

No. 743,881.

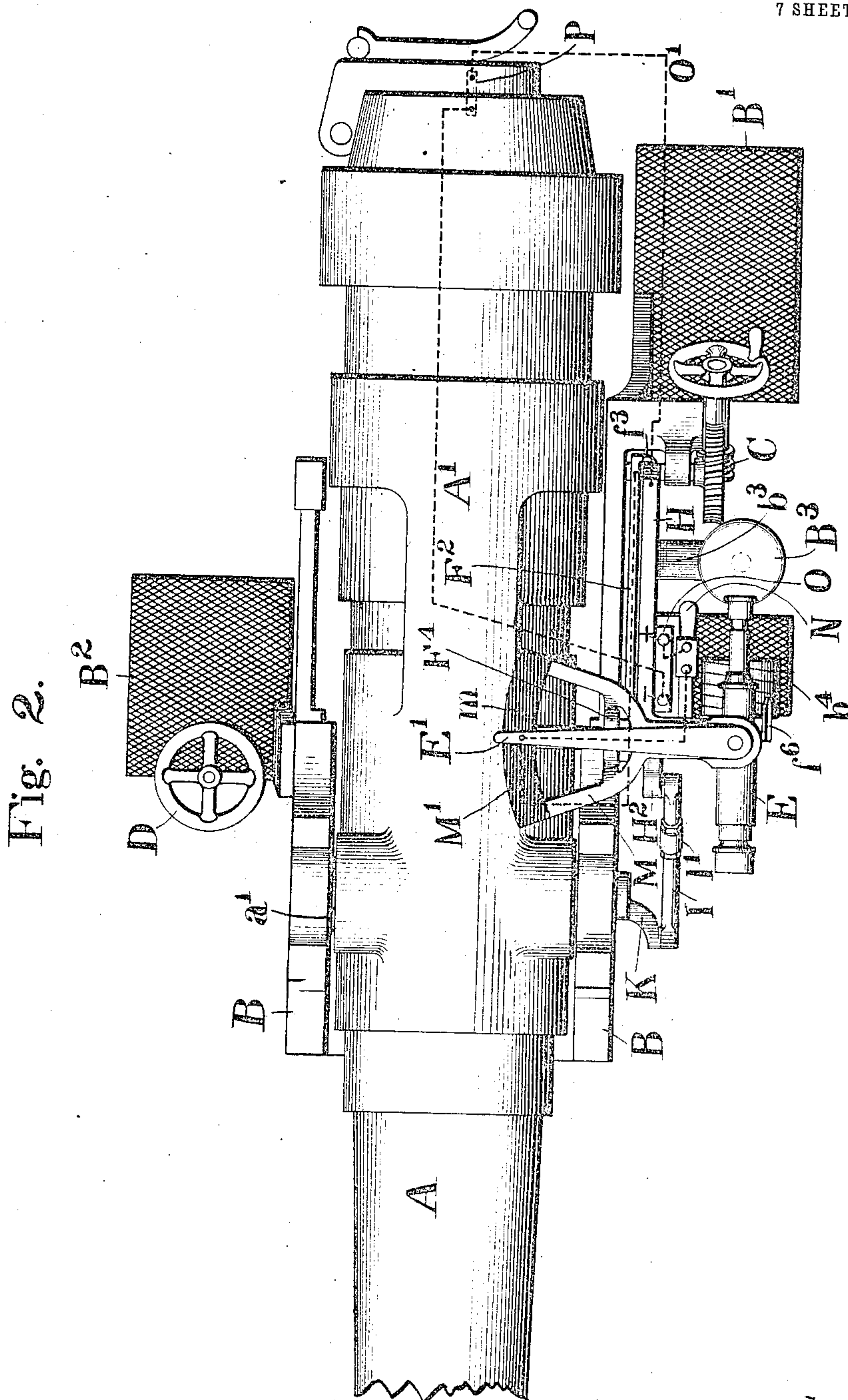
PATENTED NOV. 10, 1903.

H. W. JONES.
APPARATUS FOR SIGHTING AND FIRING ORDNANCE.

APPLICATION FILED FEB. 13, 1903.

NO MODEL.

