A. T. DAWSON & J. HORNE.

AMMUNITION HOISTING AND LOADING APPARATUS OF HEAVY ORDNANCE.

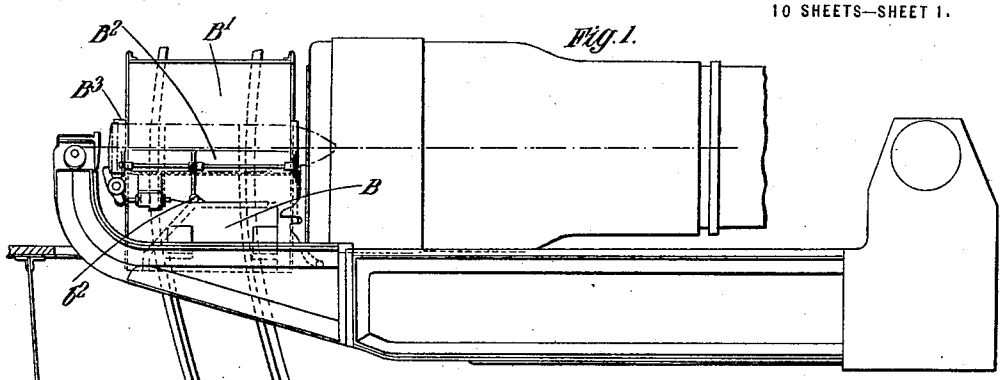
APPLICATION FILED NOV. 5, 1912.

1,182,986.

Patented May 16, 1916.

10 SHEETS—SHEET 1.

Fig. 1.



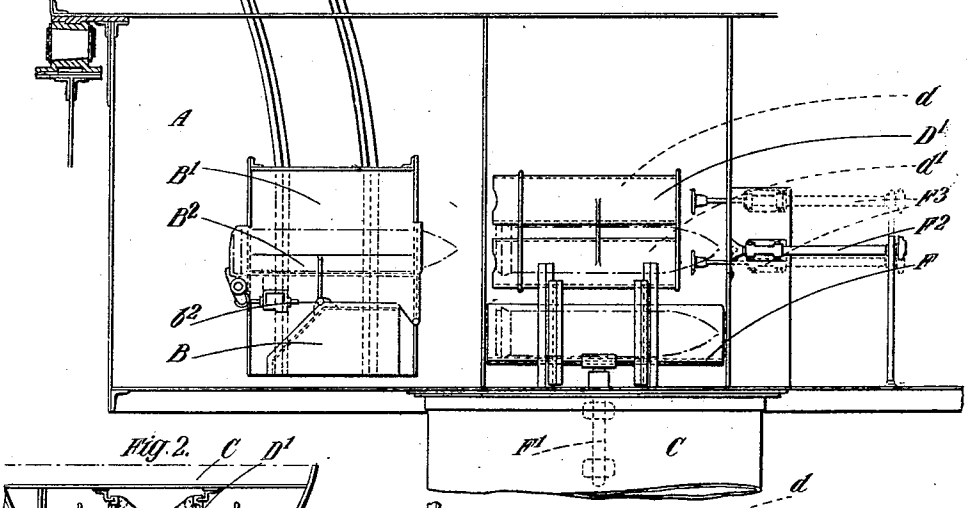
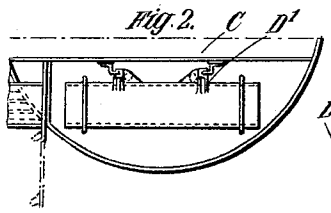


Fig. 2.



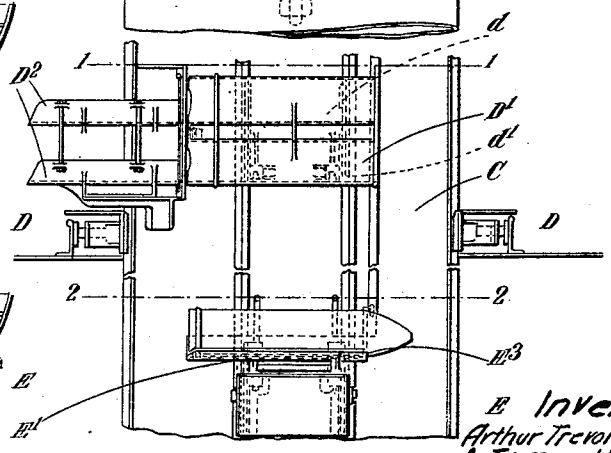
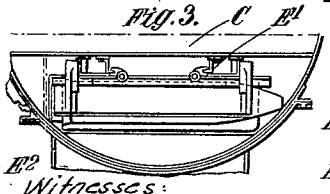


Fig. 3.



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10 SHEETS—SHEET 2.

Fig. 4.

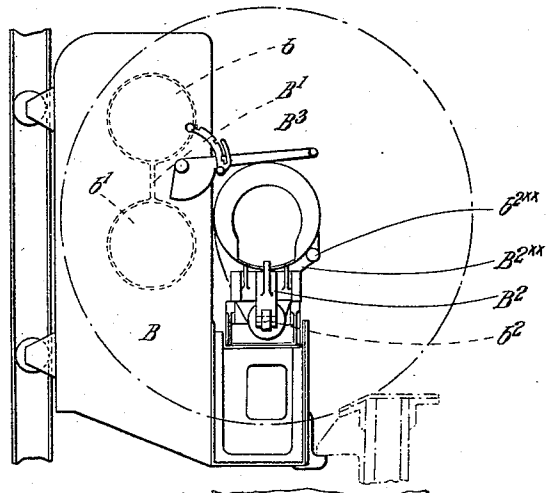


Fig. 5.

