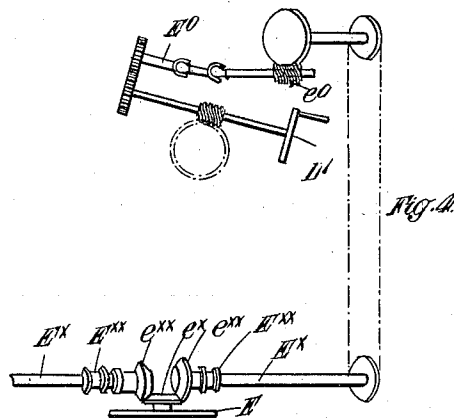
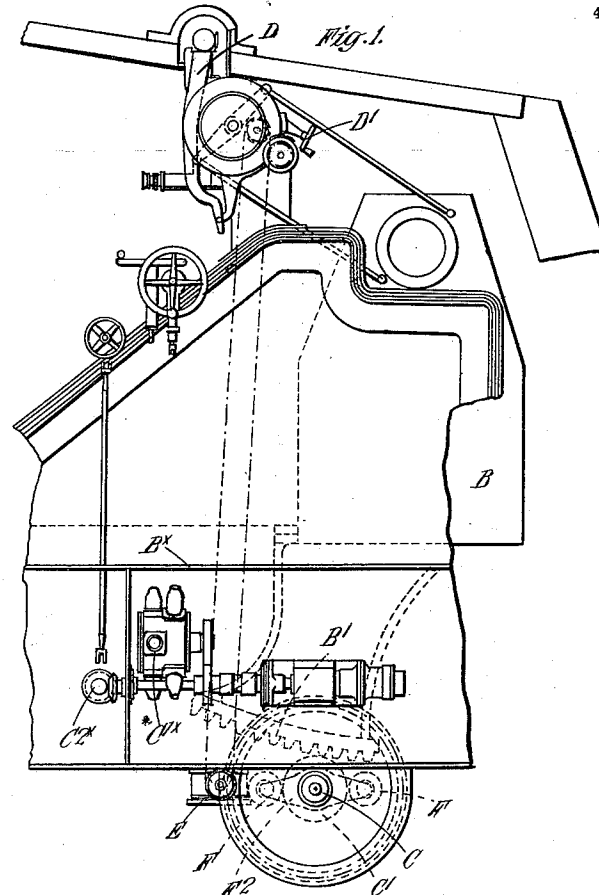


A. T. DAWSON & J. HORNE.
HEAVY ORDNANCE.
APPLICATION FILED MAR. 29, 1912.

1,041,250.

Patented Oct. 15, 1912.

4 SHEETS—SHEET 1.



Witnesses.

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4 SHEETS-SHEET 2.

