

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

1,041,247.

Patented Oct. 15, 1912.

4 SHEETS—SHEET 1.

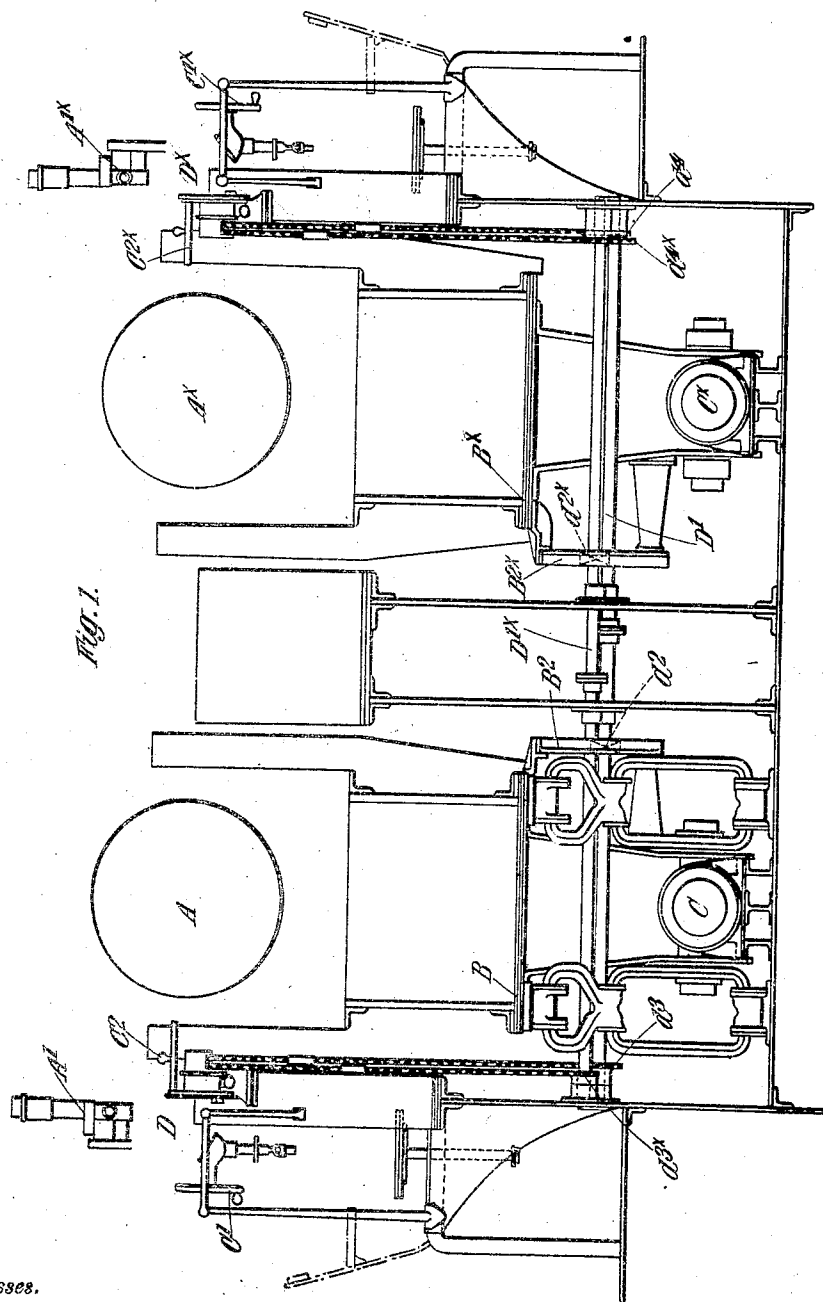


Fig. 1.