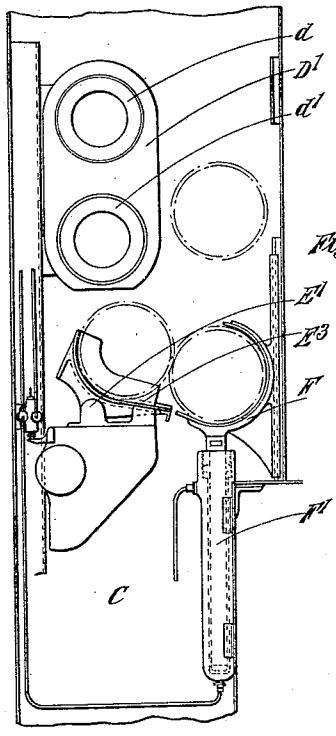
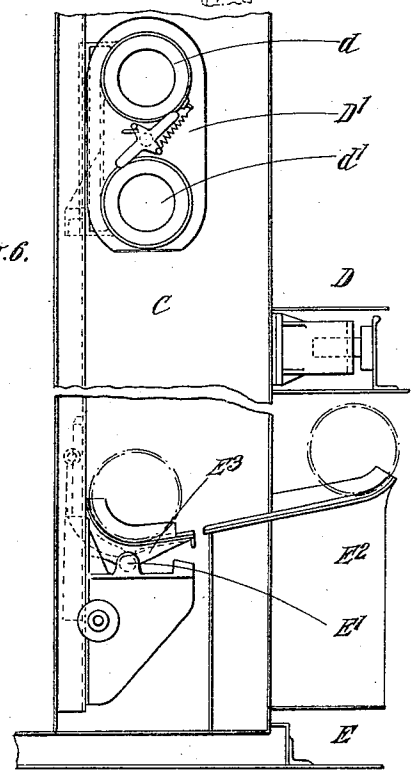


Fig. 6.



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AMMUNITION HOISTING AND LOADING APPARATUS OF HEAVY ORDNANCE.

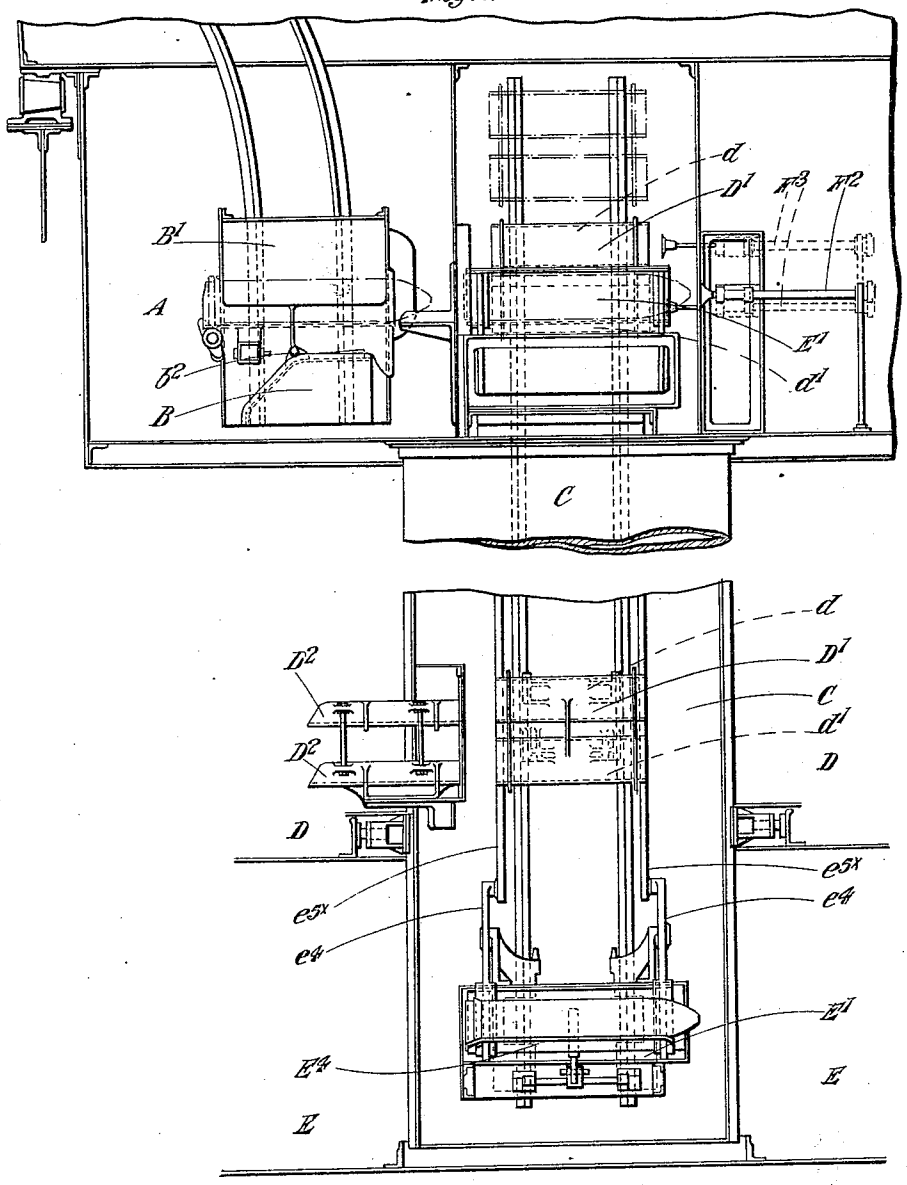
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10 SHEETS—SHEET 3.

Fig. 7.



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AMMUNITION HOISTING AND LOADING APPARATUS OF HEAVY ORDNANCE.

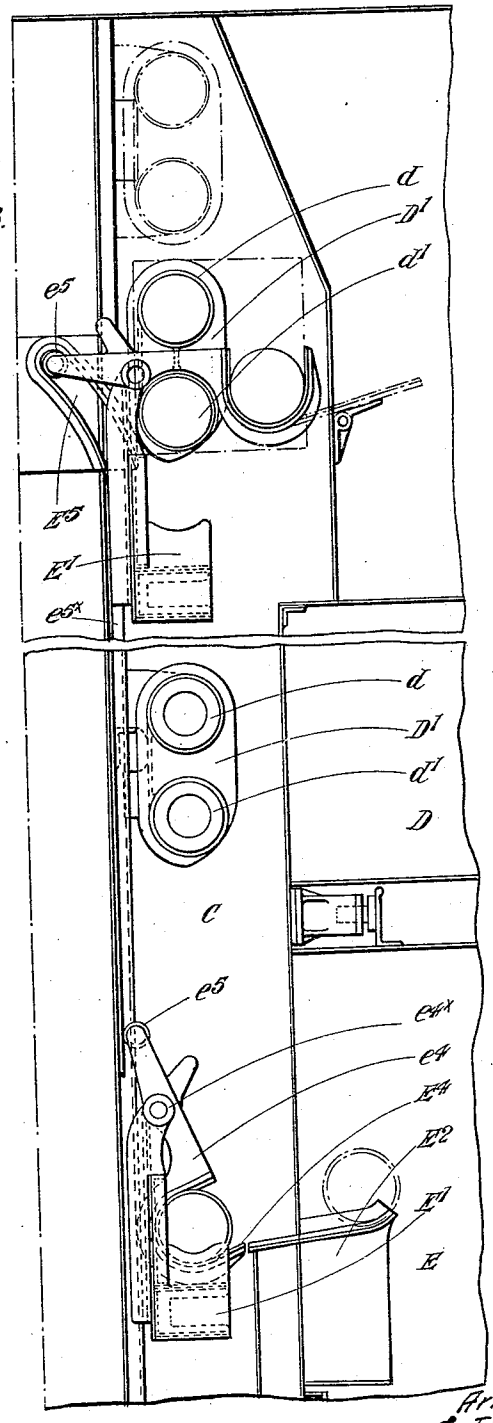
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10 SHEETS—SHEET 4.