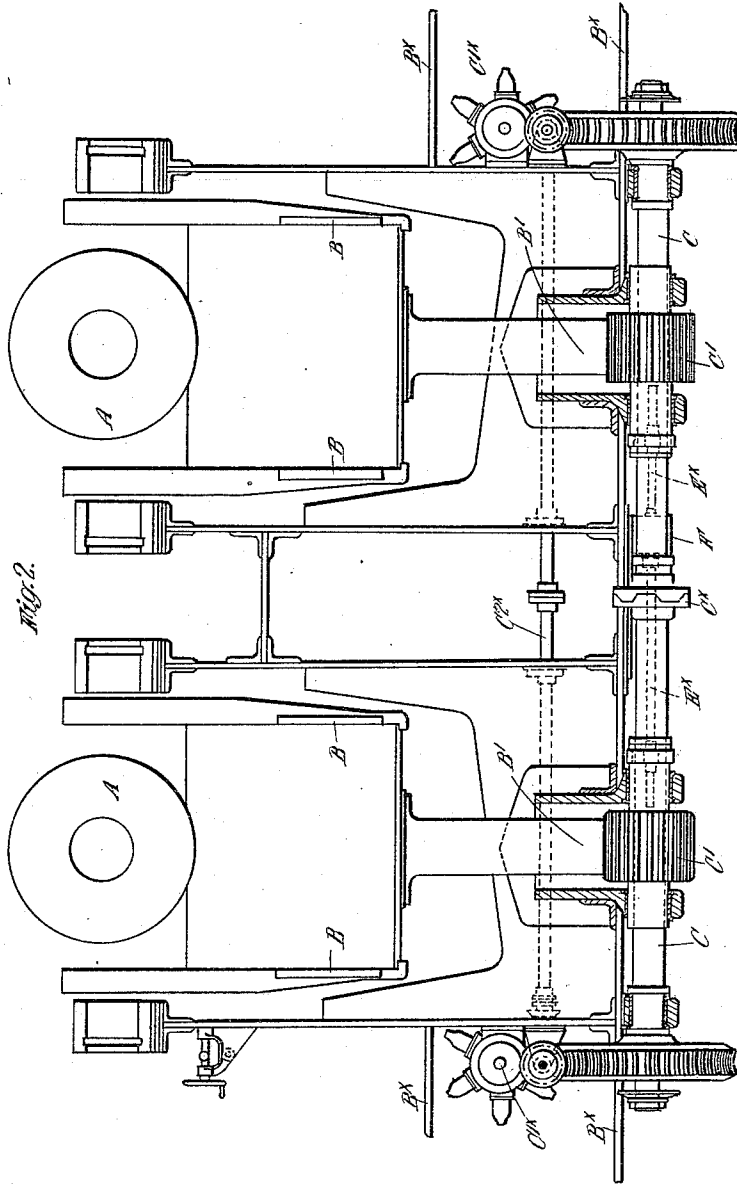


Fig. 2.

Witnesses.

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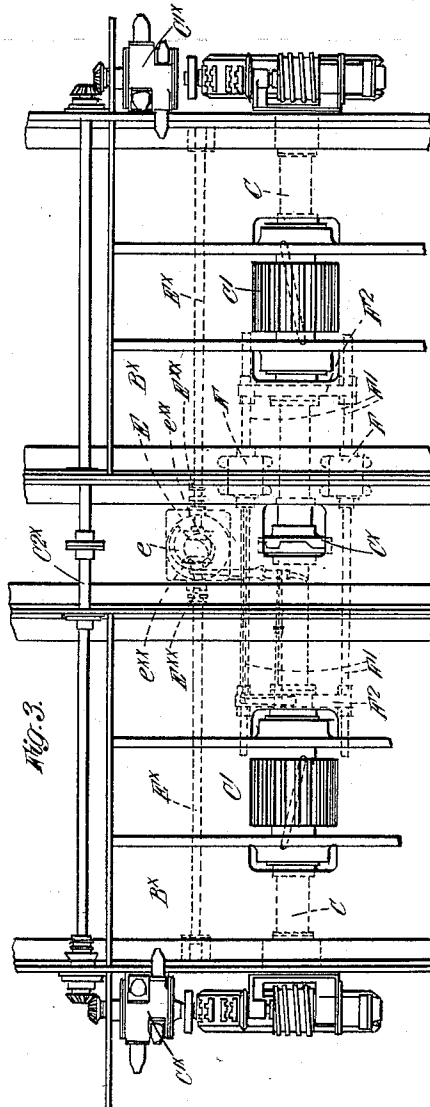
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4 SHEETS—SHEET 3.



