A. T. DAWSON & J. HORNE.

AMMUNITION HOISTING GEAR FOR HEAVY ORDNANCE.

APPLICATION FILED MAR. 8, 1910.

1,033,233.

Patented July 23, 1912.

2 SHEETS—SHEET 1.

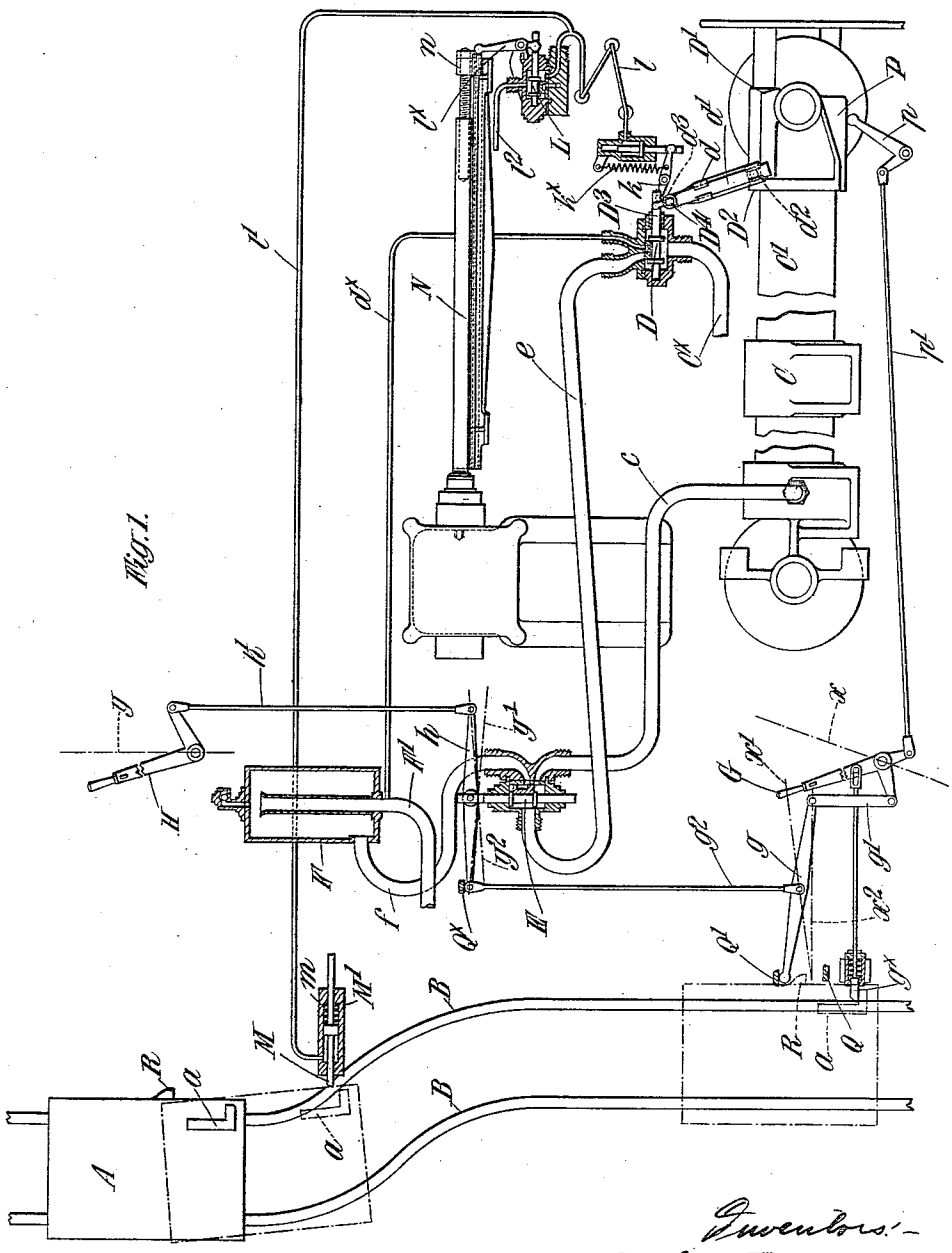

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

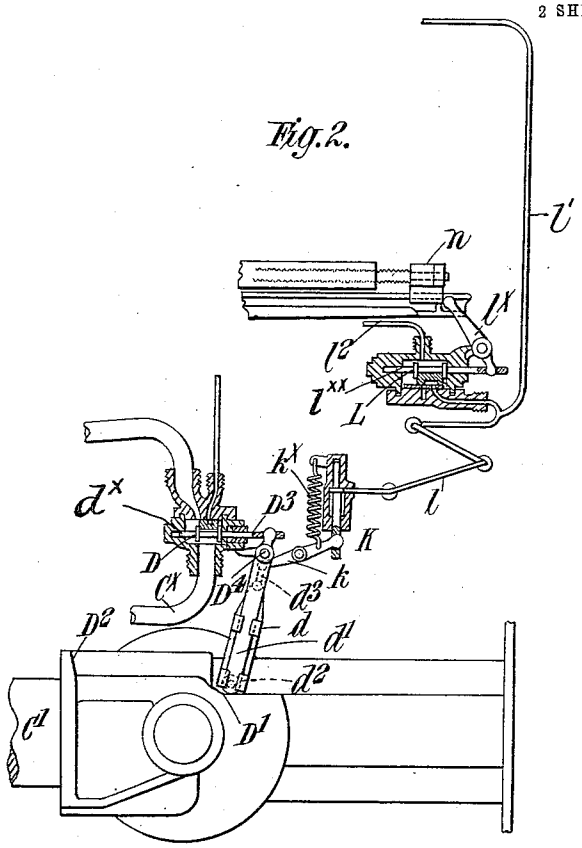


Fig. 3.

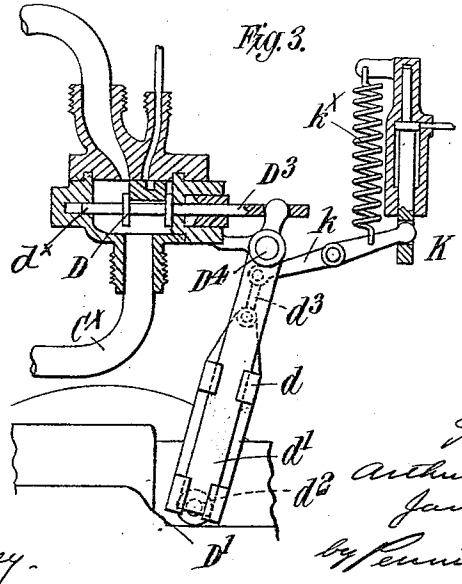
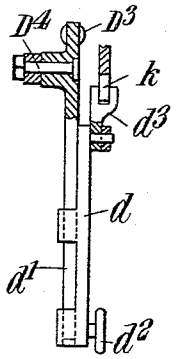


Fig. 4.



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Kenneth B. Rennie
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UNITED STATES PATENT OFFICE.

ARTHUR TREVOR DAWSON, OF WESTMINSTER, LONDON, AND JAMES HORNE, OF BARROW-IN-FURNESS, ENGLAND, ASSIGNORS, BY MESNE ASSIGNMENTS, TO VICKERS, LIMITED, OF WESTMINSTER, ENGLAND.

AMMUNITION-HOISTING GEAR FOR HEAVY ORDNANCE.

1,033,233. Specification of Letters Patent. Patented July 23, 1912.

Application filed March 8, 1910. Serial No. 547,992.

To all whom it may concern:

Be it known that we, ARTHUR TREVOR DAWSON and JAMES HORNE, both subjects of the King of Great Britain, residing, respectively, at 32 Victoria street, Westminster, in the county of London, England, and Naval Construction Works, Barrow-in-Furness, in the county of Lancaster, England, have invented certain new and useful Improvements in and Relating to Ammunition-Hoisting Gear for Heavy Ordnance, of which the following is a specification.