Fig. 8.



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Fig. 9.

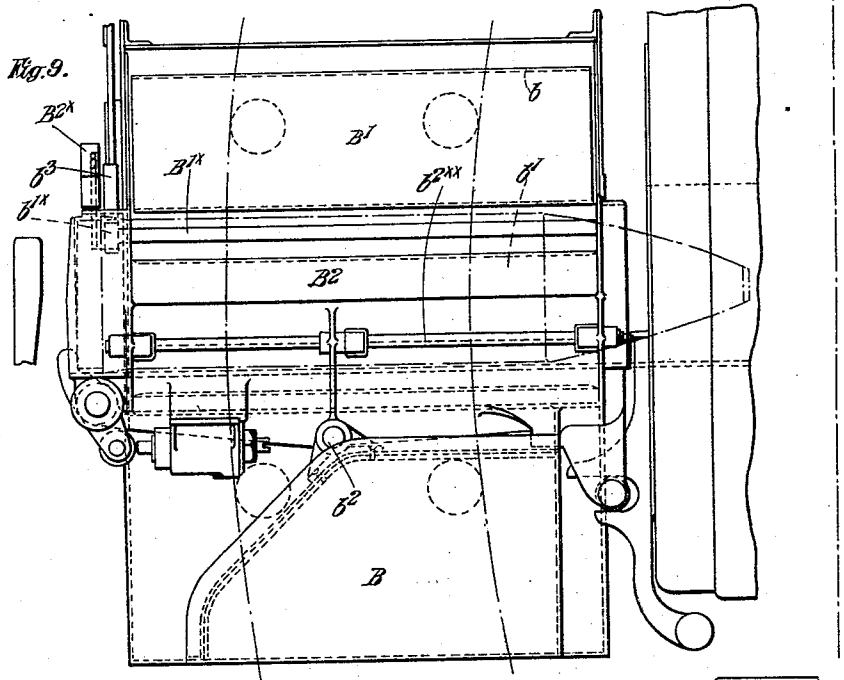
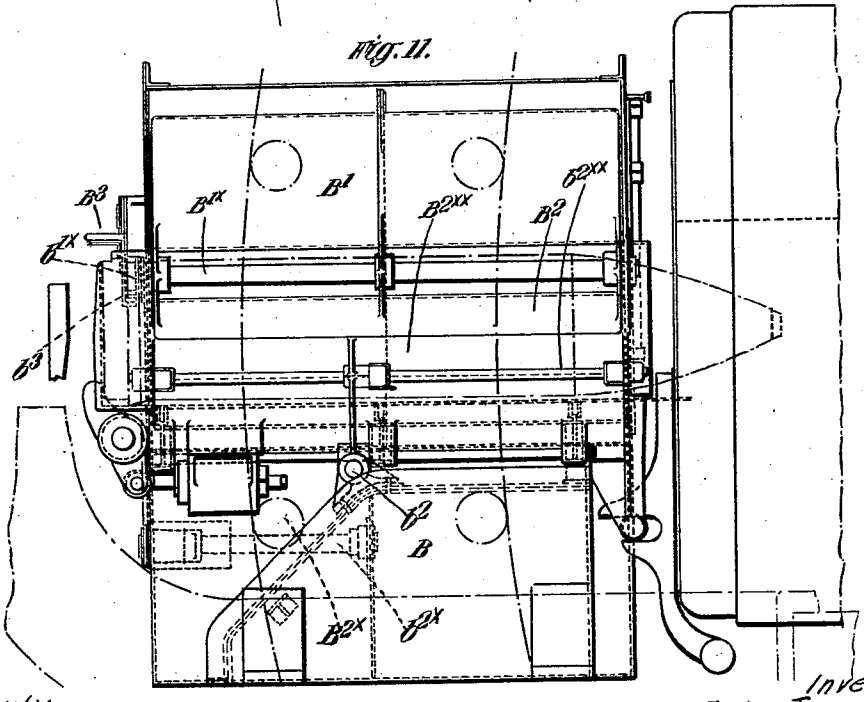


Fig. 11.



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10 SHEETS—SHEET 6.

Fig. 10.

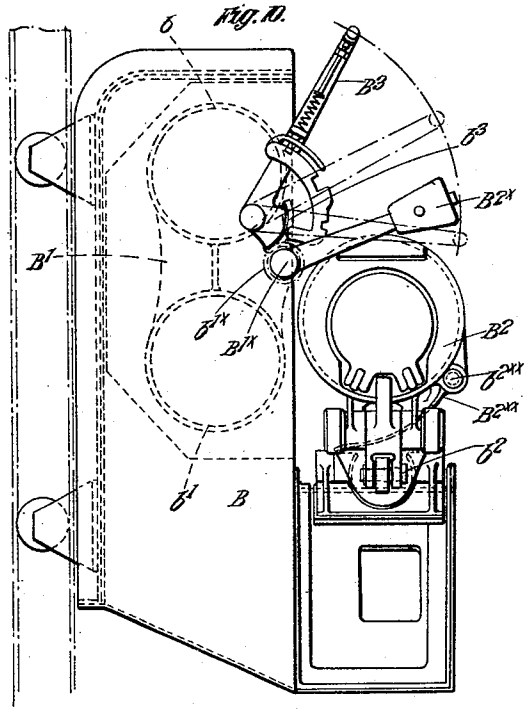
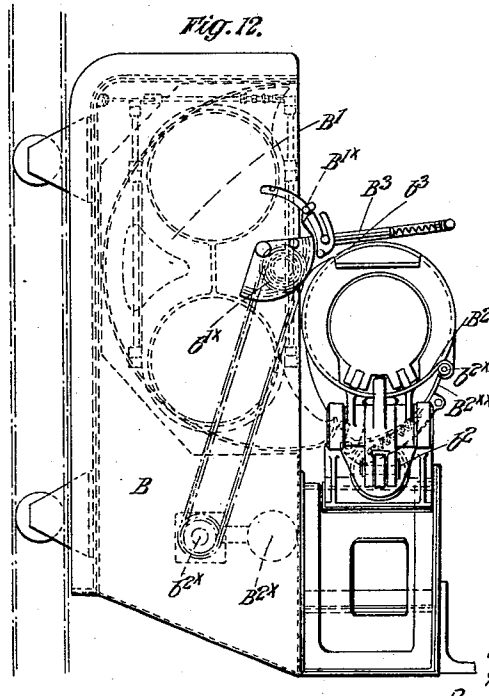