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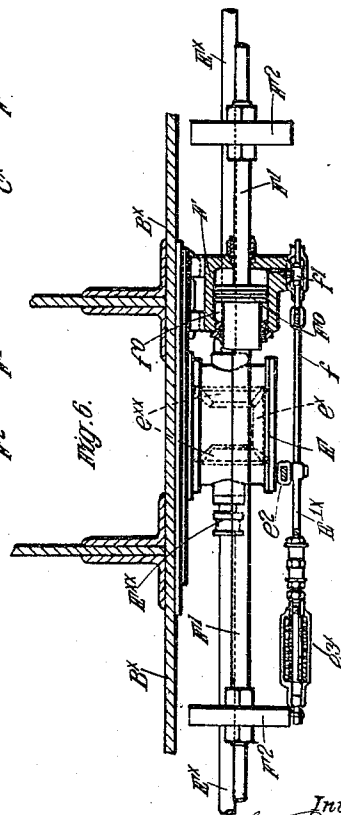
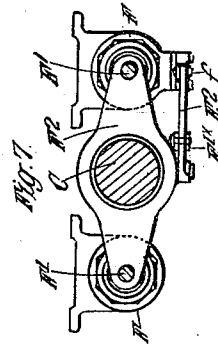
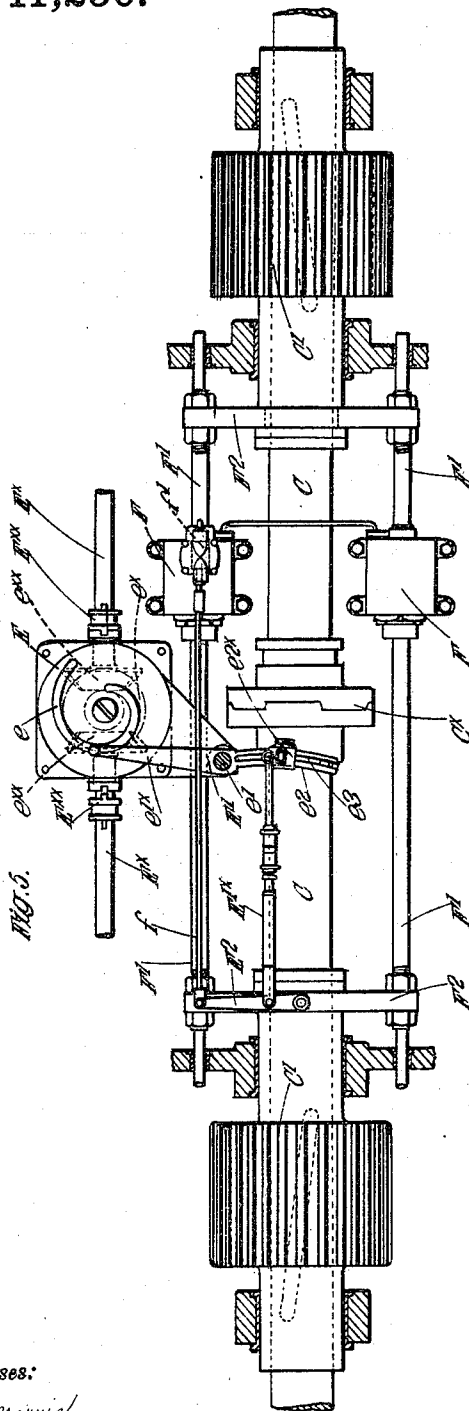
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A. T. DAWSON & J. HORNE.
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4 SHEETS—SHEET 4.



Witnesses:

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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.

HEAVY ORDNANCE.

1,041,250.

Specification of Letters Patent.

Patented Oct. 15, 1912.

Application filed March 29, 1912. Serial No. 687,115.

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 Heavy Ordnance, of which the following is a specification.

This invention relates to mountings for heavy ordnance of the kind in which two or more guns are moved simultaneously during elevation, the correction for difference in muzzle velocity between the guns being effected by changing the angle of elevation existing between them.

According to this invention we provide apparatus which is under the control of the range setting mechanism of the sighting apparatus in such a manner that the actuation of the said mechanism causes the necessary correction for difference in muzzle velocity between the guns to be automatically effected. The said apparatus comprises a device which moves in conjunction with the range setting mechanism and which co-operates with a member for controlling the movements of a contrivance employed for adjusting the position of the elevating pinion or pinions, the said member being provided with means whereby the controlling movements can be varied to accord with the difference in muzzle velocity between the guns. The said member may be connected with the control valve of one or more hydraulic cylinders or the like constituting the aforesaid contrivance which effects the correcting movements of the elevating pinion or pinions in accordance with the movement imparted to the said member by the device which moves with the range setting mechanism.

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:—

Figures 1, 2 and 3 are respectively a side elevation, an end elevation and a partial plan showing by way of example a twin gun mounting provided with a constructional

form of our improvements. Fig. 4 is a diagrammatic view showing a form of mechanical connection between the range setting hand wheel and the aforesaid device. Figs. 5, 6 and 7 are respectively a sectional plan viewed from beneath, a sectional front elevation and an end elevation showing more clearly the constructional form of our improvements.