Witnesses.  
H. S. Morris

E. C. Schurmann

Inventors

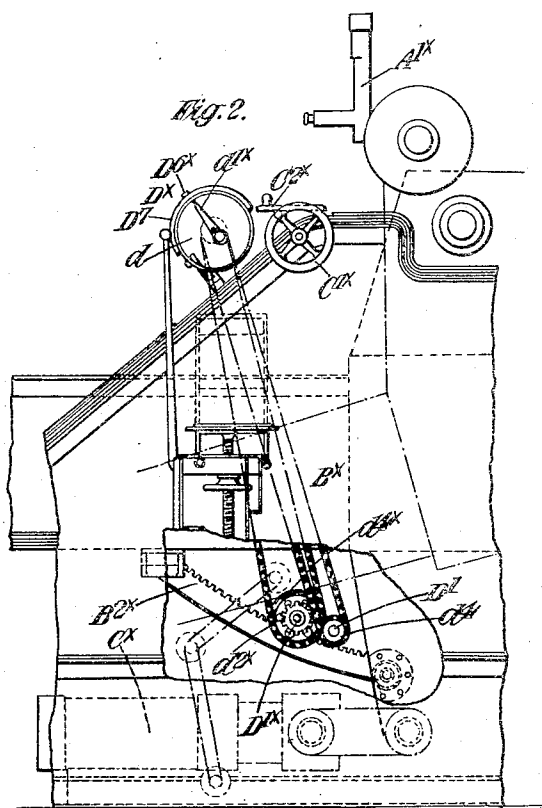
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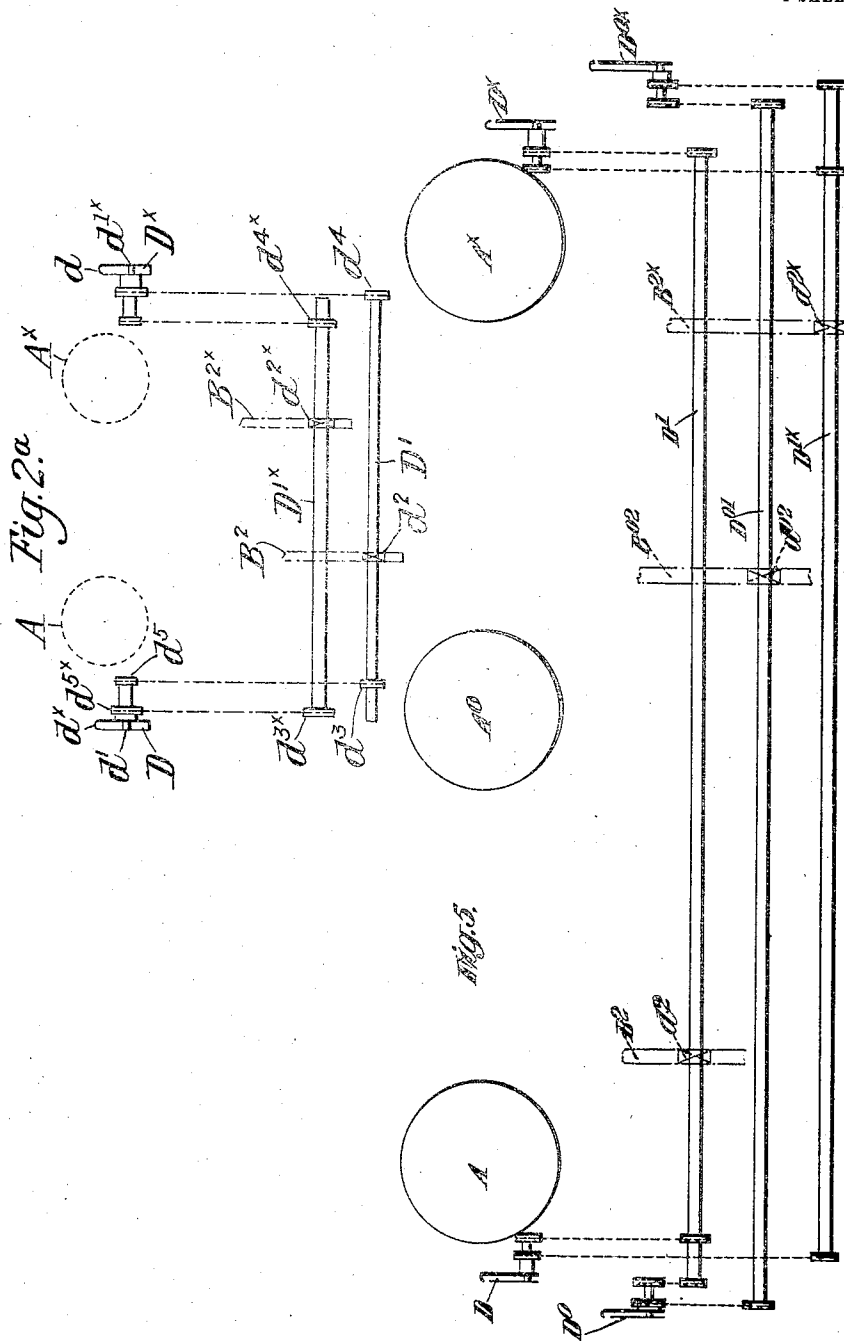
