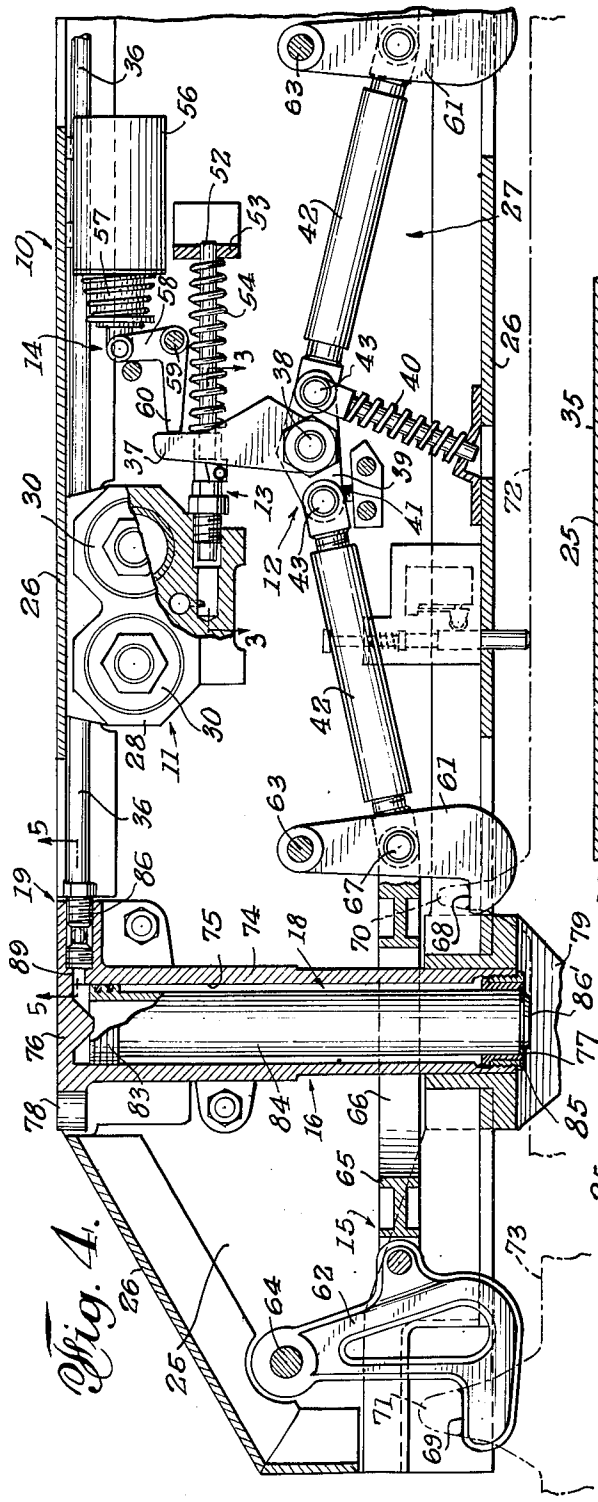


Fig. 4.

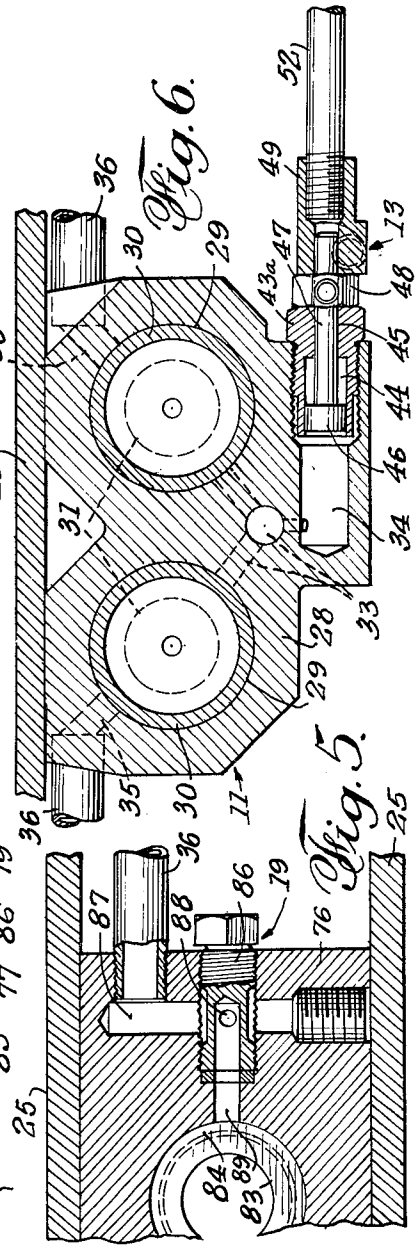


Fig. 6.