7 SHEETS—SHEET 2.



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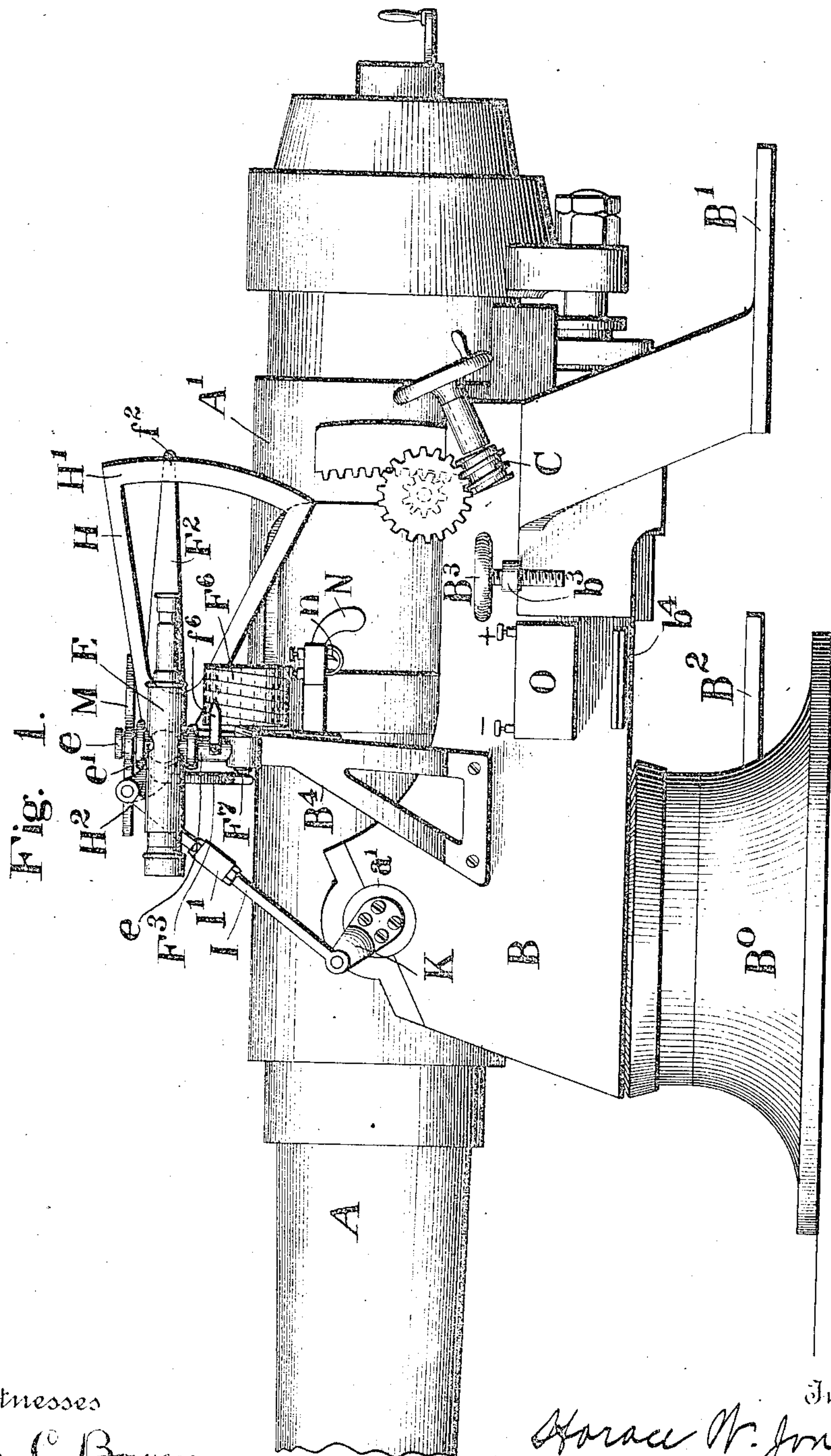
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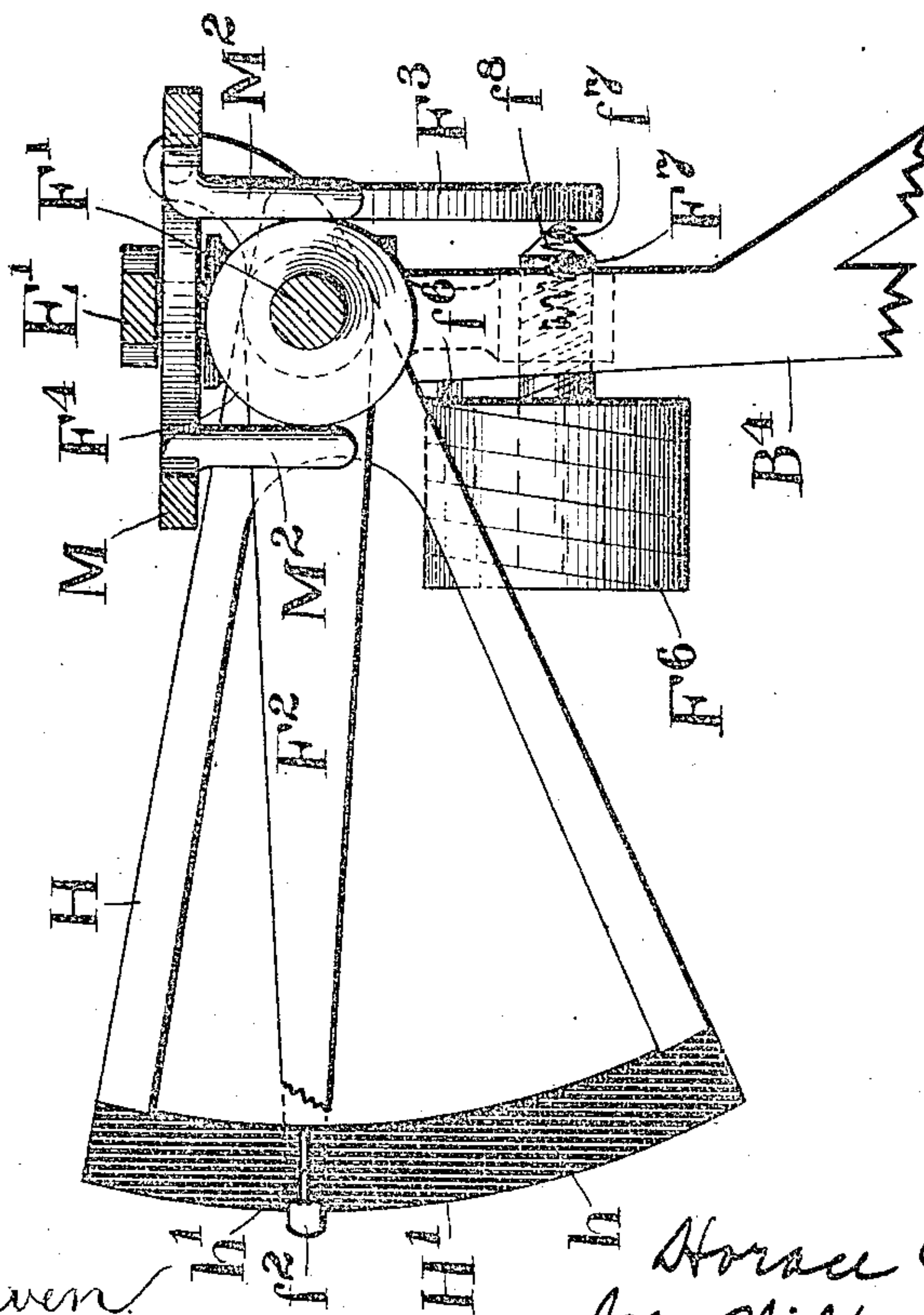
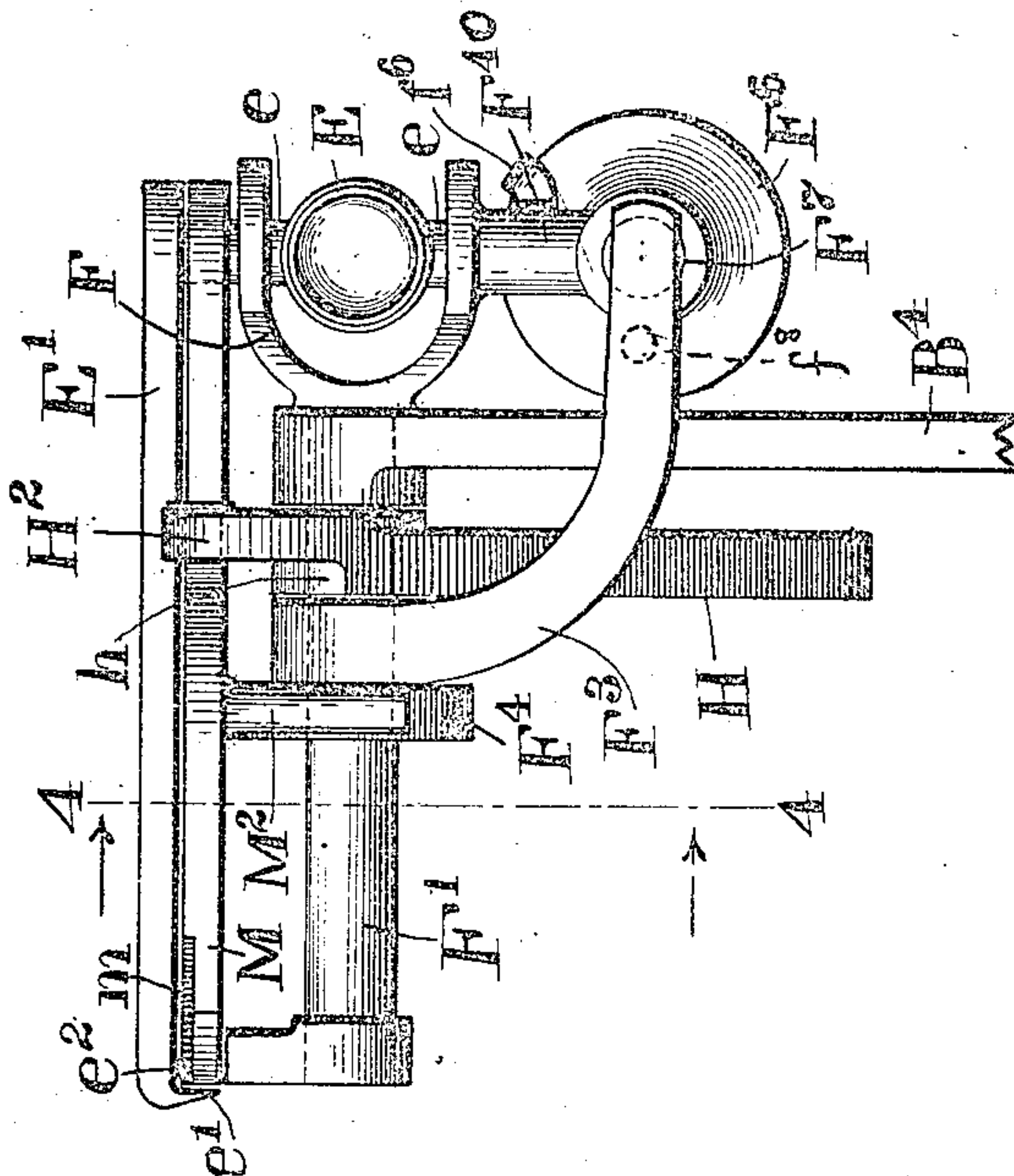
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7 SHEETS—SHEET 3.