Fig. 12.



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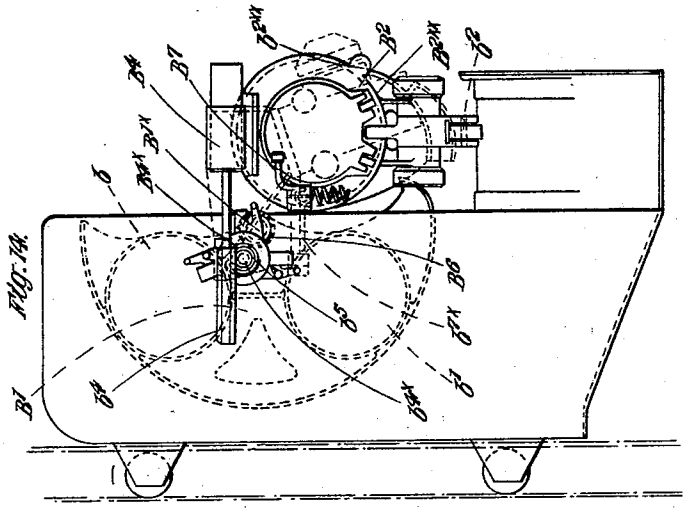


Fig. 14.

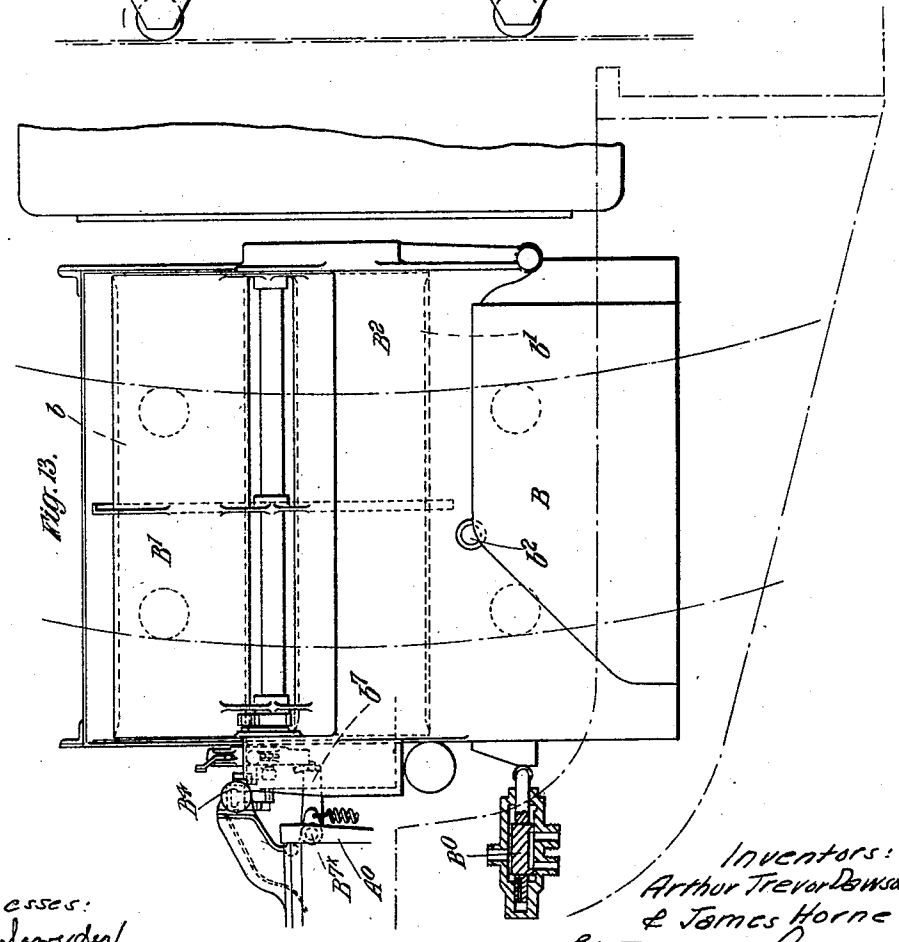


Fig. 13.

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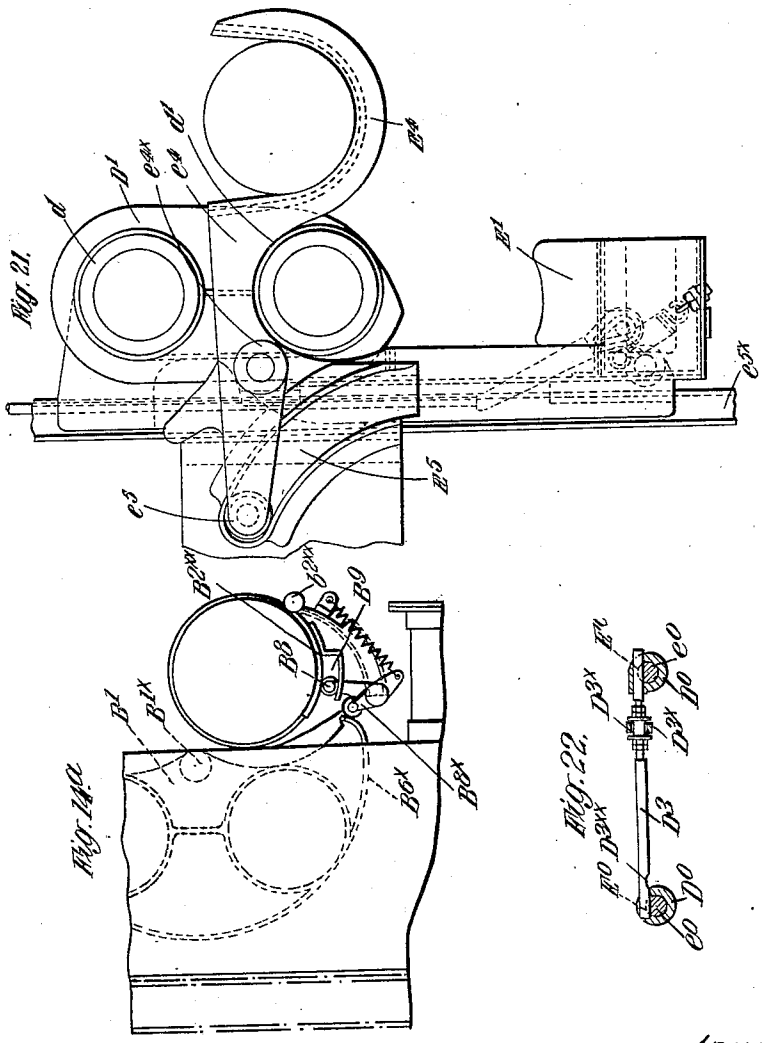