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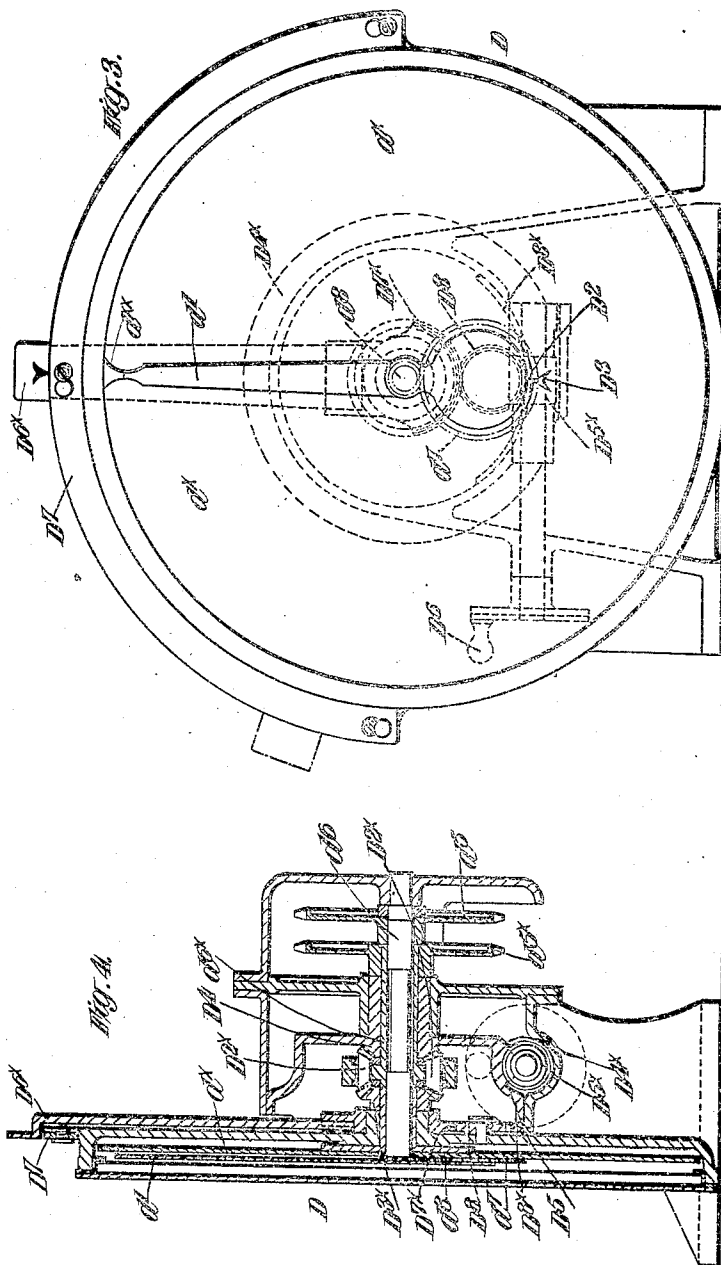
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# UNITED STATES PATENT OFFICE.