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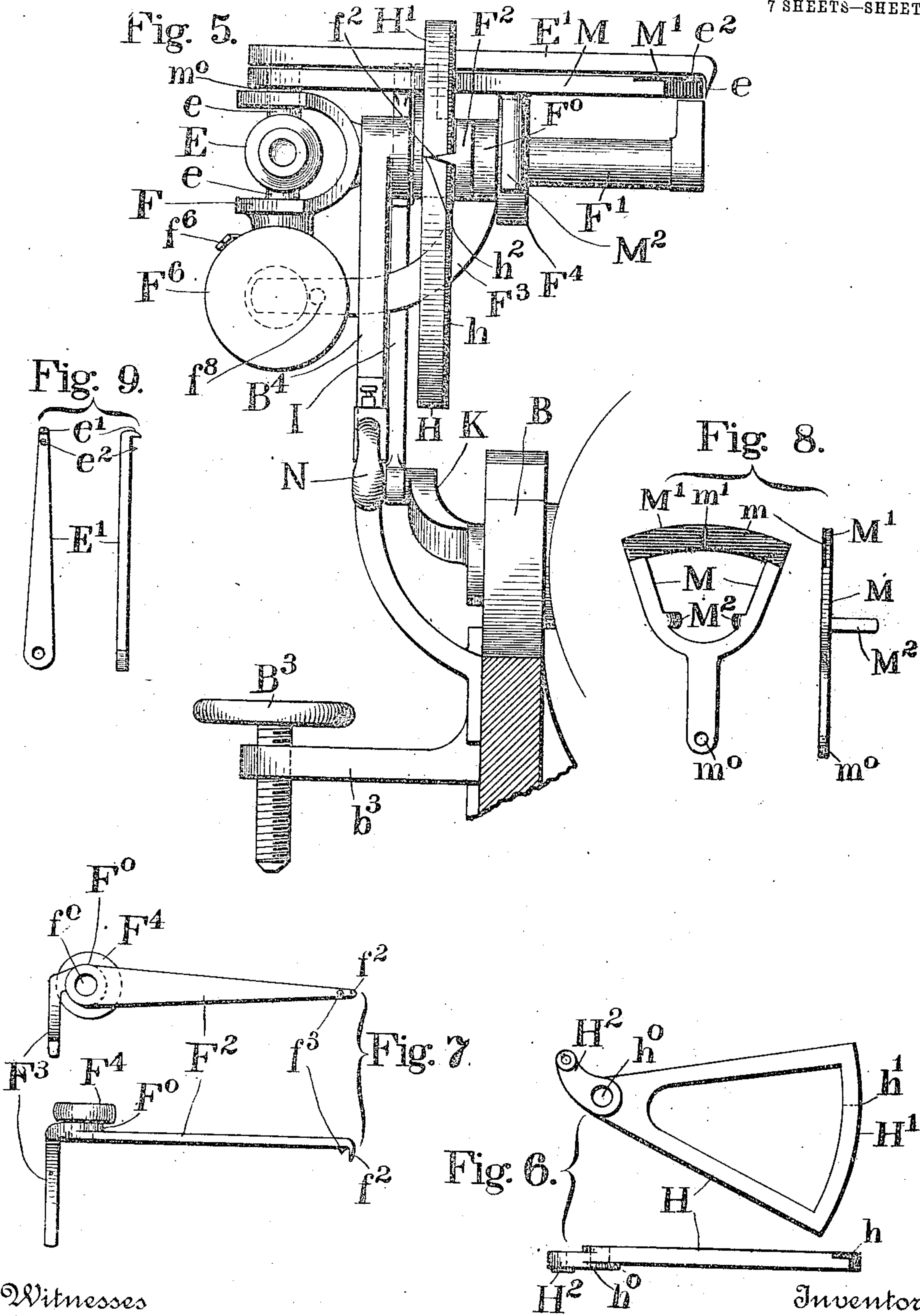
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NO MODIF

7 SHEETS—SHEET 4.



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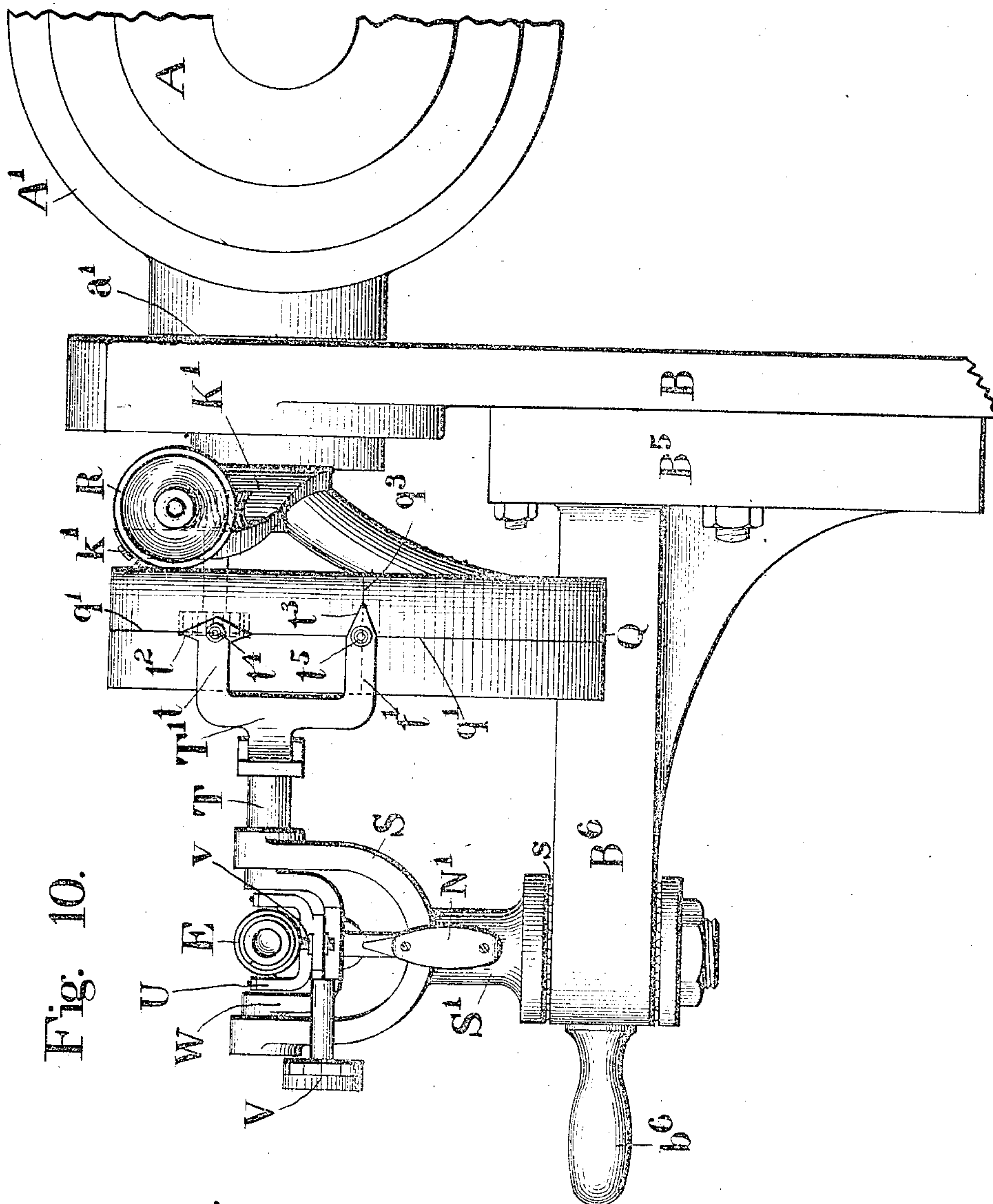
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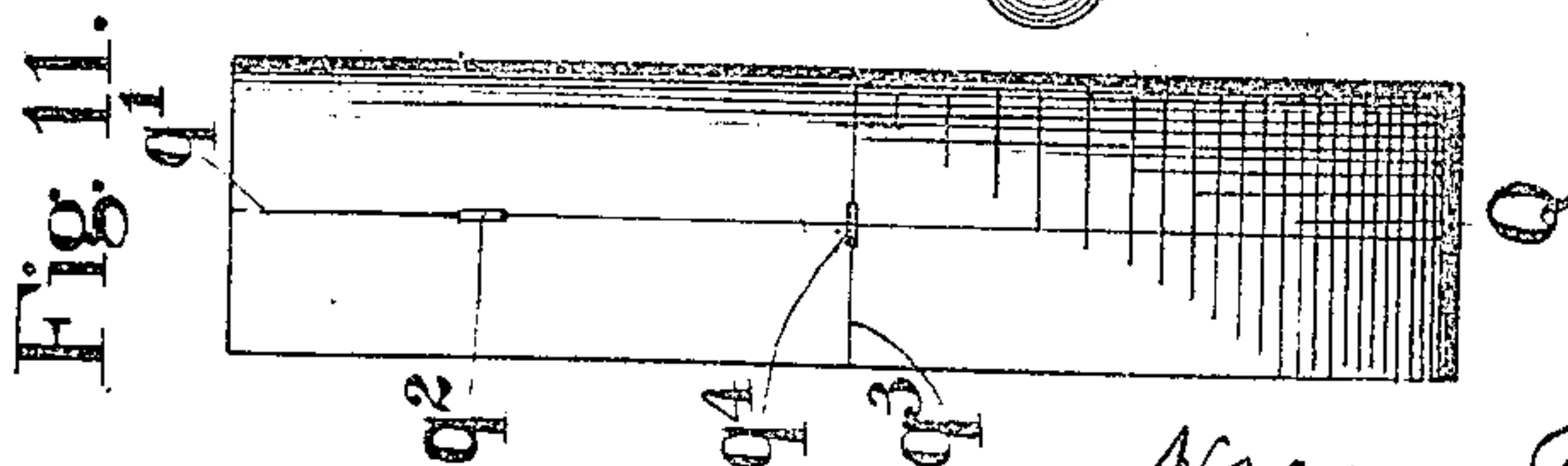
APPLICATION FILED FEB. 13, 1903.

NO MODEL.

7 SHEETS—SHEET 5.



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Witnesses

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PATENTED NOV. 10, 1903.