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

A, A are the guns, and B, B the slide frames. B^x is the gun platform or turntable.

C, C are the elevating shafts, C^x the clutch connecting them and C', C' the elevating pinions gearing with the toothed elevating arcs B', B'; C^x C^x are the elevating motors, and C^{2x} is the shaft connecting together the worms of the said motors.

D is the sight and D' the range setting hand wheel.

E represents the aforesaid device which moves in conjunction with the range setting mechanism and E' the member co-operating with the said device.

F, F represent the hydraulic cylinders constituting the aforesaid contrivance employed for adjusting the elevating pinions.

In the example illustrated, the invention is applied to two interconnected guns, the elevating pinions C' being, as shown, carried on their shafts C by spiral or inclined keys and key-ways and being adapted to be shifted axially to impart the correction for the differences in muzzle velocity

The aforesaid device E is in the example shown constituted by a plate having a cam groove *e* (Fig. 5) whose curvature corresponds to the mean curve of the varying muzzle velocities. This cam plate has a bevel pinion *e^x* which gears with two bevel pinions *e^{xx}* connected to shafts E^x by clutches E^{xx}. The said shafts are connected by suitable means such as the sprocket, worm and pinion gearing shown in Fig. 4, to the range setting hand wheels of the sighting apparatus of the guns, so that when one or other of the clutches E^{xx} is in engagement with one of the bevel pinions *e^{xx}*, the cam plate E moves when the range setting of the sight appertaining to that bevel pinion is altered. The shaft E^o (Fig. 4) operated by the hand wheel D' is as shown provided

with a universal joint, and is slidably keyed to the worm e^o . This arrangement permits of variations in distance taking place between the hand wheel D' and the cam plate E without disturbing the operative relationship of the parts.

The aforesaid member E' comprises, in the example shown, a variable throw lever pivoted at e' . One arm e'^x of the said lever has a pin, roller or the like which engages in the aforesaid cam groove e and the other arm e^2 has a slide e^{2x} which is adjustable in a curved guide e^3 formed in the said arm. This arm is graduated in feet per second to represent differences in muzzle velocity between the guns. The said slide is connected to a rod E'^x which is pivoted to a floating lever E^2 attached at its outer end to the stem f of a D -valve f' controlling the movements of pistons F^o , F^o in the aforesaid hydraulic cylinders F , F . The annular part f^o between each of the pistons and the cylinder is filled with fluid under constant pressure. Movement is transmitted from the pistons F^o , F^o through rods F' , F' to crossheads F^2 , F^2 (to one of which the lever E^2 is pivoted) engaging in grooves in the bosses of the elevating pinions C' , C' . It will be obvious that the extent of the movement transmitted by the variable throw lever E' to the valve f' , and consequently the amount by which the pinions C' , C' are moved, will depend upon the distance to which the slide e^{2x} has been adjusted from the pivot e' of the said lever E' .

When the hydraulic cylinders are not in use, and the sight is elevated, damage or inconvenience arising from the excessive movements of the system of levers connecting the valve f' to the hand wheel D' may be prevented by a self-centering spring e^{3x} (Fig. 6) fitted to the connecting rod E'^x between the floating lever E^2 and the variable throw lever E' . This connecting rod is normally of constant length, but when the hydraulic cylinders are not in use its length is capable of increasing or decreasing. One spring only may be used as shown and so arranged that its centering action can take place in both directions.

No undue additional effort will be required in operating the range setting hand wheel D' of the sighting apparatus as the ratio of the gearing between it and the cam plate E is such that the movement of the said cam plate is limited to less than one revolution for the full range setting of the sight.

In the example shown both pinions C' , C' are adapted to be moved simultaneously the keys and keyways connecting them to the shafts C , C being inclined in opposite directions so that the result of shifting the pinions axially is to cause them to rotate in reverse directions. In this manner the gun

with the higher muzzle velocity is slightly depressed, while the gun with the lower muzzle velocity is correspondingly elevated. The zero position of the pinions is therefore intermediate of their extreme movement and whether the axial movement of the pinions along their shafts is to the right or to the left is determined by the respective muzzle velocities of the guns. It is an obvious feature of our invention that the corrections the guns receive are independent of any angle of heel the ship may possess and are strictly in accordance with the range, being derived from the movements of sight elevation and not of gun elevation. We do not however confine ourselves to adjusting both of the pinions to obtain the correction as this may be effected in some cases by adjusting only one of the pinions.