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

## ELEVATING MECHANISM OF HEAVY ORDNANCE.

1,041,247.

Specification of Letters Patent.

Patented Oct. 15, 1912.

Application filed March 29, 1912. Serial No. 687,112.

*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 Elevating Mechanism of Heavy Ordnance, of which the following is a specification.

This invention relates to the elevating mechanism of heavy ordnance and has for its chief object to provide means whereby two or more guns may be elevated and simultaneously fired from the sighting position of one of them without the necessity of their respective elevating mechanism being interconnected.

According to this invention we provide an indicator comprising two pointers or the like, one of which is adapted to move with the gun contiguous thereto and the other with a gun remote therefrom. Thus by means of the ordinary elevating control mechanism the movements of one gun may be exactly followed by the other by merely keeping the two pointers in alinement or coincidence. By providing one such indicator for each gun it is possible to lay either gun relatively to the other or others. To correct for the differences in muzzle velocity between the guns, calibrating mechanism is provided on each indicator by means of which one of the pointers or the like can be caused to receive an increased or decreased movement proportional to the amount of correction desired. As a result of our improvements we can use the ordinary simple type of elevating mechanism consisting of a hydraulic press and at the same time obtain the advantages derived from the aforesaid cross connection of the elevating mechanisms.

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 and 2 are respectively an end elevation and a side elevation showing our improvements applied by way of example

to a two gun turret. Fig. 2<sup>a</sup> is a diagrammatic view showing more clearly the connections between the guns and the indicators. Figs. 3 and 4 are respectively a front elevation and a vertical transverse section of a form of the aforesaid indicator, and Fig. 5 is a diagrammatic end elevation showing one method of applying our improvements to a three gun turret.

Like letters of reference indicate similar parts in all these figures.

Referring more particularly to Figs. 1 to 4, A, A<sup>x</sup> are respectively the left and the right hand gun of a turret, A' A<sup>x</sup> their sights and B, B<sup>x</sup> their slide frames. C, C<sup>x</sup> are the hydraulic elevating presses and C', C'<sup>x</sup> the hand wheels controlling the same. C<sup>2</sup>, C<sup>2x</sup> are the training hand wheels. D, D<sup>x</sup> represent the aforesaid indicators which are arranged near the left and right hand gun respectively. The said indicators comprise in the example shown, rotary disks *d*, *d*<sup>x</sup> and pointers *d'*, *d'*<sup>x</sup>, the pointer of a particular indicator being actuated by one gun and the disk by the other gun. Thus the pointer *d'* of the indicator D is moved by the left hand gun and the disk *d*<sup>x</sup> by the right hand gun; similarly the pointer *d'*<sup>x</sup> of the indicator D<sup>x</sup> is moved by the right hand gun, and the disk *d* by the left hand gun.

In order to effect the movements of the pointers and disks, we employ in the example shown two shafts D', D<sup>x</sup> arranged transversely to the guns and supported by bearings on the turntable. The said shafts carry pinions *d*<sup>2</sup>, *d*<sup>2x</sup> engaging respectively with racks B<sup>2</sup>, B<sup>2x</sup> attached to the respective gun slides B, B<sup>x</sup>. Sprocket wheels *d*<sup>3</sup>, *d*<sup>3x</sup>, *d*<sup>4x</sup> are carried by the outer ends of each of the said shafts. The sprocket wheel *d*<sup>3</sup> is connected by means of a chain with a similar wheel *d*<sup>5</sup> (Fig. 4) on a spindle *d*<sup>6</sup> carrying the pointer *d'*. The sprocket wheel *d*<sup>3x</sup> is also connected by means of a chain to a wheel *d*<sup>5x</sup> mounted on a sleeve *d*<sup>6x</sup> surrounding the spindle *d*<sup>6</sup>, the said sleeve imparting motion to the disk *d*<sup>x</sup> through differential gear for the purpose hereinafter explained. In a similar manner the sprocket wheel *d*<sup>4</sup> drives the disk *d* through differential gearing and the wheel *d*<sup>4x</sup> drives the pointer *d'*<sup>x</sup> appertaining to the indicator D<sup>x</sup> of the right hand gun. Instead of a rotary

disk and a pointer, we may obviously employ two pointers actuated as aforesaid by the respective guns.