Fig. 5.

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Filed Sept. 4, 1959 3 Sheets-Sheet 3

Fig. 8.

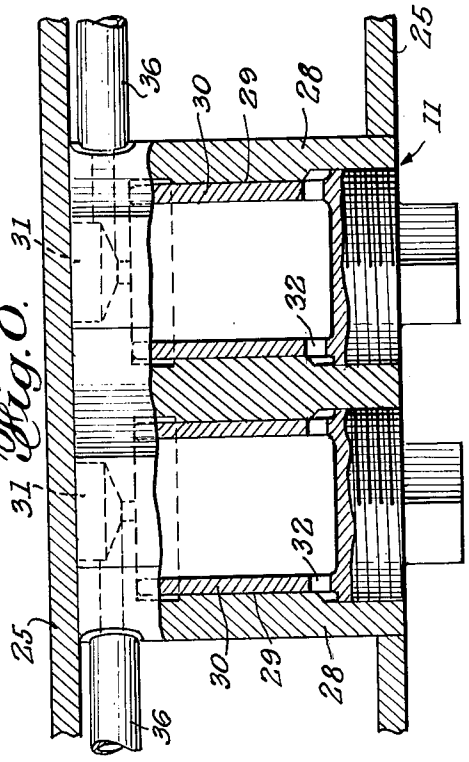


Fig. 9.

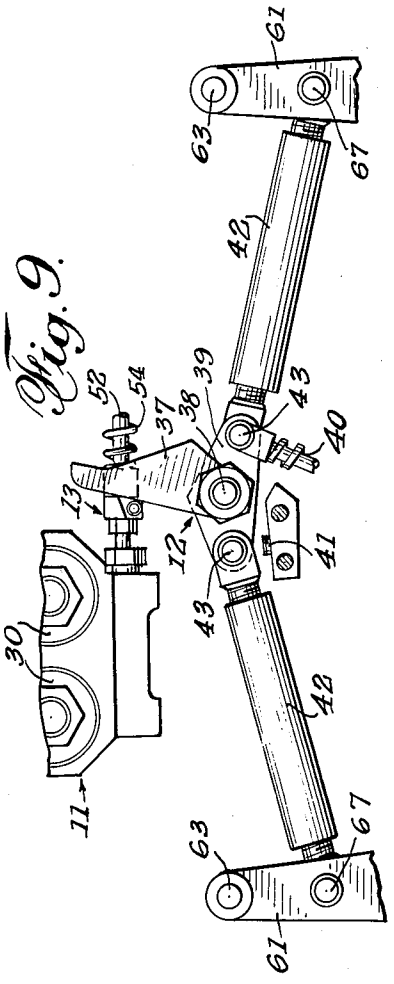
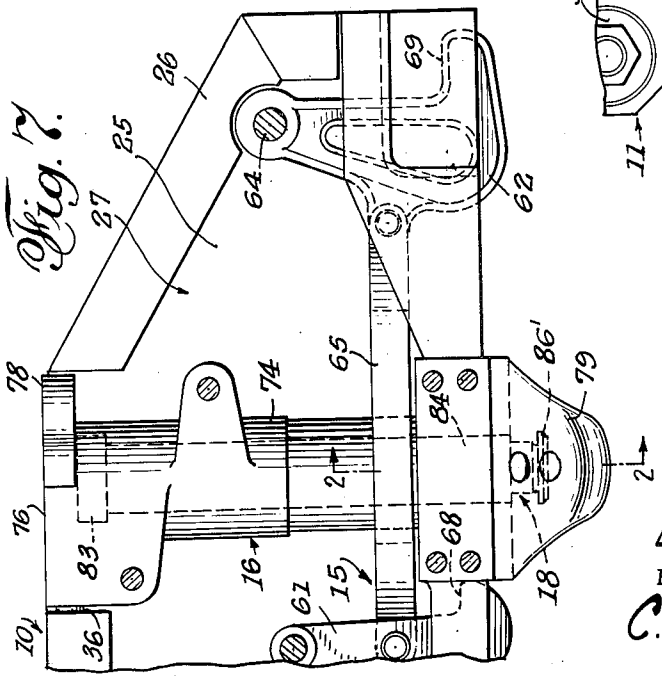


Fig. 7.