The type of sight with which our invention is employed in the example shown is that set forth in the specification of our application for British Patent No. 2923 of 1911, in which the upper prism is alone moved for changes in range; the sight for this reason remains practically in one constant position and therefore lends itself very conveniently to its range adjusting hand wheel being connected with the control valve of the hydraulic cylinders. It is possible, however, that the connection could be made to other forms of sighting gear but would involve longer sliding connections owing to the greater swinging movements of the sight.

Our improvements are not intended to be limited in their application to two guns, as they can obviously be applied to three or more inter-connected guns.

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

1. In mountings for heavy ordnance, the combination with the sight, its range setting mechanism and the elevating mechanism of a plurality of guns, of means operated by said range setting mechanism for correcting the elevation of any desired number of the guns for differences in muzzle velocity.

2. In mountings for heavy ordnance, the combination with the sight, its range setting mechanism and the elevating mechanism of a plurality of guns, of a relay device operated by said range setting mechanism for correcting the elevation of any desired number of the guns for differences in muzzle velocity.

3. In mountings for heavy ordnance, the combination with the sight, its range setting mechanism and the elevating mechanism of a plurality of guns, of a hydraulic relay device connected to any desired number of said elevating mechanisms, a valve forming part of said device, and means for operating said valve from the range setting mechanism.

4. In mountings for heavy ordnance, the combination with the sight, its range setting

mechanism and the elevating mechanism of a plurality of guns, of a hydraulic relay device connected to any desired number of said elevating mechanisms, a valve forming
 5 part of said device, and adjustable means for operating said valve from the range setting mechanism.

5. In mountings for heavy ordnance, the combination with the sight, its range setting
 10 mechanism and the elevating mechanism of a plurality of guns, of a hydraulic relay device connected to any desired number of said elevating mechanisms, a valve forming
 15 part of said device, a variable throw lever, means for connecting said lever to the valve and means for actuating said lever from the range setting mechanism.

6. In mountings for heavy ordnance, the combination with the sight, its range setting
 20 mechanism and the elevating mechanism of a plurality of guns, of a hydraulic relay device connected to any desired number of said elevating mechanisms, a valve forming part
 25 of said device, a variable throw lever, means for connecting said lever to the valve, a cam plate in engagement with said lever, and means for actuating said cam plate from the range setting mechanism.

7. In mountings for heavy ordnance, the combination with the sight, its range setting
 30 mechanism and the elevating mechanism of a plurality of guns, of a hydraulic relay device connected to any desired number of said elevating mechanisms, a valve forming part
 35 of said device, a pivoted lever, a rod, means for adjustably connecting the rod to the lever at various distances from its pivot, and

means for actuating said lever from the range setting mechanism.

8. In mountings for heavy ordnance, the combination with the sight, its range setting
 40 mechanism and the elevating pinions of a plurality of guns, of means operated from said mechanism for causing relative angular movement to take place between said
 45 pinions.

9. In mountings for heavy ordnance, the combination with the sight, its range setting
 mechanism and the elevating pinions of a plurality of guns, of a relay device operated
 50 from said mechanism for causing relative angular movement to take place between said pinions.

10. In mountings for heavy ordnance, the combination with the sight, its range setting
 55 mechanism and the elevating pinions of a plurality of guns, of a rotary elevating shaft, elevation correcting mechanism associated with said pinions and including an inclined
 60 key connection between the elevating shaft and a pinion, and means operated from the range setting mechanism for moving the pinion axially of the shaft.

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

ARTHUR TREVOR DAWSON.

JAMES HORNE.

Witnesses to signature of Arthur Trevor Dawson:

HENRY KING,

JNO. R. CASWELL.

Witnesses to signature of James Horne:

MARK G. ATKINSON,

HENRY T. McDOWALL.