Fig. 21.

Fig. 21a.

Fig. 22.

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AMMUNITION HOISTING AND LOADING APPARATUS OF HEAVY ORDNANCE.

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10 SHEETS—SHEET 9.

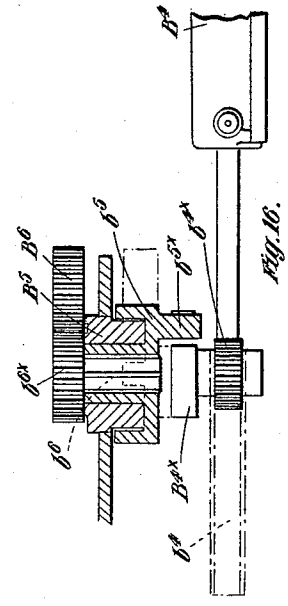


Fig. 16.

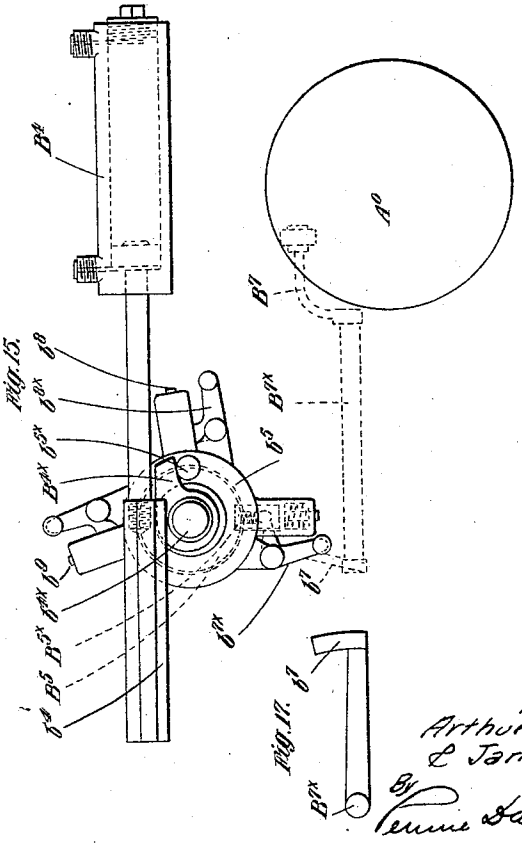


Fig. 15.

Fig. 17.

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10 SHEETS—SHEET 10.

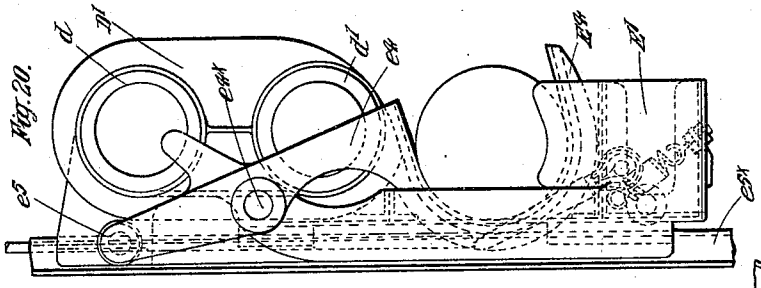


Fig. 20.