For the purpose of indicating the extent to which the pointers may have moved beyond one revolution with respect to the disks, each of the disks is provided with an index  $d^{xx}$  (Fig. 3) and each indicator has a small counter pointer  $D^2$  which is connected by gear wheels  $d^7$ ,  $d^8$  with the pointer spindle  $d^9$  (Fig. 4) so that the said pointer  $D^2$  moves at a slower speed than the pointer  $d'$ . An arrow head  $D^3$  is provided on the disk  $d^x$  so that although the pointer  $d'$  and the pointer marked  $d^{xx}$  may be in coincidence, if one of them has moved in advance of the other by one or more revolutions, the relative positions of the pointer  $D^2$  and the arrow head  $D^3$  will indicate that fact.

The aforesaid calibrating mechanism is adapted to operate upon each of the disks  $d$ ,  $d^x$  in order to give them the necessary increased or decreased movement with respect to their pointers to correct for differences in muzzle velocity that may exist between the guns. This mechanism comprises in the example shown in Figs. 3 and 4 a differential gear interposed between the sprocket wheel  $d^{5x}$  and the disk  $d^x$ . The bevel pinions  $D^{2x}$  of the said gear are carried by the sleeve  $d^{3x}$  appertaining to the sprocket wheel  $d^{5x}$ , and the bevel wheel  $D^{3x}$  of the said gear is connected to the disk  $d^x$ . A bevel wheel  $D^4$  forms part of a rotary casing  $D^{4x}$  provided at its lower part with a worm wheel segment  $D^5$  with which a worm  $D^{5x}$  engages. The said worm is actuated by a handle  $D^6$  to impart the correctional movement to the disk  $d^x$  through the bevel wheels  $D^4$ ,  $D^{2x}$  and  $D^{3x}$ . A movable pointer  $D^{6x}$  is formed with a toothed segment  $D^{7x}$  gearing with a pinion  $D^8$  which in turn is geared with an internal toothed segment  $D^{8x}$  on the rotary casing  $D^{4x}$ . The said pointer moves over a graduated strip  $D^7$  and indicates the amount of correctional movement imparted to the disk. The said strip is graduated in accordance with ranges at a definite difference in muzzle velocity, so that when the disk is displaced as aforesaid the correction is effected corresponding to the particular range in use and with the difference in muzzle velocity on which the graduations of the strip are calculated. The said strip is made removable so that it can be replaced by others, the graduations of which are based on various differences in muzzle velocity. A similar arrangement of differential gear and graduated strip is employed in conjunction with the indicator  $D^x$ .

From the foregoing description it will be seen that if the left hand gun A be elevated from the sighting and elevating station adjacent thereto, motion will be imparted to the shaft  $D'$  by the rack  $B^2$  and pinion  $d^2$

when the elevation of the gun A is changed. The movement of this shaft  $D'$  will drive the sprocket wheels  $d^3$ ,  $d^4$  which in turn impart movement through their sprocket chains to the pointer  $d'$  forming part of the indicator situated adjacent to the left hand gun A and to the disk  $d$  of the indicator of the right hand gun. The gunner in charge of the elevating of the right hand gun  $A^x$  then changes the elevation of his gun until the pointer  $d'^x$  of the adjacent indicator is brought into coincidence with the index  $d^{xx}$  of the disk  $d$ , whereupon the two guns will have been elevated to the same degree. The movement of the right hand gun in causing its degree of elevation to correspond with that of the left hand gun imparts motion to the shaft  $D'^x$  through the pinion  $d^{2x}$  driven by the rack  $B^{2x}$  and thereby, through the sprocket wheels  $d^{3x}$ ,  $d^{5x}$  and their chain, moves the disk  $d^x$  of the indicator at the left hand gun to the same extent as that of the pointer of the indicator at the right hand gun, so that the gunner in charge of the elevating of the left hand gun (if the range and muzzle velocity has been equally applied to both indicators) can see when the two guns assume the same degree of elevation and then fire them simultaneously. Similarly if the sighting and firing are being effected from the station adjacent to the right hand gun the elevating number at such station can indicate to the elevating number at the left hand gun the degree of elevation to be given thereto and ascertain by the position of his indicator when both guns have been elevated to the same degree and then simultaneously fire them.

It is obvious that the non-sighted gun, that is to say the gun which is for the time being following the movements of the other, could be elevated from the indicator at the opposite side, an additional hand wheel for controlling the valve appertaining to the elevating press of the non-sighted gun being then provided contiguous to the elevating hand wheel of the sighted gun.