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STORE EJECTOR RACK

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Filed Sept. 4, 1959, Ser. No. 838,288
4 Claims. (Cl. 294—83)

This invention relates to a rack for carrying and ejecting stores from fast-moving aircraft, especially those moving at supersonic speeds. As here used, the terms "store" or "stores" are intended to include a variety of devices, of which bombs and missiles are examples.

Since stores, as above contemplated, require careful handling, in the interests of safety, and accurate discharge to insure efficient direction toward a target area, an object of the present invention is to provide a store-ejecting rack that is safe to use, is firmly locked against accidental release until ready for ejection of the store, and is so balanced in its ejecting means as to control the angle of ejection of the store, as desired.

Another object of the invention is to provide a store-ejecting rack that is operated to eject a store by the pressure of gases generated by explosive means, the rack utilizing said pressure gases both to release or unlock the ejecting mechanism and to operate said mechanism to eject a store.

A further object of the invention is to provide a store ejector rack in which a store is so suspended that the weight of the store is cumulative to the pressure of the ejectors to cause completion of the ejection movement of the store-suspending means after the same is released or unlocked, as above indicated.

The invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. However, the drawings merely show and the following description merely describes, one embodiment of the present invention, which is given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

FIG. 1 is a top plan view of a store ejector rack according to the present invention.

FIG. 2 is an enlarged and fragmentary vertical sectional view as taken on the line 2—2 of FIG. 7.

FIG. 3 is a similarly enlarged cross-sectional view as taken on the line 3—3 of FIG. 4.

FIG. 4 is a longitudinal sectional view as taken on the line 4—4 of FIG. 1 and drawn to a scale somewhat larger than FIG. 1.

FIG. 5 is an enlarged fragmentary sectional view as taken on the line 5—5 of FIG. 4.

FIG. 6 is a similarly enlarged sectional view of breech and control means shown in FIG. 4.

FIG. 7 is a sectional view of the right-hand end of the rack, the same constituting an extension of the rack portion shown in FIG. 4.

FIG. 8 is an enlarged partial elevational and partial sectional view of the breech shown in FIGS. 4 and 6.

FIG. 9 is a fragmentary elevational view of operating mechanism, as in FIG. 4, but shown in released or unlocked position.

The store ejector rack that is illustrated comprises, generally, a frame 10, means 11 to provide a source of power for operating the present rack, normally locked

mechainsm 12 for operating the rack, means 13 operated by the means 11 to actuate the means 12 to unlocked or released position, safety locking means 14 for the means 13, store hanger means 15 at each end of the rack frame 10 normally held locked by the means 12 and released for movement to release a store hanging therefrom by unlocking of the means 12, store ejector units 16 adjacent each end of the rack frame, adjustable means 17 provided at the lower portion of each unit 16 for engaging a store suspended or hung from the means 15, an adjustable ejector piston 18 in each unit 16, and means 19 for varying the operating pressure on at least one of the pistons 18 to effect control of the angle of ejection of a store suspended from the means 15.

The frame 10 is shown as comprising two side plates 25 that are spaced and connected by top, end and lower spacers 26 to provide the frame with an inner space 27.

The means 11 is shown as a breech block 28 mounted in the space 27 and formed to have two bores 29 into which explosives are placed in tubular closure plugs 30 that are screwed into bores 29. Such explosives may be in cartridge form and, when detonated, as by caps 31, capable of creating pressures as high as 50,000 p.s.i. in the interiors of the plugs. Such explosives generate temperatures between 8,000° and 10,000° F. Accordingly, the block 28 and plugs 30 are designed to withstand the high pressures and temperatures above mentioned.

It will be realized that the pressures needed for ejecting a store at supersonic speeds and for controlling the angle of ejection must necessarily be high. Hence the 50,000 p.s.i. above mentioned. As can be seen from FIGS. 6 and 8, the gases of explosion have two paths, one through ports 32 in the plugs 30 to passages 33 into a passage 34, and the other through ports 35 into two oppositely directed pipes or tubes 36.