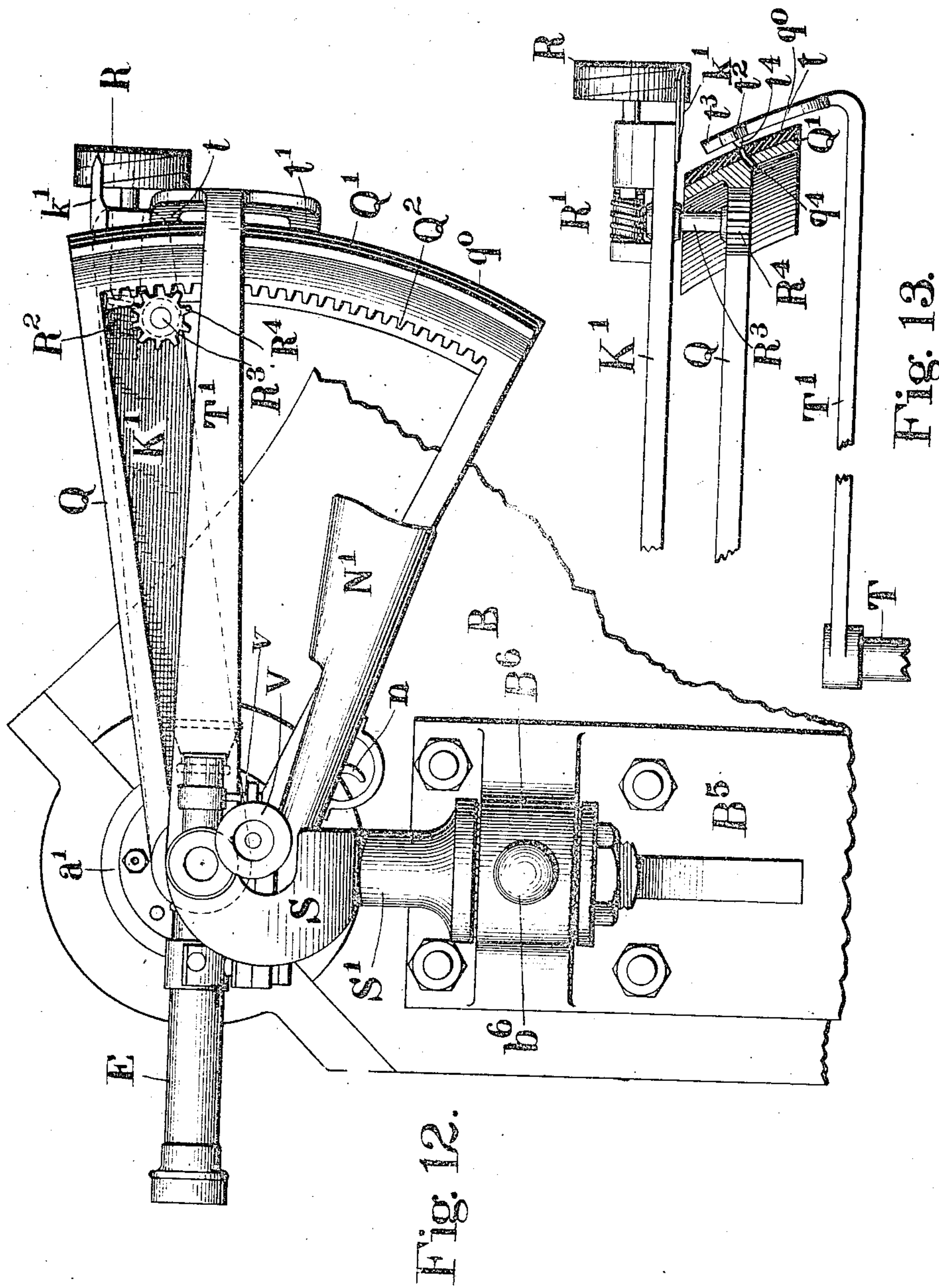
H. W. JONES.

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APPLICATION FILED FEB. 13, 1903.

NO MODEL.