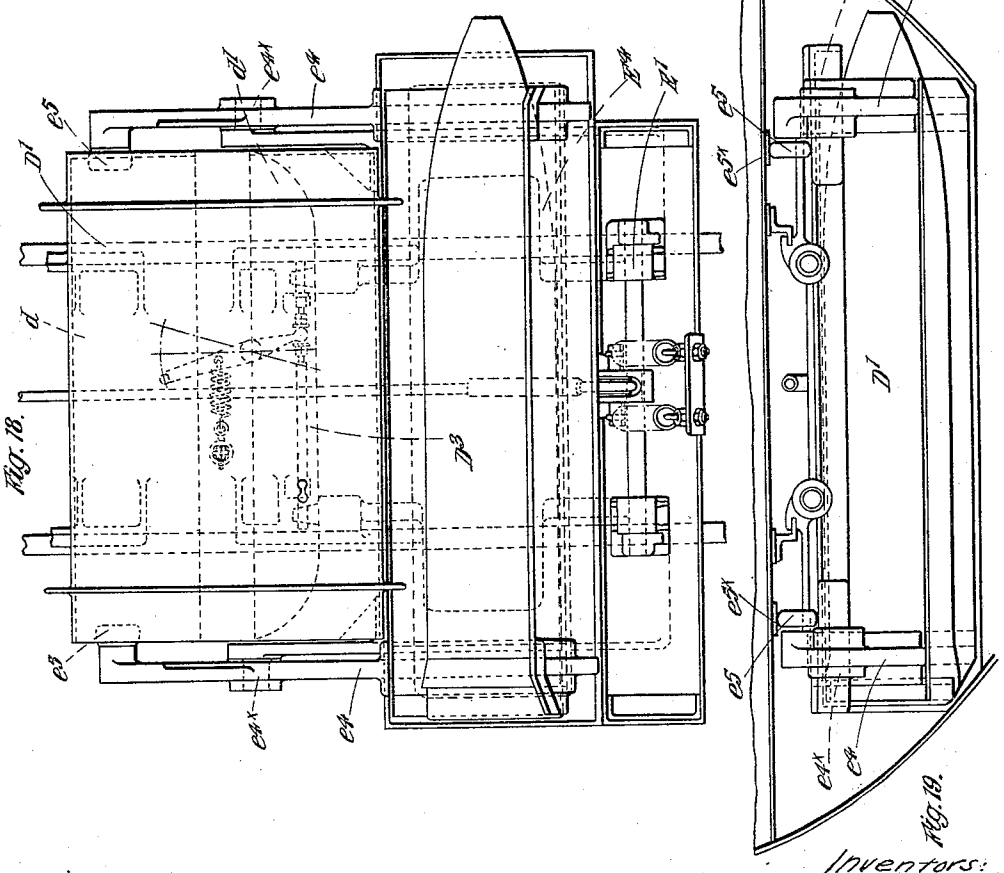


Fig. 18.

Fig. 19.

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UNITED STATES PATENT OFFICE.

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

AMMUNITION HOISTING AND LOADING APPARATUS OF HEAVY ORDNANCE.

1,182,986. Specification of Letters Patent. Patented May 16, 1916.

Application filed November 5, 1912. Serial No. 729,564.

To all whom it may concern:

Be it known that we, ARTHUR TREVOR DAWSON, knight, and JAMES HORNE, both subjects of the King of Great Britain, residing, respectively, at Vickers House, Broadway, 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 or Relating to the Ammunition Hoisting and Loading Apparatus of Heavy Ordnance, of which the following is a specification.

This invention relates to ammunition hoisting and loading apparatus of the kind in which the powder charges and the projectile are raised in a lower cage to a working chamber wherein the said powder charges and projectile are transferred from the lower cage to an upper or gun loading cage by which they are carried to the breech of the gun.

One of the objects of the invention is to provide improved means for enabling the powder charges to be conveyed in the cages in separate compartments thereof, so that the charges are not deformed by being brought into contact with one another during their transport from the powder charge room to the gun. These compartments are unprovided with doors or similar contrivances usually fitted, by which the half charge is enabled to fall from the upper compartment to the lower one during the transfer of the charges from one cage to the other and also during the loading operation, the aforesaid gun loading cage being arranged in such manner that the powder charges can be successively brought into alinement with the gun breech by a rotary movement of the portion of the gun loading cage carrying the powder charge.

According to this invention we provide the powder charge holder of each cage with two separate compartments, each of which is adapted to receive a half powder charge, the parts being arranged in such manner that the holder of the lower cage comes in line with that of the gun loading cage when the latter is in its lowered position within the working chamber, so that the powder charges can be directly transferred by rammers from each of the compartments of the lower cage holder to the corresponding compartments of the holder of the gun loading cage and without the necessity of discharging them from the lower cage into an intermediate receiver, as has been previously done. The holder of the gun loading cage is movably mounted relatively to the projectile tray and may be displaced by hand through suitable gearing or may be automatically moved by means under the control of the rammer in such manner that as the rammer reaches its withdrawn position after each stroke the holder is angularly displaced to the required extent.

To enable the projectile to be brought into its proper position for ramming into the gun loading cage, the projectile may be carried on a tray firmly secured at each end to arms or levers provided with rollers, these levers being pivoted on the frame of the projectile lower cage in such manner that as the cage nears the working chamber, the rollers on the levers engage with a cam and angularly displace the tray until, on reaching the working chamber, the said tray is in line with the projectile tray of the gun loading cage. On lowering the cage the projectile tray is restored to its original position by the cam and is retained in this position by the coöperation of the aforesaid rollers with plates fixed to the trunk.

In order that the said invention may be clearly understood and readily carried into effect, we will describe the same more fully with reference to the accompanying drawings in which—

Figure 1 is a more or less diagrammatic side elevation of a gun mounting showing one constructional form of the complete hoisting and loading apparatus. The gun loading cage and the lower cages are shown for convenience of description in two positions which as a matter of fact they never occupy at the same moment. Figs. 2 and 3 are sections taken approximately on the line 1, 1 and 2, 2 of Fig. 1. Fig. 4 is an end elevation on an enlarged scale of the gun loading cage in its position behind the breech of the gun. Fig. 5 is an end elevation

of the lower cages in the position they occupy in the working chamber. Fig. 6 is an end elevation of the lower cages in their loading positions in the trunk. Fig. 7 is a view similar to Fig. 1 (with the upper portion of the mounting omitted) showing a modified constructional form of the hoisting apparatus. Fig. 8 is an end elevation on an enlarged scale of the principal parts of Fig. 7. Figs. 9 and 10 are respectively a side elevation and an end elevation showing more clearly than Figs. 1 and 4 a constructional form of the gun loading cage. Figs. 11 and 12 are views similar to Figs. 9 and 10 showing a slightly modified form of the gun loading cage. Figs. 13 and 14 are views also similar to Figs. 9 and 10 showing means for automatically moving the powder charge holder. Fig. 14ª is a view similar to Fig. 14 showing means for moving a part of the projectile tray. Figs. 15 and 16 are respectively an end elevation and a sectional plan showing more clearly the mechanism for automatically moving the powder charge holder, and Fig. 17 is a side elevation of a part of this mechanism. Fig. 18 is a side elevation. Fig. 19 a plan, and Figs. 20 and 21 are end elevations showing the lower cages illustrated in Figs. 7 and 8, in different positions. Fig. 22 is a plan of a detail of Fig. 18.

In all these figures like letters of reference indicate similar parts.

A is the working chamber which moves with the turret during training.

B is the gun loading cage which conveys the ammunition from the working chamber to the gun, C is the rotary trunk, and D is the powder room from which the powder charges are loaded into the powder holder D′ of the lower cage. In the examples illustrated the said holder D′ is constituted by a lower cage which is separate from the projectile cage E′ into which the projectiles are loaded from the projectile room E.

The gun loading cage B comprises the rotary powder charge holder B′ and the projectile tray B^2, the latter being, in the examples shown, pivoted to the cage by a transverse pivot b^2 to enable the tray to assume an inclined position during the ascent and descent of the cage as is well understood.