This invention relates to ammunition hoisting gear for heavy ordnance, the said gear being of the kind in which a loading cage actuated by a hydraulic press is employed for conveying the ammunition along suitably arranged guide rails to the rear of the gun breech ready for loading, the loading operation being effected on any of the well known systems such for example as the fixed angle system, the all angle system or the limited angle system, and the charging of the cage with the ammunition being effected either in an intermediate chamber situated below the turntable wherein the ammunition is transferred from an intermediate hoisting cage to the loading cage, or in the shell rooms and magazines at the bottom of the main hoist trunk without the intervention of an intermediate hoisting cage.

The chief object of our invention is to so control the movements of the loading cage that it will be prevented from reaching its fully raised position behind the gun breech unless the gun has returned to its loading position after firing and the breech screw has been swung into its open position clear of the loading cage.

According to our invention we construct and arrange the loading gear in such a manner that after the loading cage has been charged with ammunition in the aforesaid intermediate chamber or at the level of the magazine and shell room, it can be released from its lowered position and caused to ascend under the action of the hydraulic press until it reaches a position just below the gun breech and clear of the path of recoil, where (in the event of the gun not having returned to the loading position) it is temporarily arrested. This arresting of the cage may be effected by the ram of the hydraulic press acting upon a suitable cut off valve on the main pressure supply pipe leading to the press and cutting off the supply of pressure fluid thereto. The cut off valve is so combined with the mechanism used for opening and closing the breech that when the cage has been arrested the gun returned to the loading position and the breech opened by the said mechanism, the valve is moved into a position to again admit the pressure fluid to the hydraulic press, whereupon the loading cage is caused to complete its ascent and occupy its loading position relatively to the gun breech. By arranging the gear in the above stated manner so that the cage comes temporarily to rest in its elevation just below the gun breech, only a short space of time will be required for the loading cage to complete its elevation when the gun returns to the loading position, because the said cage has then but a short distance to travel; a considerable saving of time will thus be effected between the firing of successive rounds and the rapidity of fire correspondingly increased.

In order that our said invention may be clearly understood and readily carried into effect we will describe the same more fully with reference to the accompanying drawings which show diagrammatically the arrangement of the various parts of the apparatus, and in which:—

Figure 1 is a general view showing the parts in their relative positions when the gun is in the fully run out position, the breech opened and the cage raised to its loading position behind the breech. Fig. 2 is a local view showing the position of the parts when the cage is in the lowest position and the gun has returned to the run out position, but before the breech has been opened. Fig. 3 is an enlarged view of the cut-off valve and its connections, and Fig. 4 is a side elevation, partly in section, of Fig. 3.

A is the loading cage, B B are the guide rails, C is the hydraulic press for raising the cage in the usual manner, and C′ is the ram of the said hydraulic press.

D is the cut off valve and D′ D^2 are the stops on the ram C′ for actuating the said valve.

A control valve E is provided on the pressure supply pipe *e* leading from the cut off valve D, the casing of said control valve being connected with the hydraulic press C