7 SHEETS—SHEET 6.



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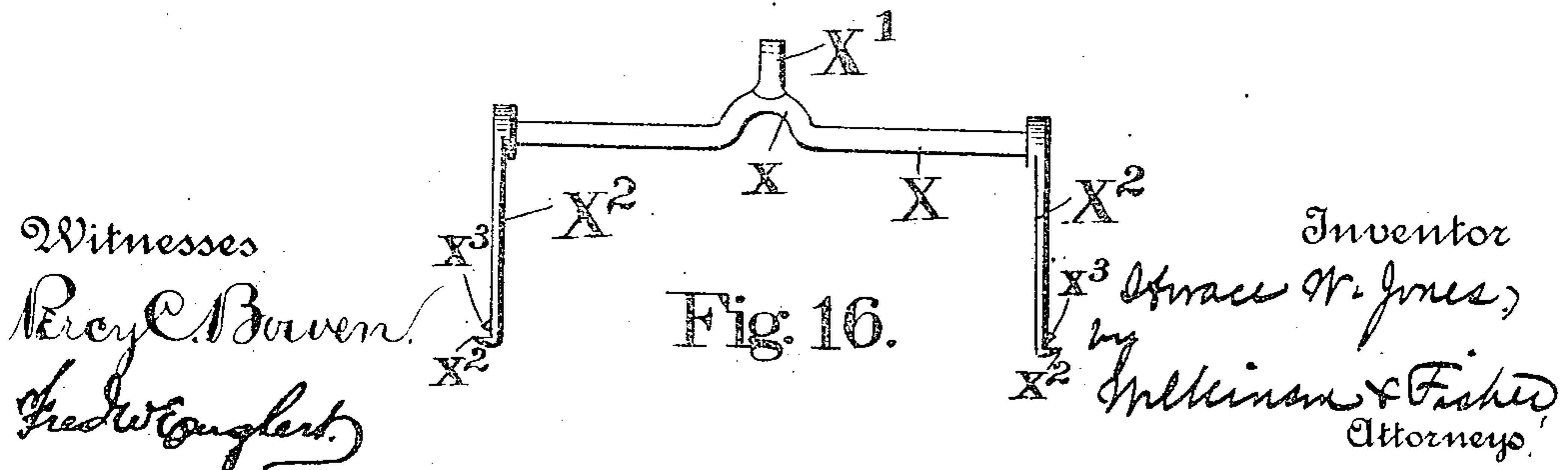
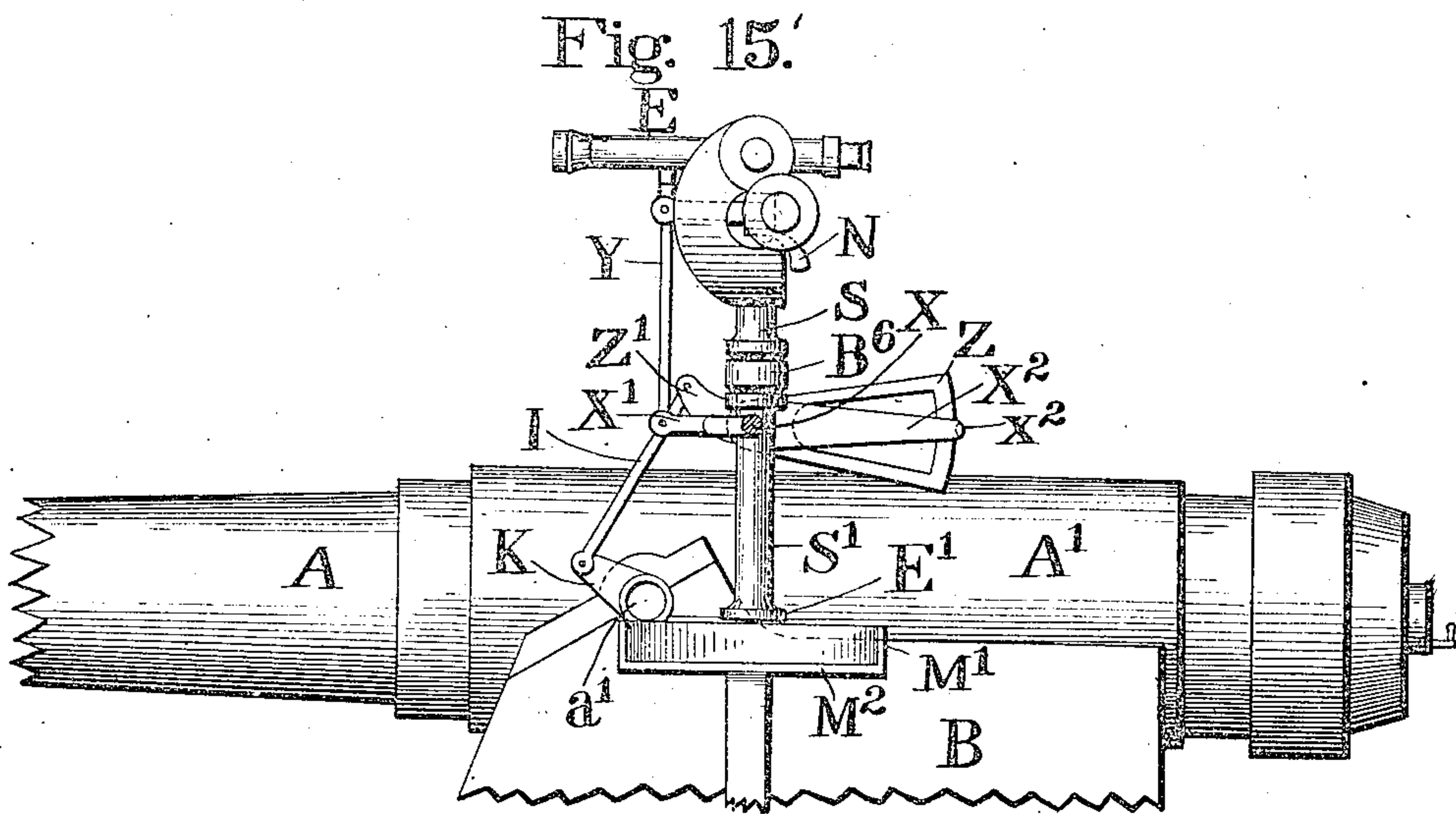
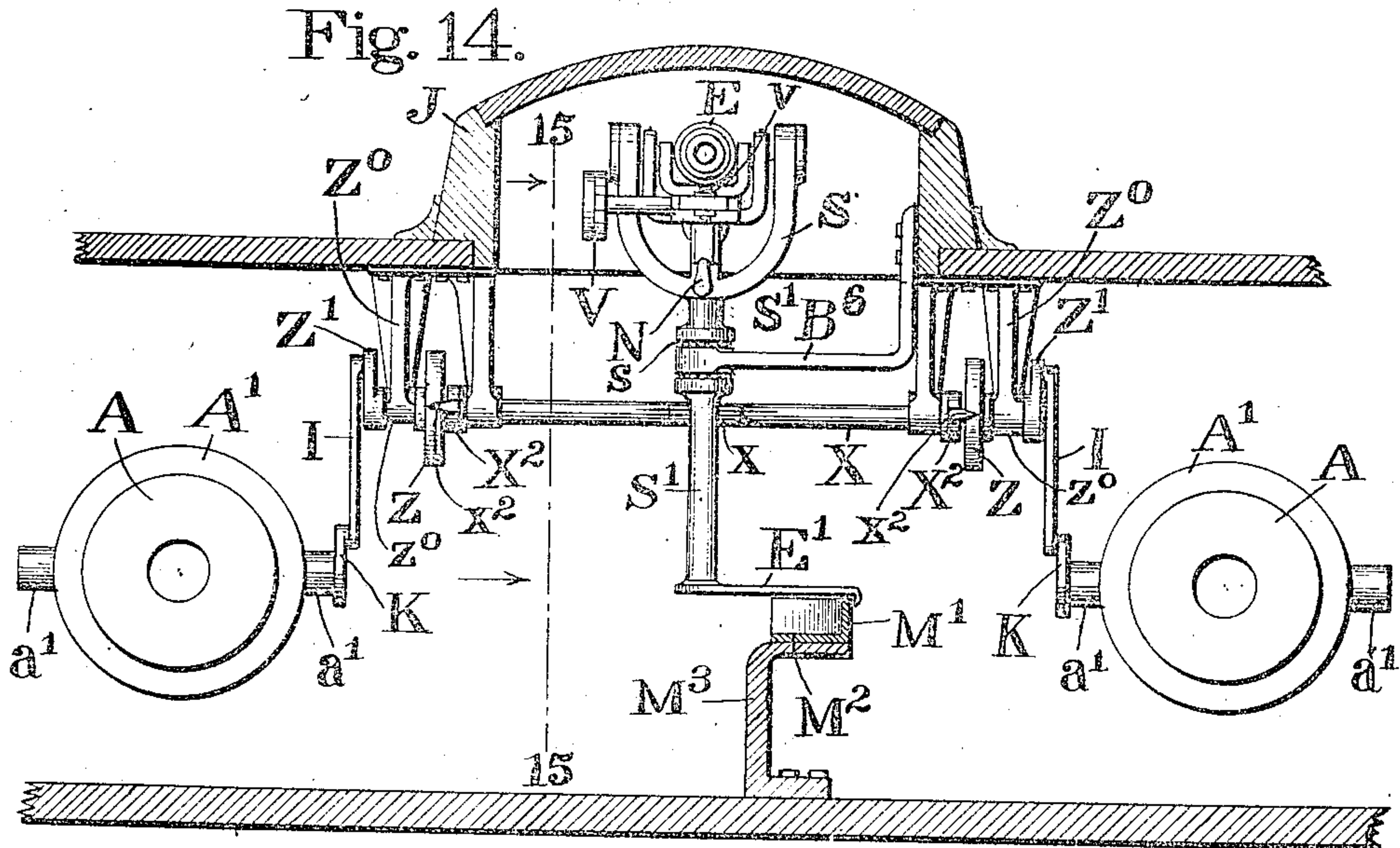
H. W. JONES.

APPARATUS FOR SIGHTING AND FIRING ORDNANCE.

APPLICATION FILED FEB. 13, 1903.

NO MODEL.

7 SHEETS—SHEET 7.



UNITED STATES PATENT OFFICE.

HORACE W. JONES, OF THE UNITED STATES NAVY, ASSIGNOR TO HUGH EVERETT CURTIS, OF ROCK ISLAND, ILLINOIS.

APPARATUS FOR SIGHTING AND FIRING ORDNANCE.

SPECIFICATION forming part of Letters Patent No. 743,881, dated November 10, 1903.

Application filed February 13, 1903. Serial No. 143,262. (No model.)

To all whom it may concern:

Be it known that I, HORACE W. JONES, lieutenant United States Navy, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Apparatus for Sighting and Firing Ordnance; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in apparatus for pointing and firing ordnance; and it is intended for use with heavy ordnance mounted on suitable gun-platforms either aboard ship or in fortifications on shore.

In the methods of sighting and firing guns now most generally used the person sighting the gun either himself completes the operation of firing, as by pulling the trigger or pressing a button, or he orders some one else to fire, in which case there is generally a substantial personal error, commonly called the "personal equation" of the gun captain or the "firing interval." According to my invention it is the duty of the gun-pointer merely to keep the cross-hairs of a telescope constantly on the target and then for other persons to so adjust the gun in train and elevation that when the direction of the axis of the bore of the gun bears the desired relation to the collimation-axis of the telescope the gun will be automatically fired. In this way the operation of firing the gun will be made more or less mechanical. The man at the telescope does not know when the gun is to be fired, and hence his personal equation is eliminated and the gun is fired automatically when in the desired position. The men at the training and at the elevating gear do their work in a purely mechanical way, and there is little skill and less judgment required, thus avoiding personal errors. I accomplish these ends by providing electric contacts so arranged that they will complete an electric circuit through the primer and fire the gun when the gun is properly laid in elevation and in train when at the same time the cross-hairs of the telescope bear on the target. In order to prevent the gun from being prema-

turely or accidentally fired when the cross-hairs of the telescope do not bear on the target, I provide a trigger or spring-switch, which is kept closed by the gun-pointer while the cross-hairs bear on the target, but is released, thus breaking the circuit, whenever through any cause he is unable to keep the cross-hairs of his telescope on the target.

My invention will be understood by reference to the accompanying drawings, in which the same parts are indicated by the same letters throughout the several views.

Figure 1 is a side elevation of a gun mounted on a pedestal-mount, such as are used on sponsons aboard ship. Fig. 2 is a plan view of the gun shown in Fig. 1, parts of the mount being omitted for the sake of clearness in the drawings. Fig. 3 is a detail, on a large scale, showing a front elevation of the sighting attachment. Fig. 4 shows a section along the line 4 4 of Fig. 3 and looking in the direction of the arrows. Fig. 5 is a rear elevation of the sighting attachment. Fig. 6 is a detail showing in side elevation and in plan the sector-arm for completing the electric circuit when the gun is laid at the desired elevation. Fig. 7 shows in side elevation and in plan the pointer-arm that sweeps over the sector shown in Fig. 6. Fig. 8 shows in plan and in side elevation the sector which completes the electric circuit when the gun is properly trained. Fig. 9 shows in inverted plan and in side elevation the pointer-arm which sweeps over the sector shown in Fig. 8. Figs. 6 to 9 are on a reduced scale. Fig. 10 shows a rear view of a modified form of the invention in which a single sector is used to adjust both for elevation and for train. Fig. 11 is a detail showing a rear view of the sector shown in Fig. 10 with the electric contact-strips for completing the circuit when the gun is properly laid in elevation and in train. Fig. 12 is a side elevation of the device shown in Fig. 10. Fig. 13 is a plan, partly in section and partly broken away, of the means for adjusting the sector in elevation. Fig. 14 is a diagrammatic view showing the invention applied to the pointing and firing of two guns by means of a single gun-pointer using a single telescope. Fig. 15 is a section along the line 15 15 of Fig. 14 and looking in the direc-

tion of the arrows, and Fig. 16 is a detail showing the arrangement of pointers and contact-arms by which the firing elevation of two or more guns may be simultaneously controlled from a single telescope.