The powder charge holder B′ is as aforesaid provided with two separate compartments b b' and the powder cage D′ is also provided with similar compartments d d'. The holder B′ is adapted to be rocked about a pivot $B'^{\times}$ in order to bring its compartments successively opposite the breech chamber of the gun for loading, the said pivot being equidistant from the axes of the compartments b, b' and the axis of the gun. The said holder is, in the examples shown in Figs. 4, 9, 10, 11 and 12 moved about its pivot $B'^{\times}$ by a hand lever B^3 and suitable gearing, which comprises a toothed quadrant b^3 on the spindle of the hand lever B^3, which quadrant gears with a pinion $b'^{\times}$ on the pivot $B'^{\times}$. In Figs. 9 and 10 the quadrant is formed with external teeth and in Figs. 11 and 12 with internal teeth. In order to reduce the effort required to be exerted in moving the holder B′ it is balanced by suitable means such as a spring or (as in the examples shown) a balance weight $B^{2\times}$. In Figs. 9 and 10 this balance weight is carried by an arm attached directly to the pivot $B'^{\times}$, but in Figs. 11 and 12 the weight is shown as being carried by an arm mounted on a spindle $b^{2\times}$ which is connected by a chain and sprocket wheels with the pivot $B'^{\times}$.

Figs. 13 to 16 illustrate the preferred means that are employed for automatically moving the holder B′. These means comprise a hydraulic cylinder B^4 fixed to the loading arm, the ram of which is connected to a rack member b^4 that engages with a pinion $b^{4\times}$ connected to or integral with a tappet lever $B^{4\times}$. The cage B has a bracket B^5 which carries a disk b^5 provided with a projecting stud $b^{5\times}$ which bears against the shoulder of the tappet lever as shown. The said disk is connected through a shaft b^6, and a pinion $b^{6\times}$ to a second pinion B^6 on the pivot $B'^{\times}$ of the holder B′. The hydraulic cylinder B^4 is under the control of a valve B^0 (Fig. 13) which is arranged in such manner that as the cage reaches its loading position it is operated to place the right hand end of the cylinder to exhaust so that the pressure fluid constantly acting on the left hand face of the ram tends to displace the latter to the right, but is prevented from doing so by the spring bolt $B^{5\times}$ which passes through a hole in the disk b^5 and engages with a recess in the bracket B^5. The said bolt is carried by the disk b^5 as are also two other similar bolts b^8, b^9.

Arranged contiguous to the rammer head A^0 (Fig. 15) is a lever B^7 mounted on a spring controlled shaft $B^{7\times}$ having an arm b^7 adapted to coöperate with a bell crank lever b^7 appertaining to the spring bolt $B^{5\times}$. When the rammer head moves forward to ram the shell the shaft B^7 is moved by its spring so that the arm b^7 assumes a position out of the path of the lower arm of the bell crank lever $b^{7\times}$ which is then moved to the left, (Fig. 15) by a light spring which bears on the upper arm of the lever $b^{7\times}$. On the rammer being withdrawn, the head A^0 cooperates with the lever B^7 to cause the arm b^7 to engage with the right side of the lower arm of the lever $b^{7\times}$ and thereby withdraws the spring bolt $B^{5\times}$ clear of its recess in the bracket B^5. The ram and the rack member b^4 attached thereto can now move and in so doing displace the holder B′ about its pivot

$B'^{\times}$ through the aforesaid gearing until the first half powder charge is in line for ramming, whereupon the holder is locked by the engagement of the second spring bolt b^8 with the aforesaid recess in the bracket B^5, this bolt having moved with the disk into the position previously occupied by the bolt $B^{5\times}$. The first half charge is then rammed and when the rammer head returns, the said second bolt b^8 is released by the engagement of the arm b^7 with the bell crank lever $b^{8\times}$ in a similar manner to that described with reference to the bolt $B^{5\times}$, whereupon the holder B′ is displaced as before until its movement is stopped by the engagement of the third spring bolt b^9 with the recess in the bracket B^5 when the second half powder charge is in line for ramming. The latter half charge is then rammed and on the rammer head returning, the bolt b^9 is released as described with reference to the bolts $B^{5\times}$ and b^8. The powder holder is again angularly displaced until it resumes its normal position (after having completed one revolution) and is then locked by the spring bolt $B^{5\times}$. When the cage is being lowered the disk b^5 moves clear of the tappet lever $B^{4\times}$ on the loading arm, the aforesaid control valve is operated in the direction to admit pressure fluid to the right hand end of the cylinder B^4 and the ram and the parts operated thereby are thus restored to their original position as shown in Figs. 14 and 16.

In the examples illustrated a portion $B^{2\times\times}$ of the projectile tray B^2 of the gun loading cage, namely the part adjacent to the powder holder B, is hinged longitudinally by the spindle $b^{2\times\times}$ to the fixed part so as to be capable of being lowered automatically into the position shown in broken lines in Figs. 10, 12, 14 and 14^a when the powder holder B′ is being moved about its pivot $B'^{\times}$ as aforesaid to bring the powder charges into the ramming positions. The means employed for automatically moving the part $B^{2\times\times}$ comprise in the example shown in Fig. 14^a a spring controlled bell crank lever $B^{8\times}$ adapted to be rocked about its spindle in a clockwise direction by the engagement of a cam surface $B^{6\times}$ on the holder with a roller on the said bell crank lever. Attached to this lever is an arm having a roller B^8 that engages in a channel B^9 on the part $B^{2\times\times}$ to cause it to be displaced into the position shown in broken lines. When the holder returns to the position shown, the spring of the bell crank lever $B^{8\times}$ causes the latter and the part $B^{2\times\times}$ to resume their normal positions.

In a gun loading cage of the type in which the projectile tray is not pivoted transversely as aforesaid we may construct the apparatus in such manner that the projectile tray B^2 is rigidly attached to the powder holder B′, so that it moves therewith when the said holder is angularly displaced about its pivot as aforesaid; this arrangement possesses the advantage that the projectile tray acts as a balance weight to the powder holder.

The powder cage D′ and the projectile cage E′ are separate from one another and are loaded with ammunition by means of the waiting trays D^2 and the bogey E^2 arranged in the powder room and projectile room respectively. The powder cage is as aforesaid formed with two separate compartments d d' and in consequence two superposed waiting trays D^2 are provided in the powder charge chamber. When the ammunition is being raised in the trunk, the projectile cage E′ moves first and upon reaching the powder cage D′ lifts the same so that they both ascend together. At the commencement of the ascent of the powder cage D′ it becomes locked to the cage E′ by the bolt D^3 (Fig. 18) which is connected to a spring controlled lever $D^{3\times}$ adapted to be actuated by a cam on the trunk so that the bolt can be withdrawn as the powder cage D′ nears its loading position contiguous to the waiting trays D^2 during its descent.