The explosives may be detonated in any of various ways. Electrical detonation is preferred. The means that may be used for this purpose is not illustrated because it is quite conventional.

The mechanism 12 (FIGS. 4 and 9) is shown as comprising a lever 37 of inverted T form having a cross arm 39 and rockable on a pivot 38 carried by the plates 25. A spring device 40 is arranged to bias the cross arm in one direction against a fixed stop 41, and an adjustable rod 42 extends from each end of said cross arm and pivotally connects at 43 to said ends. As will be seen from FIG. 4, the cross arm is so angled, that when against stop 41, the axis of the rods 42 connected to the stopped end of the cross arm passes through the axis of pivot 38 while the axis of the other rod 42 will pass in over-center relationship to the pivot 38. Thus, any forces imposed axially on the rods 42 in a direction toward pivot 38 are solidly resisted. Only when the lever 37 is rocked in a clockwise direction, as shown in FIG. 9, is the means 12 unlocked.

The actuating means 13 for the mechanism 12 is best seen in FIGS. 3, 4 and 6, the same being powered by the pressure gas flowing into the passage 34. Said means 13 comprises a fitting 43*a* that has a cylinder bore 44 that opens into passage 34 and a connecting rod bore 45, a piston 46 in the cylinder bore and subject to the pressure in passage 34 to be projected into the cylinder bore, a rod 47 on the piston and extending through the bore 45, an adjustable stop nut 48 on said rod, an actuator 49 engaged against the nut 48 and provided with ends 50 (seen in FIG. 3 and shown dotted in FIG. 6) that slide in horizontal slots 51 in the side plates 25 (FIG. 3), an extension rod 52 carried by the actuator 49 and guided in a bracket 53, and a spring 54 around rod 52 having abutment, at one end, against bracket 53 and, at the other end, in biasing engagement with the actuator 49.

It will be seen, particularly from FIG. 3, that the lever 37 is forked at its upper end so that the rod 52 may be disposed between the sides of said lever, the sides having bearing engagement against the edge 55 of the actuator 49. The pressure of gases on piston 46 projects the actuator 49 against the bias of spring 54 and rocks lever 37 from the locked position of FIG. 4 to the released position of FIG. 9, thereby unlocking the mechanism 12.

The safety locking means 14 is shown as electrical and comprises a solenoid 56 that has a spring projected floating core 57, and a bell crank lever 58 that is moved by said solenoid around a pivot 59. An arm 60 of lever 58 normally has interfering engagement, as shown, with arm 37 and is withdrawn from such engagement upon retraction of the core 57 and clockwise rocking of the lever 58. Only when the arm 37 is freed can the mechanism operate. Hence, inadvertent firing of the explosive cannot cause unlocking of the means 12. Under certain circumstances physical or mechanical safety locks may be used instead of the means 14 or in addition thereto. For instance, a cross pin may lock the end of lever 37 to the frame and be withdrawn when ejection is to be instituted.

The hanger means 15 each comprises hooks 61 and 62 on respective pivots 63 and 64 and connected by a link 65 so as to move together on their respective pivots. Said link is shown with an opening 66 to accommodate the unit 16 that is disposed between the hooks. The hook 61 of each pair of hooks is connected by a pivot 67 to the rod 42. It will be evident that when the means 12 is locked, the ledges 68 and 69 of the respective hooks 61 and 62 are horizontal and constitute level supports that engage loops 70 and 71 of stores 72 and 73.

The hooks 61 may carry one size of store and the hooks 62 a larger store. Or, all four hooks may be used to carry one store. In any case, the four hooks shown, being simultaneously movable by reason of their connecting links 65 and substantially simultaneously operable to store-releasing position, may be used together or in pairs, as the case may be.

It will be noted that the loops 70 and 71 engage the hook ledges 68 and 69 to one side of and below the hook pivots 63 and 64. Thus, the weight of a store on said hooks, at all times, seeks to force the hooks toward release position. This movement tendency is, of course, counteracted by the locked means 12 but becomes effective, when the means 12 is unlocked to the position of FIG. 9. Since one thousand or more pounds may be hanging on each hook, the latter are laterally displaced on their pivots when the means 12 is unlocked.