Referring now to Figs. 1 to 9, A represents a gun mounted in the sleeve or cradle A', which is trunnioned, as at a' , on the top carriage B, which is pivoted on a pedestal or lower carriage B'. The gun is elevated and depressed by means of the elevating-gear C, controlled by a man standing on the platform B'. The training of the gun is effected by means of suitable training-gear D, preferably located at the opposite side of the gun from the elevating-gear, and it may be operated by a man standing on the platform B', which platform is also carried by the top carriage. The special form of elevating and training gear does not constitute a part of my present invention, and any suitable elevating and training gear, whether operated by hand or by other motive power, may be adopted. The top carriage also carries an adjustable seat B³, preferably screwing up and down in a nut b^3 like a piano-stool and with a foot-rest b^4 for the gun-pointer. E represents a telescope which is mounted to swing on a vertical axis e , and this axis e is mounted in the yoke F on the horizontal axis F', so that the telescope may be caused to point in any desired direction. Pivoted on the horizontal axis F' is a pointer and contact-arm F², carrying a pointer-arm f^2 and a contact-maker f^3 . (Shown most clearly in Fig. 7.) The hub F⁰ of this arm F² is perforated, as at f^0 , to pass over the shaft F' and carries an eccentric F⁴, the function of which will be hereinafter described. The arm F² projects beyond this hub F⁰, as shown at F³ in Fig. 7, and against this downwardly-projecting arm F³ the point f^7 of the screw F⁷, carried by the drum F⁶, normally bears. f^8 indicates a spring to keep the point f^7 and the arm F³ in contact. This drum is graduated either to ranges or to angles of elevation, or both, and the angle of elevation or the range is indicated by the pointer f^6 . (See Fig. 1.) This pointer f^6 is attached to any suitable part of the arm F⁴⁰, which carries the telescope. The sector H carries the arc H', which is faced with insulating material h , in which is embedded a contact wire or strip h' . This sector is pivoted, as at h^0 , on the shaft F' and is provided with an arm H², to which is pivotally connected the rod I, which may be provided with a turnbuckle or other adjusting device I', (see Fig. 1,) and this arm is connected to the arm K, fast to one of the trunnions a' . The length of the arm K from its center of motion is the same or bears some known relation to the length of the arm H² from its center of motion, so that as the gun is elevated or depressed the arc H' swings about the shaft F'. Now if the drum F⁶ be turned to the desired elevation indicated by the range-scale the pointer f^2 will be moved along the arc H', and if sub-

sequently the gun be brought to the desired elevation the contact f^3 will make electrical connection with the strip h' , inlaid in the insulating material h on the face of the arc H'. Thus it will be seen that if the drum be turned to the desired elevation and the cross-hairs of the telescope be kept on the target that when the gun is turned to the proper elevation the electric circuit will be completed as far as the elevating-gear is concerned. In order, however, that the gun be fired at the proper instant, it is necessary not only that the cross-hairs shall be on the target and the trigger be pulled or the corresponding switch be closed, but that also the gun must be trained in the proper position in the horizontal plane. The method of automatically completing the electric circuit when the cross-hairs are on the target and the gun is properly trained will now be described. E' represents a pointer-arm carrying a pointer e' , which swings in azimuth with the telescope E while the pointer sweeps over the arc M' of the training-sector M. This sector is faced with insulating material, as at m , (see Fig. 8,) and is provided with a contact-strip m' to make contact with the contact-piece e^2 on the arm E' when the gun is properly trained. This training-sector is pivoted, as at m^0 , on the shaft e , preferably above the telescope E, as shown in Figs. 5 and 8. This sector has two downwardly-projecting arms M², which bear against opposite sides of the eccentric F⁴ on the hub F⁰ of the pointing-arm F². Thus the raising or lowering of this pointing-arm F² will cause the training-sector to swing slightly about its pivot and automatically apply a correction for drift of the projectile. As is well known, the error due to drift varies with the range, and the correction for drift may be readily applied by the use of the eccentric F⁴. It will be seen that when the cross-hairs of the telescope are on the target and the gun properly trained, being automatically compensated for drift, as aforesaid, that the contact e^2 will make connection with the contact-strip m' . Since the segment M is swung with the gun and the pointing-arm E' has swung with the telescope and both gun and telescope are in the proper position, the electric circuit will be complete as far as training the gun will effect it. If now the gun be at the proper elevation, the cross-hairs of the telescope be pointed at the target, and the gun be properly trained, the trigger n be pulled the electric circuit will be completed through the primer, as indicated by the dotted lines in Fig. 2, where the current is shown as going from the positive pole of the battery through the trigger, through the arm E', the contact e^2 , the strip m' , the training-sector M, the arm F², the sector H, the conductor O', the primer P, then through the mass of the gun, and back to the negative pole of the battery. This trigger n operates an ordinary electric switch inclosed in the handle N. This conductor O' is the well-known insulated wire

and is merely indicated in dotted lines in Fig. 2. Thus it will be seen that the gun cannot be fired electrically until, first, it is properly elevated; second, it is properly trained, and, third, the trigger n be pulled or an equivalent switch be closed. The man at the telescope would only keep the trigger pulled when the cross-hairs of the telescope are on the target, so that it follows that the gun cannot be fired electrically until it is properly elevated and properly trained. As will be seen, the elevating and training are done by two men, entirely independent of the sighting of the telescope, and with a little practice the men at the elevating and training gear can so elevate and train the gun that the pointers f^3 and e' are always at or very near the index or firing points on the sectors H and M. Thus the skill involved in properly pointing the gun consists in the ability of one man to keep the cross-hairs of the telescope on the target and of two other men to keep two pointers continuously pointed at given marks on corresponding sectors. None of the three men just referred to will know just when the gun will be fired, and as a consequence the personal errors due to excitement or other causes will be largely obviated.

While I have shown the invention as applied to a pivoted recoil-mount, it is equally applicable to almost any of the mounts used for heavy ordnance.

In the form of invention shown in Figs. 10 to 12 I combine the two sectors into one, and I also combine the two pointing and contact arms, so that they may be both attached to a common stem. Thus, referring to these figures, K' represents an arm fast to the trunnion of the sleeve or cradle, which arm carries a pointer k' , which points to the range-scale on the drum R. The range-drum R is mounted on a shaft R' , journaled in the arm K' , which shaft carries a worm R^2 , which engages in a worm-wheel on the shaft R^3 . This shaft R^3 carries a pinion R^4 , which meshes with the rack Q^2 of the sector Q, and thus the sector is raised or lowered to correspond to the range at which the gun is to be fired, the sector being pivoted on a projection from the trunnion a' , as shown in Fig. 12. The outer face Q' of this sector is curved, as shown at Fig. 13, and is insulated, as at q^0 . Into this insulated portion of the sector are inlaid the electric contact for train q^2 , the electric contact for elevation q^4 , while lines q' and q^3 (see Fig. 11) are drawn on the face of the sector to aid the eye of the men at the elevating and training gear. The telescope E rotates about the same axis and swings laterally with the shaft T, which shaft carries the pointing-arms t and t' , each provided with pointers t^2 and t^3 , respectively, and each having a contact-maker t^1 and t^5 , respectively, which contact-makers are adapted to make contact with strips q^2 and q^4 . (Shown in Fig. 11.) Thus it will be seen that as the telescope is elevated or depressed the arm t

will swing vertically along the arc Q' , while if the telescope be swung laterally the arm t will be moved laterally over the curved face of the sector, as indicated in Fig. 13, and it will be evident that unless the gun is in the proper position with regard to the telescope both in elevation and in train electric contact will not be made with both of the strips q^2 and q^4 , and consequently the gun cannot be fired electrically. In this form of invention the telescope is shown as carried by a yoke S, pivoted on a spindle S' , which is mounted on roller-bearings s in the arm B^6 of the bracket B^5 , secured to the gun-mount. A hand-grip b^6 may be provided for the man at the telescope to steady himself. The device would be operative if the telescope were journaled directly on the shaft T, projecting into the yoke S; but to allow for corrections of lateral errors—such as drift, error due to wind, velocity of the target or of the gun-platform—the telescope may be mounted in a yoke U, pivoted in the yoke W, which turns with the shaft T, and devices for adjusting the elevation v and for adjusting for lateral errors V may be supplied. In Fig. 12 I have shown a gun-stock N' , carrying the trigger n to facilitate the pointing of the telescope. These details may be varied at will. The electrical connections through the two pointing-arms and the trigger would be similar to those already described with reference to Fig. 2.