and the exhaust tank F by means of pipes c and f respectively. The said valve E is under the control of two hand levers G and H which are connected therewith by means of floating levers g, h and rods g', g^2 and h'. The said hand lever G is situated below, *i. e.* at the place where the loading cage is charged with the ammunition, and the hand lever H is situated above *i. e.* on the loading platform. The lower hand lever G is provided for moving the control valve E into the position to admit pressure fluid to the said hydraulic press C to raise the loading cage and the upper hand lever H is provided for moving the said control valve into the position to exhaust the lifting press and permit the loading cage A to descend after the gun has been loaded. The hand lever G is also adapted to release a spring controlled retaining bolt g^x employed for locking the loading cage in its completely lowered position, the said bolt being attached to the hand lever G by means of a pin and slot arrangement and capable of engaging with a stop piece a on the cage. The spindle D^3 of the aforesaid cut off valve D is formed with a slot in which engages the rounded end of a tappet lever d' which is pivoted to a part of the valve casing at D^4 (Figs. 3 and 4). A sliding member d provided with flanges is disposed on the lever d' the said member being provided with a roller d^2, which is adapted to be acted upon by the aforesaid stops D' D^2 on the ram C' of the hydraulic press. The stop D' is situated in advance of, and at a lower level than the stop D^2. The sliding member d of the tappet lever d' is under the control of a small ram K and is connected therewith by means of a link d^3 and a pivoted lever k. The said ram is in turn under the control of a hydraulic valve L which is adapted to be operated by the aforesaid mechanism by which the breech is opened and closed. The said hydraulic valve L communicates with the ram K by means of a pipe l and from this pipe another pipe l' leads to a hydraulic cylinder M' containing a catch or bolt M which is controlled by a spring m. The said catch or bolt is situated in a position to positively retard the upward movement of the loading cage by engaging with the said stop piece a thereon as said cage comes temporarily to rest in its position just below the gun breech as indicated in dotted lines at the upper part of the accompanying drawing.

In the example shown the mechanism for opening and closing the breech, comprises a horizontal shaft N which is rotated to close or open the breech and which recoils with the gun and the combined sliding and rotating movements of this shaft are utilized to determine respectively the "fully run out" and "fully open" positions and to actuate the hydraulic valve by means of the coöperation of the screwed plug n with the pivoted lever l^x. The said plug n which screws into the shaft N is prevented from rotating by having a crosshead formed at its outer end which engages in a suitable slide so that when the shaft N is rotated during the opening of the breech, the said plug moves longitudinally in an outward direction and actuates the pivoted lever l^x.

Fig. 2 shows the parts in their relative positions when the gun has returned to the run out position, before the breech has been opened, the screwed plug n and the valve L being in the positions shown.

When the lower hand lever is shifted to the "raise" position (shown in the drawing by the reference letter x) it will release the bolt g^x and open the control valve E in the manner hereinafter more fully described thus admitting pressure fluid to the said hydraulic press C to cause the latter to elevate the loading cage A. As the ram C' of the said hydraulic press is forced outward in effecting the aforesaid elevation of the cage, the forward stop D' in due course engages with the roller d^2 of the tappet lever d' and by operating the latter causes it to close the cut off valve D and stop the supply of pressure fluid to the said press through the pipe e. At this time the cage has been elevated to the aforesaid position just below the gun breech and out of the path of recoil of the gun and as the ram of the hydraulic press C ceases to move farther owing to the pressure fluid having been cut off therefrom, the cage comes to rest in this position; at the same time the catch or bolt M engages with the stop piece a on the cage and positively holds the latter in this position. When the gun returns to the loading position and the breach has been fully opened the aforesaid plug n of the shaft N, forming part of the mechanism by which such opening is effected moves from the position shown in Fig. 2 to that shown in Fig. 1 and acts upon the pivoted lever l^x in the manner hereinbefore described and operates the aforesaid hydraulic valve L which then admits pressure fluid to the small ram K and also to the hydraulic cylinder M' appertaining to the aforesaid catch or bolt M; the said catch or bolt is thus retracted and the cage released. The ram K operates through the intervention of the pivoted lever k and the link d^3 as aforesaid to cause the member d' to slide longitudinally on the tappet lever d and thus move the roller d^2 out of contact with the stop D'. The inclosed end d^x (Fig. 3) of the spindle of the cut-off valve D fits loosely in the valve casing so that the pressure fluid can act on said inclosed end and thus cause the valve to open, so that fluid is once more admitted to the hydraulic press C from the main supply pipe C^x, through the pipe e the valve E and the pipe c, and the cage A is caused to

