No. 728,716. PATENTED MAY 19, 1903.

E. W. HUBBARD & S. C. VESTAL.

SIGHT FOR GUNS.

APPLICATION FILED MAY 19, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

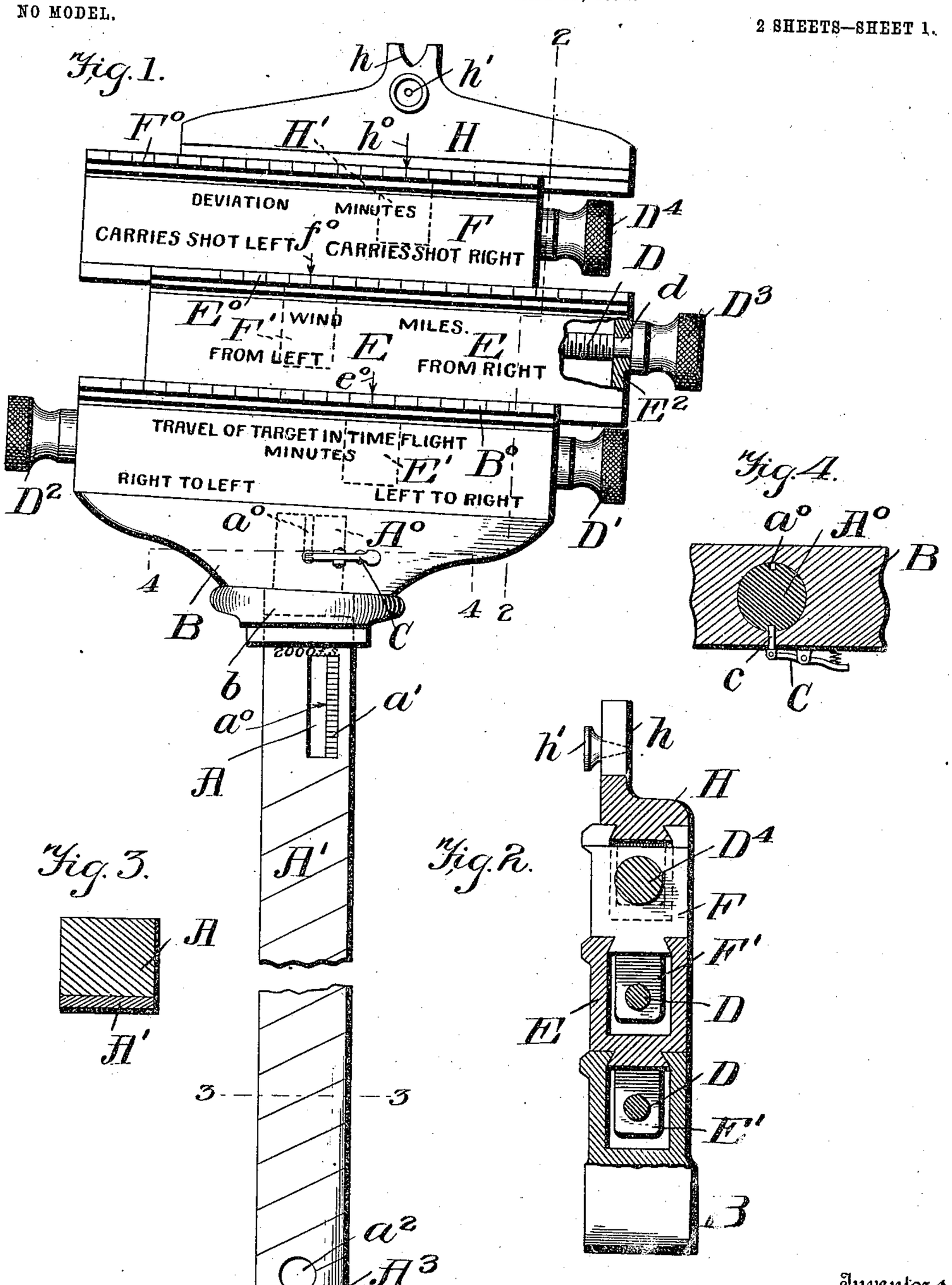

Fig. 4.

Fig. 3.

Fig. 2.