In the form of device shown in Figs. 14 to 16 a single telescope is used to direct the pointing of two turret-guns. In these figures the telescope is shown as mounted on a bracket B^6 in a similar way to that shown in Fig. 10; but the spindle S' is carried downward and carries a pointer E' , which sweeps over the circle M' , fast to a flange M on a cylindrical bracket M^3 , which is secured to and is carried by the turret. X represents a shaft journaled in hangers from the top of the turret and carrying pointing-arms X^2 , one for each gun, with pointers x^2 and contacts x^3 . This shaft is preferably curved forward, as at x , so as to have its center of motion intersect the center of motion of the spindle S' , and the said shaft carries a forwardly-projecting arm X' , which is connected by the rod Y to the telescope or a lug beneath the same, as shown in Fig. 15. It will be seen that any motion of the telescope about its transverse axis will rock the shaft X, causing the pointers x^2 to swing about the elevation-sector Z. This elevation-sector is carried by a shaft journaled in the hangers Z^0 (see Fig. 14,) and this shaft carries an arm Z' , connected by the rod I to the arm K on the trunnions a' of the sleeve or cradle A' of the gun A. Thus it will be seen that the two contacts for elevation will be simultaneously put in the operative position by the gun-pointer at the telescope, and his keeping the cross-hairs of the telescope on the target will automatically direct the training-arm E'

to the desired position, so that when the turret is properly trained electric contact will be made by the training-arm, and when either gun is properly adjusted for elevation electric contact will be made by the elevating-arm. Finally, when either gun is properly elevated and the turret properly trained and when the trigger is pulled the electric circuit will be completed and that gun will be automatically fired. As before stated, the trigger should be kept pulled when the cross-hairs are on the target and when the guns are properly loaded and ready for firing. At other times the trigger should be released, and firing by electricity will be interrupted. It will be obvious in superposed turrets having the upper turrets rigidly attached to the lower that a single telescope may be used to direct the pointing of four of the guns.

For the sake of clearness in the drawings parts are shown diagrammatically, and many parts are omitted in Figs. 14 and 15.

It will be obvious that the herein-described method of and apparatus for directing the pointing of one or more guns by means of a single telescope will be widely varied, and I do not mean to limit my invention to the present form of construction nor to the combination or arrangements of parts herein described and shown. Thus it will be evident that instead of the sectors moving with the guns the sectors may move with the telescope and the pointers with the gun, and in the claims I consider these two alternative constructions as equivalent.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In an apparatus for sighting ordnance, the combination with the gun and cradle, of a telescope mounted in bearings on the gun-mount so as to be turned freely in every direction and independent of the gun, arms moving in elevation and laterally, respectively, with said telescope, a source of electricity, an electric firing-circuit, and electric contacts in said circuit adjustably connected to but moving with the cradle of the gun, said arms and contacts automatically closing said circuit when the cradle reaches a definite known position relative to the telescope, substantially as described.

2. In an apparatus for sighting ordnance, the combination with the gun and cradle, of a telescope mounted in bearings on the gun-mount so as to be turned freely in every direction and independent of the gun, arms moving in elevation and laterally, respectively, with said telescope, a source of electricity, an electric firing-circuit, and electric contacts in said circuit adjustably connected to but moving with the cradle of the gun, said arms and contacts automatically closing said circuit when the cradle reaches a definite known position relative to the telescope, and a trigger or cut-out switch normally

breaking said circuit but closing same when desired, substantially as described.

3. In an apparatus for sighting ordnance, the combination with the gun and cradle, of means for elevating and depressing said cradle, and independent means for training the cradle and gun, a telescope mounted in bearings on the gun-mount so as to be turned freely in every direction and independent of the gun, arms moving in elevation and laterally, respectively, with said telescope, a source of electricity, an electric firing-circuit, and electric contacts in said circuit adjustably connected to but moving with the cradle of the gun, said arms and contacts automatically closing said circuit when the cradle reaches a definite known position relative to the telescope, substantially as described.

4. In an apparatus for sighting ordnance, the combination with the gun and cradle, of means for elevating and depressing said cradle, and independent means for training the cradle and gun, a telescope mounted in bearings on the gun-mount so as to be turned freely in every direction and independent of the gun, arms moving in elevation and laterally, respectively, with said telescope, a source of electricity, an electric firing-circuit, and electric contacts in said circuit adjustably connected to but moving with the cradle of the gun, said arms and contacts automatically closing said circuit when the cradle reaches a definite known position relative to the telescope, and a trigger or cut-out switch normally breaking said circuit but closing same when desired, substantially as described.

5. In an apparatus for sighting ordnance, the combination with the gun and cradle, of a telescope mounted in bearings on the gun-mount so as to be turned freely in every direction and independent of the gun, of an arm moving in elevation and another arm moving laterally with said telescope, a sector, with means for adjusting the same for elevation, arranged to swing in elevation with the gun, and a sector arranged to swing laterally with the gun, a source of electricity, an electric firing-circuit, and electric contacts in said circuit adjustably connected to but moving with the cradle of the gun, said arms and contacts automatically closing said circuit, when the cradle reaches a definite known position relative to the telescope, substantially as described.

6. In an apparatus for sighting ordnance, the combination with the gun and cradle, of a telescope mounted in bearings on the gun-mount so as to be turned freely in every direction and independent of the gun, of an arm moving in elevation and a second arm moving laterally with said telescope, a sector, with means for adjusting the same for elevation, arranged to swing in elevation with the gun, and a sector arranged to swing laterally with the gun, a source of electricity, an electric

firing-circuit, and electric contacts in said circuit adjustably connected to but moving with the cradle of the gun, said arms and contacts automatically closing said circuit when the
5 cradle reaches a definite known position relative to the telescope, and a trigger or cut-out switch normally breaking said circuit but closing same when desired, substantially as described.

10 7. In an apparatus for sighting and firing ordnance, the combination with the gun, means for elevating and depressing the gun, and independent means for training the gun, of a telescope mounted in bearings on the
15 gun-mount so as to be turned freely in every direction independent of the gun, an arm moving in elevation, and a second arm moving laterally with said telescope, a sector with means for adjusting the same for elevation
20 arranged to swing in elevation with the gun, and a second sector arranged to swing laterally with the gun, a source of electricity, and an electric firing-circuit made up in part of conductors carried by said arms and sectors
25 and automatically closed by the movement of said arms over said sectors, substantially as described.

8. In an apparatus for sighting and firing ordnance, the combination with the gun,
30 means for elevating and depressing the gun, and independent means for training the gun, of a telescope mounted in bearings on the gun-mount so as to be turned freely in every direction independent of the gun, of an arm
35 moving in elevation, and a second arm moving laterally with said telescope, a sector with means for adjusting the same for elevation arranged to swing in elevation with the gun, and a second sector arranged to swing laterally
40 ally with the gun, a source of electricity, and an electric firing-circuit made up in part of conductors carried by said arms and sectors automatically closed by the movement of said arms over said sectors, and a trigger or cut-out switch normally breaking said circuit but
45 closing same when desired, substantially as described.

9. In an apparatus for sighting ordnance, the combination with a telescope mounted in
50 bearings on the gun-mount so as to be turned freely in every direction independent of the gun, of an arm adapted to move in elevation, and a second arm adapted to move laterally, both connected to and moving with said telescope, a sector with means for adjusting the
55 same for elevation arranged to swing in elevation with the gun and arranged to cooperate with the first arm, and a sector arranged to swing laterally with the gun and arranged to cooperate with the second arm, a source
60 of electricity, and an electric circuit through the primer made up in part of conductors carried by said arms and sectors, automatically closed by the movement of said arm over said sectors, substantially as described.
65

10. In an apparatus for sighting ordnance, the combination with a telescope mounted in

bearings on the gun-mount, so as to be turned freely in every direction independent of the gun, of an arm adapted to move in elevation,
70 and a second arm adapted to move laterally, both connected to and moving with said telescope, a sector with means for adjusting the same for elevation arranged to swing in elevation with the gun and arranged to cooperate
75 with the first arm, and a second sector arranged to swing laterally with the gun and arranged to cooperate with the second arm, a source of electricity, and an electric firing-circuit made up in part of conductors carried
80 by said arms and sectors automatically closed by the movement of said arms over said sectors, with a cut-out switch normally breaking said circuit, but completing same when the gun is in the firing position and the
85 switch is closed, substantially as described.