Each store ejector unit is shown as a vertical housing 74 having a cylinder bore 75 therein and formed to have a closed end 76 and an open end 77, mounting ears 78 provided on the upper end of housing 74 and by means of which the rack is fastened in operative position on or in an aircraft, and a saddle-shaped end fitting 79 secured to the lower end of housing 74 and designed as laterally extending means that engage the store and hold the same against lateral movement while held suspended by the hanger means 15.

As best seen in FIG. 2, said fitting 79 is provided with means 17 that comprise a plurality of individually adjustable shoes 80 that are swivelly carried on ball joints 81 by adjustable screw plugs 82. It will be evident that said means 17, when adjusted according to the outer contours of the store, hold said store steady on its hooks.

Each ejector piston 18 is provided with a piston part 83 that fits the cylinder bore 75, and a ram part 84 that extends through the open end 77 of the housing 74 and is guided at said end in a bearing 85 carried by the housing. In this case, the piston 18 is shown as lower end and as provided in the hollow thereof with an adjustable foot 86'. The drawings clearly show that said foot may be retracted or extended, as desired, so the same firmly bears against a store while the piston is in its retracted position. Since the pistons 18 are projected to cause ejection of a store from the rack by pushing against said store and because the forces involved are quite great, as above mentioned, it is important to have the foot in contact with the store to prevent shock or damage, as may be caused by a piston that has a percussive impact rather than a pushing effort on the store.

The gas released into pipes 36 project the pistons 18. Since it is essential to control the ejection angle of the store to obviate damage or failure during ejection, one or both units 16 may be provided with the means 19 for varying the ejection pressures reaching the ejection piston 18 of one unit 16 with respect to that of the piston of the other unit. In this instance, the means 19 is shown as a fitting 86 that is disposed across a passage 87 in the housing end 76 and which receives gases under pressure from the pipe 36. Said fitting is provided with an orifice 88 that is smaller than the passage 87, the size of said orifice lowering the flow of gases from said passage 87 into the inlet 89 to the cylinder bore 75.

In the above manner, one piston may have a lesser operating pressure thereon than the other, or the pressures on the two pistons may be equalized. Thus, exact ejection control is afforded by the means 19.

While the foregoing specification illustrates and describes what I now contemplate to be the best mode of carrying out my invention, the construction is, of course, subject to modification without departing from the spirit and scope of my invention. Therefore, I do not desire to restrict the invention to the particular form of construction illustrated and described, but desire to cover all modifications that may fall within the scope of the appended claims.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. An explosively operated ejector rack comprising: a pair of single hook means to suspend a store at longitudinally spaced points; a single pivoted lever of inverted T form; rods pivotally connected between the ends of the cross head of said lever and said hooks; a fixed stop effective to prevent rotation of said lever through an angle, in one direction, greater than required to hold the hooks in locked position; resilient means urging said lever against said stop; at least two store ejector means operated by pressure gas; a pressure chamber adapted to receive explosive means; pressure gas operated means effective when operated to rotate said lever against the effort of said resilient means in a direction to move said hooks to released position; and conduits directly connecting said pressure chamber with said ejector means and said means rotating said lever to ensure simultaneous flow of pressure gas into, and operation of, said ejector means and means rotating said lever.

2. An explosively operated ejector rack as set forth in claim 1 and in addition comprising: fittings adapted to be placed in the conduits adjacent the point of delivery of pressure gas into the ejector means, each said fitting being provided with an orifice for the flow of gas therethrough, said orifice being effective to lower the rate of flow of pressure gas into the ejector means sufficiently to establish a required rate of flow of gas into one ejector means with respect to another of said means while not materially restricting said flow during a simultaneous operation of the hook releasing and ejector means.

3. An explosively operated ejector rack as set forth in claim 1 and in addition having safety stop means engaging against said inverted T shaped lever to prevent movement thereof in a direction to effect release of said hooks, said stop means comprising: a bell crank lever having one arm engaging against said T-shaped lever on the side opposite to said fixed stop; a solenoid having its core pivotally connected to the other arm of said lever, and resilient means acting normally to hold one arm of the bell crank lever against said inverted T lever, the energization of said solenoid being effective to move

said one arm out of the path of movement of said inverted T lever.

4. In a store-ejecting rack as set forth in claim 1, a pair of pivotal hooks for suspending a store and a second pair of pivotal hooks, a link connecting one hook of each pair with an adjacent hook of the other pair.

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