Witnesses

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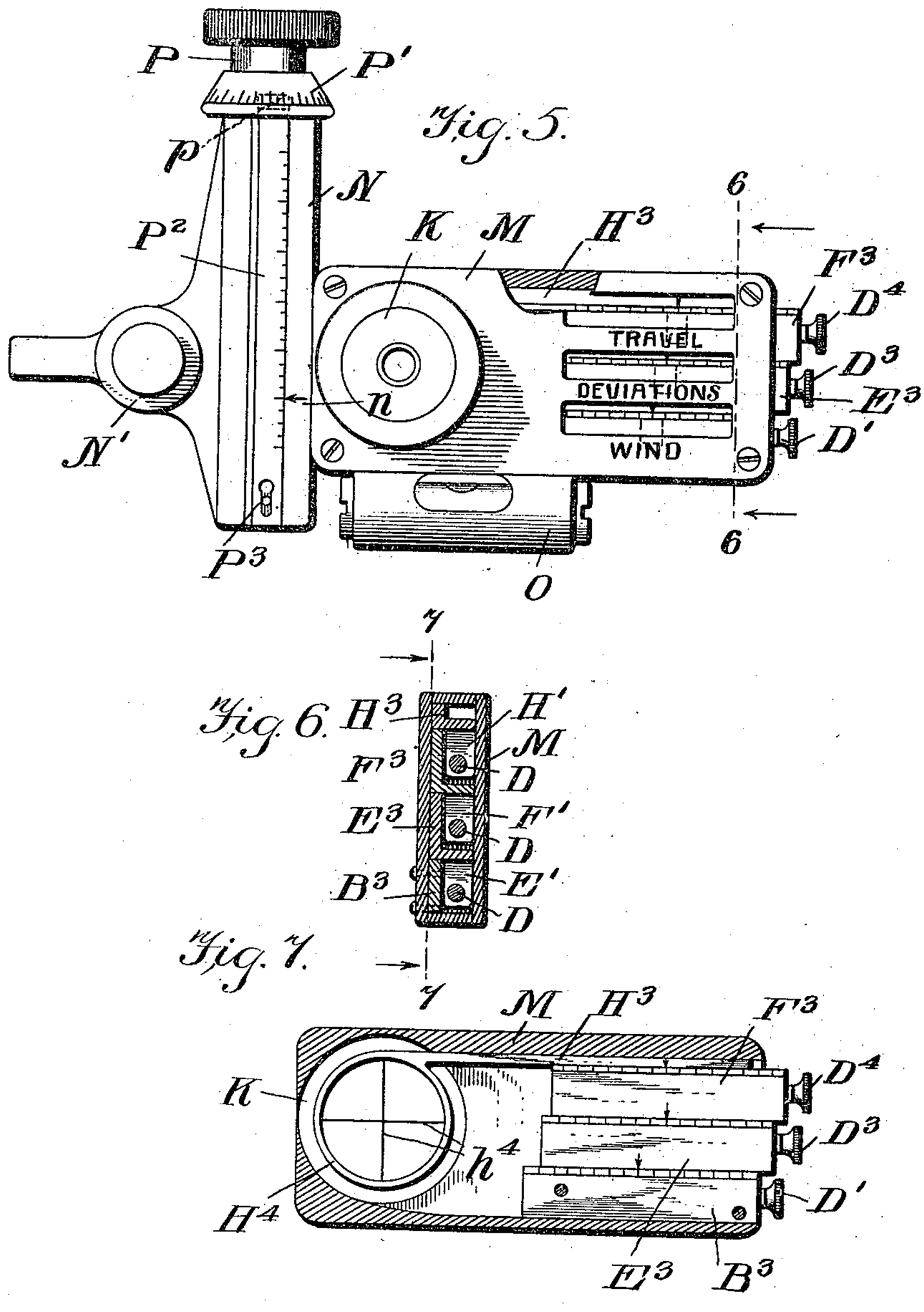

Fig. 5.

Fig. 6.

Fig. 7.

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UNITED STATES PATENT OFFICE.

ELMER W. HUBBARD AND SAMUEL C. VESTAL, OF THE UNITED STATES ARMY.

SIGHT FOR GUNS.

SPECIFICATION forming part of Letters Patent No. 728,716, dated May 19, 1903.

Application filed May 19, 1902. Serial No. 108,086. (No model.)

To all whom it may concern:

Be it known that we, ELMER W. HUBBARD, captain, of the United States Army, stationed at Fort Monroe, in the State of Virginia, and SAMUEL C. VESTAL, captain, of the United States Army, stationed at Fort Slocum, State of New York, have invented certain new and useful Improvements in Sights for Guns; and we 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.

Our invention relates to improvements for sights for guns; and it consists of certain novel features hereinafter described and claimed.

Reference is had to the accompanying drawings, in which the same parts are indicated by the same letters throughout the several views.

Figure 1 represents a rear sight or a tangent sight for ordnance or artillery constructed according to our invention, parts being broken away. Fig. 2 represents a section along the broken line 2 2 of Fig. 1 and looking to the left. Fig. 3 represents a section along the line 3 3 of Fig. 1. Fig. 4 represents a section along the line 4 4 of Fig. 1 and looking down. Fig. 5 represents a telescopic sight constructed according to our invention. Fig. 6 represents a section through the same along the line 6 6 of Fig. 5 and looking to the left; and Fig. 7 represents a section through the casing and illustrates the movement of the adjustable cross-hairs, the section being along the line 7 7 of Fig. 6 and looking to the right in said figure.