Fig. 22 shows the arrangement of the bolt D^3 which passes through lugs D^0 on the cage D′ and engages in slots E^0 in pins e^0 on the cage E′. The said bolt is formed with a recess $D^{3\times\times}$ which when the bolt is moved to the left of the position shown in Fig. 22, registers with the left hand pin e^0, the end of the bolt being then out of engagement with the slot E^0 in the right hand pin. The cages are thus disconnected so that the cage E′ can descend to the projectile room E. When the cages D′ E′ reach the working chamber the tray E^3 of the cage E′ is, in the example shown in Figs. 1 to 6, tilted as shown in Fig. 5 to cause the projectile to roll into the receiver F which is supported on the ram of hydraulic press F′, so that the receiver can be raised to bring the projectile into position opposite the projectile tray B^2 of the gun loading cage as is shown in broken lines in Figs. 1 and 5. In this position the projectile is rammed by the rammer F^2 onto the projectile tray B^2 and the powder charges are also rammed by the rammers F^3 directly from the separate compartments d d' of the cage D′ to those b b' of the powder holder B′.

Figs. 7, 8 and 18 to 21 show a constructional form of the means for lifting the tray of the projectile hoist cage into line with the projectile tray of the gun loading cage. In these figures E^4 represents the tray of the hoist cage E′, the said tray being made integral with levers e^4 pivoted at $e^{4\times}$ to the upper part of the cage E′. The outer ends of the said levers are furnished

with rollers e^5 which, during the ascent and descent of the lower cages, bear against plates e^{5x} and thereby retain the tray in the position shown in Figs. 18 to 20. As the cages near the working chamber, the rollers e^5 engage in a cam groove E^5 (Figs. 8 and 21) and tilt the levers e^4 and the tray into the position shown in Fig. 21. The projectile and the powder charges in the separate compartments of the cage D′ can then all be rammed directly into the gun loading cage by the rammers F^2 F^3. The levers e^4 are so formed that when the cage is in the position shown in Figs. 18 to 20, they prevent the powder charges from moving accidentally out of the compartments d d' as is clearly seen in Fig. 20.

The means disclosed herein for moving the powder charge holder of the gun loading cage are not specifically claimed in this application, but are made the subject matter of divisional applications. Likewise, the means disclosed herein for lifting the lower powder charge holder and projectile tray are not specifically claimed in this application, but are made the subject matter of a divisional application.

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

1. In ammunition hoisting and loading apparatus for heavy ordnance, the combination with the working chamber and the rotary trunk, of a lower powder charge holder movable in said trunk, a gun loading cage comprising a powder charge holder, and a projectile tray, each holder having separate powder charge compartments which come into alinement when both the holders are at rest in the working chamber, means for transferring the powder charges directly from the compartments of the lower holder to those of the gun loading holder, and means for moving said gun loading powder charge holder relatively to the said tray to bring the compartments thereof successively into alinement with the bore of the gun.

2. In ammunition hoisting and loading apparatus for heavy ordnance, the combination with the working chamber and the rotary trunk, of a lower cage comprising a separable powder charge holder and projectile tray, a gun loading cage comprising a powder charge holder and a projectile tray, each holder having separate powder charge compartments which come into alinement when both the holders are in the working chamber, means for transferring the powder charges directly from the compartments of the lower holder to those of the gun loading holder, and means for moving said gun loading powder charge holder to bring the compartments thereof successively into alinement with the bore of the gun.

3. In ammunition hoisting and loading apparatus for heavy ordnance, the combination with the working chamber and the rotary trunk, of a lower cage comprising a separable powder charge holder and projectile tray, a gun loading cage comprising a projectile tray and a powder charge holder pivoted to the cage, each holder having separate powder charge compartments which come into alinement when both the holders are at rest in the working chamber, means for transferring the powder charges directly from the compartments of the lower holder to those of the gun loading holder, and means for rocking said gun loading powder charge holder to bring the compartments thereof successively into alinement with the bore of the gun.

4. In ammunition hoisting and loading apparatus for heavy ordnance, the combination with the working chamber and the rotary trunk, of a lower cage comprising a powder charge holder and a pivoted projectile tray, a gun loading cage comprising a projectile tray and a powder charge holder pivoted to the cage, each holder having separate powder charge compartments which come into alinement when both the holders are at rest in the working chamber, means for transferring the powder charges directly from the compartments of the lower holder to those of the gun loading holder, and means for rocking said gun loading powder charge holder to bring the compartments thereof successively into alinement with the bore of the gun.

5. In ammunition hoisting and loading apparatus for heavy ordnance, the combination with the working chamber and the rotary trunk, of a lower cage comprising a powder charge holder and a pivoted projectile tray, a gun loading cage comprising a projectile tray and a powder charge holder pivoted to the cage, each holder having separate powder charge compartments which come into alinement when both the holders are at rest in the working chamber, means for transferring the powder charges directly from the compartments of the lower holder to those of the gun loading holder, a projectile receiver in the working chamber, means for moving said receiver into alinement with the tray of the gun loading cage, and means for rocking said gun loading powder charge holder to bring the compartments thereof successively into alinement with the bore of the gun.

6. In ammunition hoisting and loading apparatus for heavy ordnance, the combination with the working chamber and the rotary trunk, of a lower cage comprising a powder charge holder, and a pivoted projectile tray carried thereby, a gun loading cage comprising a projectile tray and a powder charge holder pivoted to the cage, each holder having separate powder charge compartments which come into alinement when

both the holders are at rest in the working chamber, means for transferring the powder charges directly from the compartments of the lower holder to those of the gun loading holder, means for automatically tilting said pivoted tray as it reaches the working chamber, a projectile receiver in the working chamber, means for moving said receiver into alinement with the tray of the gun loading cage, and means for rocking said gun loading powder charge holder to bring the compartments thereof successively into alinement with the bore of the gun.

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

ARTHUR TREVOR DAWSON.
JAMES HORNE.

Witnesses to the signature of Sir Arthur Trevor Dawson:

HENRY KING,
JNO. R. CASWELL.

Witnesses to the signature of James Horne:

MARK G. ATKINSON,
HENRY T. McDOWELL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."