11. In an apparatus for sighting ordnance, the combination with a telescope mounted in bearings on the gun-mount so as to be turned
90 freely in every direction independent of the gun, of an arm moving in elevation, and a second arm moving laterally with said telescope, a sector with means for adjusting the same for elevation arranged to swing in elevation with the gun, and a second sector arranged
95 to swing laterally with the gun, with means for adjusting said second sector for lateral errors in the flight of the projectile, a source of electricity, and an electric firing-circuit made up in part of conductors carried
100 by said arms and sectors automatically closed by the movement of said arms over said sectors, substantially as described.

12. In an apparatus for sighting ordnance, the combination with a telescope mounted in
105 bearings on the gun-mount so as to be turned freely in every direction independent of the gun, of an arm moving in elevation, and a second arm moving laterally with said telescope, a sector with means for adjusting the
110 same for elevation arranged to swing in elevation with the gun, and a second sector arranged to swing laterally with the gun, with means for adjusting said second sector for lateral errors in the flight of the projectile,
115 a source of electricity, and an electric firing-circuit made up in part of conductors carried by said arms and sectors automatically closed by the movement of said arms over said sectors, with a cut-out switch normally
120 breaking said circuit, but completing same when the gun is in the firing position and the switch is closed, substantially as described.

13. In an apparatus for sighting ordnance, the combination with the gun, means for elevating and depressing the gun, and independent means for training the gun, of a telescope
125 mounted in bearings on the gun-mount so as to be turned freely in every direction independent of the gun, of an arm adapted to move in elevation, and a second arm adapted to move laterally, both connected to and moving with said telescope, a sector with means
130 for adjusting the same for elevation arranged

to swing in elevation with the gun, and arranged to cooperate with the first arm, and a second sector arranged to swing laterally with the gun and arranged to cooperate with the second arm, a source of electricity, and an electric circuit through the primer made up in part of conductors carried by said arms and sectors automatically closed by the movement of said arms over said sectors, substantially as described.

14. In an apparatus for sighting ordnance, the combination with the gun, means for elevating and depressing the gun, and independent means for training the gun, of a telescope mounted in bearings on the gun-mount so as to be turned freely in every direction independent of the gun, of an arm adapted to move in elevation, and a second arm adapted to move laterally, both connected to and moving with said telescope, a sector with means for adjusting the same for elevation arranged to swing in elevation with the gun and arranged to cooperate with the first arm, and a second sector arranged to swing laterally with the gun, and arranged to cooperate with the second arm, a source of electricity, and an electric circuit through the primer made up in part of conductors carried by said arms and sectors automatically closed by the movement of said arms over said sectors, with a cut-out switch normally breaking said circuit, but completing same when the gun is in the firing position and the switch is closed, substantially as described.

15. In an apparatus for sighting and firing ordnance, the combination with a turret and a plurality of guns mounted therein, of a telescope mounted in bearings carried by said turret, and independent of said guns, so as to be turned freely in every direction, of an arm moving in elevation, and a second arm moving laterally with said telescope, a sector for each gun arranged to swing in elevation with said gun, with means for adjusting the elevation of said sectors, a single sector arranged to swing laterally with the turret, a source of electricity, and an electric firing-circuit made up in part of conductors carried by said arms and sectors and automatically closed by the movement of said arms over said sectors, and a trigger or cut-out switch normally breaking said circuit but closing same when desired, substantially as described.

16. In an apparatus for sighting and firing ordnance, the combination with a turret, and a plurality of guns mounted therein, of means for elevating and depressing each gun separately, and means for training the turret with all the guns, of a telescope mounted in bearings carried by said turret, and independent of said guns, so as to be turned freely in every direction, an arm moving in elevation, and a second arm moving laterally with said telescope, a sector with means for adjusting the same for elevation provided for each gun and arranged to swing in elevation with the gun,

and a sector arranged to swing laterally with the turret, a source of electricity, and an electric firing-circuit made up in part of conductors carried by said arms and sectors and automatically closed by the movement of said arms over said sectors, substantially as described.

17. In an apparatus for sighting and firing ordnance, the combination with a turret and a plurality of guns mounted therein, of means for elevating and depressing each gun separately, and independent means for training the turret, of a telescope mounted in bearings carried by said turret, and independent of said guns, so as to be turned freely in every direction, of an arm moving in elevation, and a second arm moving laterally with said telescope, a sector with means for adjusting the same for elevation provided for each gun and arranged to swing in elevation with said gun, and a second sector arranged to swing laterally with the turret, a source of electricity, an electric firing-circuit made up in part of conductors carried by said arms and sectors and automatically closed by the movement of said arms over said sectors, and a trigger or cut-out switch normally breaking said circuit but closing same when desired, substantially as described.

18. In an apparatus for sighting and firing ordnance, the combination with a turret and a plurality of guns mounted therein, of a telescope mounted in bearings, carried by said turret, and independent of said guns, so as to be turned freely in every direction, an arm adapted to move in elevation, and a second arm adapted to move laterally, both arms being connected to and moving with said telescope, a sector with means for adjusting the same for elevation provided for and arranged to swing in elevation with each gun and arranged to cooperate with the first arm, and a sector arranged to swing laterally with the turret and arranged to cooperate with the second arm, a source of electricity, and an electric firing-circuit made up in part of conductors carried by said arms and sectors automatically closed by the movement of said arms over said sectors, substantially as described.

19. In an apparatus for sighting ordnance, the combination with a turret, and a plurality of guns mounted therein, a telescope mounted in bearings, carried by said turret, and independent of said guns, so as to be turned freely in every direction, an arm adapted to move in elevation and a second arm adapted to move laterally, both arms being connected to and moving with said telescope, a sector with means for adjusting the same for elevation provided for and arranged to swing in elevation with each gun, and arranged to cooperate with the first arm, and a sector arranged to swing laterally with the turret and arranged to cooperate with the second arm, a source of electricity, and an electric circuit through the primer made up in part of conductors carried by said arms and sectors au-

5 automatically closed by the movement of said arms over said sectors, with a cut-out switch for each gun, normally breaking the circuit for that gun, but completing same when the gun is in the firing position and the switch is closed, substantially as described.

10 20. In an apparatus for sighting and firing ordnance, the combination with a turret and a plurality of guns mounted in cradles therein, of a telescope mounted in bearings, carried by said turret, and independent of said guns, so as to be turned freely in every direction, arms moving in elevation and laterally, respectively with said telescope, electric
15 contacts adjustably connected to but moving with the cradle of each gun, a source of electricity, and an electric firing-circuit for each gun, automatically closed by the movement of said arms over said contacts, substantially
20 as described.

21. In an apparatus for sighting ordnance, the combination with a turret, and a plurality of guns mounted in cradles therein, of a telescope mounted in bearings, carried by said
25 turret, and independent of said guns, so as to be turned freely in every direction, arms moving in elevation and laterally, respectively, with said telescope, electric contacts adjustably connected to but moving with the
30 cradles of each gun, a source of electricity, and an electric firing-circuit for each gun automatically closed by the movement of said arms over said contacts, and a trigger or cut-out switch at each gun normally breaking the
35 circuit for said gun, but closing same when desired, substantially as described.

22. The combination with a gun, means for elevating and depressing same, and independent means for training the gun, of a telescope
40 mounted independent of the gun, adapted to be swung through the desired angle in elevation and laterally, a source of electricity, and an electrical firing-circuit controlled by the relative movements of said gun and said telescope, substantially as described.

23. The combination with a gun, means for elevating and depressing same, and independ-

ent means for training the gun, of a telescope mounted independent of the gun adapted to be swung through the desired angle in elevation and laterally, a source of electricity, and
50 an electrical firing-circuit through the primer of the gun controlled by the relative movements of said gun and said telescope, with a cut-out switch normally breaking said circuit, but adapted to complete same when the
55 gun is in the firing position and the switch is closed, substantially as described.

24. The combination with a gun and cradle, and means for training and for elevating and
60 depressing said gun and cradle, of a telescope mounted to move freely about a point in every direction and independent of the gun, a source of electricity, an electric firing-circuit, and contacts completing said circuit, made by
65 moving said cradle to a definite known position relative to said telescope, substantially as described.

25. In an apparatus for sighting and firing ordnance, the combination with a telescope
70 mounted in bearings on the gun-mount so as to be turned freely in every direction independent of the gun, of an arm moving in elevation, and another arm moving laterally with said telescope, a sector, with means for
75 adjusting the same for elevation arranged to swing in elevation with the gun and to indicate visually the desired position of the arm moving in elevation, and a second sector arranged to swing laterally with the gun and
80 adapted to indicate visually the desired position of the arm swinging laterally, a source of electricity, and an electric firing-circuit, carried partly by said arms and said sectors and automatically closed by the movement of
85 said arms over said sectors, when the gun reaches a definite known position relative to the telescope, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HORACE W. JONES.

Witnesses:

R. M. PARKER,

FRED W. ENGLERT.