complete its ascent until it reaches its loading position behind the gun breech as shown in full lines in the drawing. As this ascent is completed the rear stop D^2 on the ram of the hydraulic press acts upon the roller d^2 of the tappet lever d and causes the latter to actuate the cut off valve D and again stop the supply of fluid pressure to the said hydraulic press, any leakage past valve D passing through the pipe $d^\times$ to the main exhaust pipe F'. At the same time a cam piece P on the ram C' operates a pivoted lever p connected by means of a rod p' with the hand lever G and sets the latter into the "lower" position as indicated in full lines in the drawing. The parts are then in the positions shown in Fig. 1 of the drawing. When the hand lever H is moved into the "lower" position (indicated in dotted lines by the reference letter y) the control valve E is moved downward owing to the engagement of the outer end of the floating lever h with a fixed stop $Q^\times$ into the position for placing the hydraulic press C to exhaust; the cage therefore descends. The floating lever h then occupies the position indicated in dotted lines at y'. As the cage A reaches its lowermost position a stop R thereon operates to rock the floating lever g about its pivoted connection with the rod g' owing to the fact that the hand lever G is retained in the "lower" position by means of a suitable spring bolt or the like. The said lever g then assumes the position shown in dotted lines at x^2 and the upper floating lever h is thereby rocked about its pivoted connection with the valve E into the position shown in dotted lines at y^2. The hand lever H is thus set into the "raise" position as shown in the drawing, in which position it is locked by a spring bolt or the like similar to that used with the hand lever G. The outer end of the lever g is then in contact with a fixed stop Q so that when the hand lever G is actuated to raise the cage the lever g will be rocked about the said stop Q into the position shown in dotted lines at x' when the lever h will be moved into the position shown in full lines in the drawing and the valve E opened to allow pressure fluid to enter the press C as aforesaid. The cycle of operations above described will then again take place.

The hand lever G it will be observed is employed only for causing the raising of the loading cage A and is set to the "lower" position automatically. The hand lever H is on the contrary employed only for causing the lowering of the loading cage and is set to the "raise" position automatically. When the gun breech is closed or the gun run in, the lever $l^\times$ is released and the valve L is returned to the cut off position by reason of the constant pressure of fluid supplied by the pipe l^2 being able to gain access to the inclosed end $l^{\times\times}$ (Fig. 2) of the spindle of the valve L which fits loosely in the valve casing. The pressure on the small ram K is relieved and the latter is returned to its original position by means of the spring $k^\times$ attached to the lever k.

What we claim and desire to secure by Letters Patent of the United States is:—

1. In ammunition hoisting gear for ordnance, the combination with the loading cage, its hoist, and the device for manually controlling the latter, of automatic means operable independently of the said manual device for temporarily arresting the movement of the hoist unless the gun has returned to the loading position and the breech opened.

2. In ammunition hoisting gear for ordnance, the combination with the loading cage, its hoist, and the device for manually controlling the latter, of automatic means operable independently of said manual device for temporarily arresting the movement of the hoist unless the gun has returned to the loading position and the breech opened, and automatic means for causing the hoist to move again when required.

3. In ammunition hoisting gear for ordnance, the combination with the loading cage, its hoist, and the device for manually controlling the latter, of automatic means operable independently of said manual device for temporarily arresting the movement of the hoist unless the gun has returned to the loading position and the breech opened, and means for causing the hoist to move again when the gun has returned to the loading position and the breech opened.

4. In ammunition hoisting gear for ordnance, the combination with the loading cage, its hoist and the device for manually controlling the latter, of means for closing the supply of motive power to said hoist at a point in the travel of the cage where it is clear of the path of recoil of the gun, and means for opening the supply of the motive power to said hoist when the gun has returned to the loading position and the breech opened.

5. In ammunition hoisting gear for ordnance, the combination with the loading cage, its hydraulic hoist and the device for manually controlling the latter, of means operable independently of the said manual device for cutting off the supply of motive fluid to said hoist at a point in the travel of the cage where it is clear of the path of recoil of the gun and means for again admitting the supply of the motive fluid to the hoist when the gun has returned to the loading position and the breech opened.