Referring now particularly to Figs. 1 to 4, (shown in Sheet 1 of the drawings,) the sight-bar A is shown set at an angle, as is usual, to allow for drift. On this bar A we provide an index a^0, and in order to allow for variations in initial velocity of projectile due to varying weights of powder charge or to variations in the powder itself from the standard velocity we provide a series of detachable plates, as A′, each having a window and scale, as further described below. Each plate is to be graduated in yards or other suitable linear units of range, and such graduation may also, if necessary, be made with reference to the height of the gun above the plane of the target. The plates would thus be separately graduated for, say, two thousand feet velocity, two thousand one hundred feet, &c. The upper end of the plate fits into a socket b in a frame B, mounted above the sight-bar, and the lower end of the plate is provided with an enlarged opening a^2 and a slot a^3, whereby the plate may be slipped over the screw A^3 and then clamped in place, as shown in Fig. 1.

On the bar A is an index a^0, corresponding to the window and scale of plate A′, so arranged that after applying the proper plate for velocity of powder it can be adjusted up or down by the scale and index aforesaid, so as to allow for any further accidental or unknown causes affecting range of the projectile, such as wind, atmospheric conditions, jump, &c. Thus before beginning an action a trial shot is fired at some object whose range is known, and the distance the shot strikes over or short is determined. The gun and bar A then remaining in the same absolute and relative position as before, the plate A′ is then moved up or down until the main-range index reads to the observed range of the shot fired. The sight is then adjusted for that initial velocity and other conditions affecting range. The object of such adjustment is to enable the gunner to always keep his sight reading to the exact distance of the target as reported, and thus avoid the loss of time and inaccuracy due to the ordinary methods now in use. Similarly the system of plates described may be used to find the initial velocity of the powder charge closely enough for practical purposes. Attach a plate corresponding as nearly as possible to the given charge. Fire a shot at, say, five thousand yards elevation. Suppose the observed range of shot is four thousand five hundred yards. Leaving gun and bar A as before take off, the first plate and by trial find one which when applied will read "four thousand five hundred yards."

For errors in pointing the gun laterally or in train, due to deviation, to the force of the wind, travel of target, or to other causes, we provide a series of independently-movable slides mounted on the frame B. There may be two or more of these slides; but we have shown three, each independently movable, as will now be described.

The frame B has journaled therein a screw D, (see Fig. 2,) which has at its end milled heads D′ and D². This screw is cut away, as shown, at *d* on slide E next the milled head D³, Fig. 1, so as to revolve in, but not pass out, of the frame B. The lower screw D engages a nut E′, projecting downward from the slide E. This slide carries an index or zero-point e^0, which is moved by means of the milled heads D′ or D² along the scale B^0 on the frame B. In the slide E another screw D is similarly journaled, which is operated by the milled head D³. This screw engages the nut F′, projecting downward from the slide F, and the said slide F has an index f^0, which travels along the scale E^0 on the slide E. In the same way the slide F carries a screw which engages the nut H′ of the eyepiece H. This eyepiece has an index h^0 traveling along the scale F^0 of the slide F. The said eyepiece H may be provided with a sight-notch *h* and a peep-hole *h′*. The scale F^0 is intended to correct errors of deviation, and this correction is effected by moving the index h^0 to the proper position on the scale F^0, which may be done by simply rotating the milled head D⁴.

The scale E^0 is intended to provide for correction due to the force and direction of the wind, and this correction is made by moving the index f^0 along the scale E^0 to the desired position. This may be done by simply turning the milled head D³. Where the target is stationary, no further corrections against lateral error than those stated will probably be required; but where the target is in motion, especially in rapid motion, as a vessel under full speed, it becomes very important to correct for the travel of target, and for this reason we provide the scale B^0 and means for moving the pointer e^0 of the slide E along this scale. The parts F and H being set for deviation and for wind and the index e^0 being at the zero-point on the scale B^0, the sight is brought on some given part of the ship—say the mainmast. This is done by training the gun. Now stop training the gun and by means of the head D′ or D² keep the line of sight on the same part of the vessel during the time of flight of the projectile to that range, or, say, ten seconds, and then cease turning the milled head D′. If the gun were now fired while trained on the target, the shot would strike some distance astern. To obviate this difficulty, the whole upper part of the sight is rotated one hundred and eighty degrees about the vertical head A^0. The travel is now taken, as previously described, the sight quickly rotated back to the position shown in Fig. 1. The line of sight is now again brought to bear by traversing the gun, when the gun will be pointed the correct angular distance ahead of the moving target and may be fired at once. A second head D² is provided, so that in this reversed position the slide may be operated, as usual, from the right of the sight.