Although the invention is particularly intended for use with two guns, we wish it to be understood that we do not desire to confine its use thereto as it can be applied to three or more guns.

In the case of three guns we may employ an indicator with three pointers at each gun, but preferably we omit placing an indicator contiguous to the middle gun, and provide, at each side of the turret two indicators, each having two pointers or a disk and a pointer, as shown in Fig. 5. In this figure A,  $A^x$  represent, as before, the left and right hand gun, and  $A^0$  represents the middle gun.  $D'$ ,  $D'^x$  are the transverse shafts operated by the racks  $B^2$   $B^{2x}$  and the pinions  $d^2$   $d^{2x}$  of the left and the right hand gun respectively and  $D^{0'}$  is the transverse shaft actu-

ated through the rack B<sup>o2</sup> and the pinion d<sup>o2</sup> of the middle gun. The shaft D<sup>o1</sup> has sprocket wheels thereon for transmitting movement to the pointers of the two indicators D<sup>o</sup>, D<sup>ox</sup> arranged adjacent to the left and right hand gun respectively. At the right hand gun is the indicator D<sup>x</sup> which has its disk and pointer actuated by the left gun and right gun respectively as aforesaid and the indicator D<sup>ox</sup> has its pointer operated by the middle gun and its disk by the right hand gun of the two indicators at the left hand side, D has its disk and pointer actuated by the right and left hand gun respectively, as aforesaid, and the indicator D<sup>o</sup> has its disk and pointer actuated by the middle gun and the left hand gun respectively.

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 elevating mechanism of a plurality of guns, of a pointer and a disk constituting an indicator arranged contiguous to each gun, means for moving the pointer of one indicator and the disk of another indicator from one gun and means for moving the disk of said one indicator and the pointer of said other indicator from another gun.

2. In mountings for heavy ordnance, the combination with the elevating mechanism of a plurality of guns, of a pointer and a disk constituting an indicator arranged contiguous to each gun, displaceable members, means for actuating each of them from one of the guns during its elevation and means for connecting one pointer and one disk of each of the indicators to each of the said members.

3. In mountings for heavy ordnance, the combination with the elevating mechanism of a plurality of guns, of a pointer and a disk constituting an indicator arranged contiguous to each gun, rotary shafts, means for actuating each of them from one of the guns during its elevation, and means for connecting both the pointer of one indicator and the disk of another indicator to each of the said shafts.

4. In mountings for heavy ordnance, the combination with the turntable, the gun slides and the elevating mechanism of a plurality of guns, of a pointer and a disk con-

stituting an indicator arranged contiguous to each gun, rotary shafts carried by the turntable, a pinion on each of said shafts, racks on the gun slides with which said pinions engage, means for actuating the pointer of one indicator and the disk of another indicator from one of said shafts, and means for actuating the disk of said one indicator and the pointer of said other indicator from another of said shafts.

5. In mountings for heavy ordnance, the combination with the elevating mechanism of a plurality of guns, of a pointer and a disk constituting an indicator arranged contiguous to each gun, means for moving the pointer of one indicator and the disk of another indicator from one gun, means for moving the disk of said one indicator and the pointer of said other indicator from another gun, and manual means for causing relative movement to take place between the pointer and disk of each indicator to compensate for differences in muzzle velocity between the guns.

6. In mountings for heavy ordnance, the combination with the elevating mechanism of a plurality of guns, of two members constituting an indicator arranged contiguous to each gun, means for moving one of the members of each indicator from the gun contiguous thereto and the other from the gun remote therefrom, manual means for moving one of the members of each indicator with respect to the other member to compensate for differences in muzzle velocity between the guns, a graduated scale adjacent to each of the indicators, a pointer movable with respect to said scale, and means for adjusting the position of said pointer during the compensating movement of the adjustable member.

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

ARTHUR TREVOR DAWSON.

JAMES HORNE.

Witnesses as to the signature of Arthur Trevor Dawson:

HENRY KING,

JNO. R. CASWELL.

Witnesses as to the signature of James Horne:

MARK G. ATKINSON,

HENRY T. McDOWALL.