6. In ammunition hoisting gear for ordnance, the combination with the loading cage, its hydraulic hoist and the device for manually controlling the latter, of a cut off

valve controlling the supply of motive fluid to said hoist, means for actuating said valve to cut off the supply of motive fluid at a point in the travel of the cage where it is clear of the path of recoil of the gun the said valve being actuated to again supply the motive fluid to the hoist when the gun has returned to the loading position and the breech opened.

7. In ammunition hoisting gear for ordnance, the combination with the loading cage, its hydraulic hoist and the device for manually controlling the latter, of a cut off valve controlling the supply of motive fluid to said hoist, means for actuating said valve to cut off the supply of the motive fluid at a point in the travel of the cage where it is clear of the path of recoil of the gun, the said valve being actuated to again supply the motive fluid to the hoist when the gun has returned to the loading position and the breech opened, and means under the control of the hoist for positively retaining and releasing the cage in and from its arrested position.

8. In ammunition hoisting gear for ordnance, the combination with the loading cage, its hydraulic hoist and the device for manually controlling the latter, of a cut off valve controlling the supply of fluid to said hoist independently of said manual device, means on the ram of the hydraulic hoist whereby said valve can be actuated to cut off the supply after a given time in the event of the gun not having returned to its loading position, and means for again admitting the supply of the motive fluid to the hoist when the gun has returned to the loading position and the breech opened.

9. In ammunition hoisting gear for ordnance, the combination with the loading cage, its hydraulic hoist and the device for manually controlling the latter, of a cut off valve controlling the supply of fluid to said hoist independently of said manual device, a stop on the ram of the hoist, a lever connected with said valve and adapted to cooperate with said stop to cause said valve to cut off the supply of fluid to the hoist, and means whereby said valve can be opened to again admit fluid to the hoist when the gun has returned to the loading position and the breech opened.

10. In ammunition hoisting gear for ordnance, the combination with the loading cage, its hydraulic hoist and the device for manually controlling the latter, of a cut off valve controlling the supply of fluid to the said hoist independently of said manual device, a stop on the ram of the hoist, a pivoted lever connected with said valve, a member adapted to slide on said lever, a roller on said member for coöperating with said stop to cause the said valve to cut off the supply of fluid to the hoist, and means whereby said valve can be opened to again admit fluid to the hoist when the gun has returned to the loading position and the breech opened.

11. In ammunition hoisting gear for ordnance, the combination with the loading cage, its hydraulic hoist and the means for manually controlling the same, of a cut off valve controlling the supply of fluid to the said hoist independently of said manual device, a stop on the ram of the hoist, a pivoted lever connected with said valve, a member adapted to slide on said lever, a roller on said member for coöperating with said stop to cause the said valve to cut off the supply of fluid to the hoist independently of said manual device, means whereby said valve can be opened to again admit fluid to the hoist when the gun has returned to the loading position and the breech opened, and a second stop on the ram adapted to coöperate with said roller to again cut off the supply of fluid to the hoist when the cage has reached its loading position.

12. In ammunition hoisting gear for ordnance, the combination with the loading cage, its hydraulic hoist and the means for manually controlling the latter, of a cut off valve controlling the supply of fluid to the said hoist independently of said manual device, of a stop on the ram of the hoist, a pivoted lever connected with said valve, a member adapted to slide on said lever, a roller on said member for coöperating with said stop to cause said valve to cut off the supply of fluid to the hoist, a hydraulic ram connected with said sliding member, a valve for controlling said ram, a shaft which is rotated to open and close the breech, a screwed crosshead connected therewith and adapted to operate said ram controlling valve, and a second stop adapted to coöperate with said roller to again cut off the supply of fluid to the hoist when the cage has reached its loading position.

In testimony whereof we affix our signatures in presence of two witnesses.

ARTHUR TREVOR DAWSON.
JAMES HORNE.

Witnesses to the signature of Arthur Trevor Dawson:

HENRY KING,
C. A. SEARLE.

Witnesses to the signature of James Horne:

W. H. ATKINSON,
J. B. COOK.