In order to insure that the frame B is turned through exactly one hundred and eighty degrees, we provide grooves a^0 in the head A^0 in the sight-bar A and also a suitable spring-catch C, having a pin *c* to project into one of these grooves a^0, and thus hold the frame B against turning on the bar A. Thus it will be seen that we provide simple means for correcting errors in range or in lateral deviation of the projectile which may be readily made use of without requiring any special degree of intelligence on the part of the gunner and which can be carried on under conditions of excitement, as in action, and that can also enable the officer to better control the fire of a number of guns than can be done with present devices. The corrections for wind and deviation being independent are not affected by the correction for travel.

The means for moving the sight-bar A vertically to adjust the elevation of the gun according to the range of the target is not a part of our present invention, but is well known in the art and need not be described herein.

We have thus described our invention as applied to the rear or ordinary tangent sight for guns; but the same may be applied to a telescopic sight, automatic or other form, with slight modifications. We have shown such application in Figs. 5 to 7 on Sheet 2 of the drawings, in which K represents a telescope, which is mounted in the frame M, secured to the bracket N, attached to the gun by the arm N′ in the usual way and provided with the ordinary level O.

P represents the screw for adjusting the sight in elevation, having the usual graduated micrometer-circle P′. Instead of the scale P² being fixed on the vertically-movable bar or drum, as in the ordinary construction, we make this scale adjustable, having its head project into the socket *p* and its lower end adjusted by means of the screw P³, adjustment being for the same purpose and effected in the same way as the adjustment of the plate A′, already referred to in connection with Fig. 1. Thus it will be seen that we provide adjustable means for correcting for errors in elevation, as before described with reference to Fig. 1. The errors for lateral deviation are corrected in a similar way to that already described with reference to Fig. 1. Thus the bars B³, E³, and F³ carry scales to register, respectively, with indexes on the bars E³, F³, and H³. The bar H³ carries the cross-hairs h^4 in the frame H⁴ in the focus of the telescope K. These bars H³, F³, and E³ have downwardly-projecting lugs or nuts H′, F′, and E′, (see Fig. 6,) which are engaged by corresponding screws D, which screws are turned by the milled heads D⁴, D³, and D′. It is immaterial which one of these heads or bars is used to adjust for travel of target or for deviation of the projectile or for the force and direction of the wind; but to prevent mistakes the bars should be suitably marked with scales and indices, as indicated in Fig. 5.

It will be seen that in either case the correction applied is the algebraic sum of the

corrections, due to the deviation of the projectile, due to the force and direction of the wind, and due to the travel of the target in the time of flight of the projectile.

Since it will be impracticable to shift the telescope-sight through one hundred and eighty degrees in order to adjust this for the travel of the target, it will become necessary to point the gun at the target by training, then to follow the target by turning the screw D^4 for the time of flight of the projectile at that range, and then move the bar H^3 through twice the distance already shifted, but in the opposite direction. Thus if the bar H^3 has been moved through five divisions to the right while following the target it should be shifted through ten divisions to the left, when the sight will be set in the proper direction ahead of the target.

For further convenience in shifting the sight the heads or scales may be marked "carries shot left," "carries shot right," "from left," "from right," "right to left," "left to right," or any other equivalent terms.

It will thus be seen that we have provided a simple and efficient sight by means of which errors in elevation and in lateral deviation may be corrected without any mathematical calculation and without requiring more than average intelligence on the part of the gunner.

For convenience in stating our claims we will refer to the parts H and H^3 as the "eyepiece," meaning by this term the piece next the eye which determines the line of sight.

It will be obvious that various modifications might be made in the herein-described apparatus which could be used without departing from the spirit of our invention. Thus while we have shown a telescopic sight and the rear sight of a tangent sight it will be evident that the same idea might be applied to adjusting the well-known helical scale on a sight-drum or the well-known spiral scale on a plane surface.

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

1. In a sight for guns, the combination with a sight-bar, of a plate adjustably connected to said bar and carrying a scale registering with an index on said bar, whereby correction may be made for errors in elevation, substantially as described.

2. In a sight for guns, the combination with a sight-bar, of a plate adjustably connected to said bar and carrying a scale registering with an index on said bar whereby correction may be made for errors in elevation, and a frame carried by said bar with laterally-movable slides mounted thereon, whereby correction may be made for lateral errors, substantially as described.

3. In a sight for guns, the combination with a sight-bar and a reversible frame mounted thereon, of a laterally-movable eyepiece, and of a plurality of slides each independently adjustable and moving said eyepiece all mounted on said frame, substantially as described.

4. A sight for guns, comprising a sight-bar, a frame mounted thereon and means for rotating said frame through one hundred and eighty degrees on said bar, a plurality of slides mounted on said frame and each independently movable and each capable of adjusting the line of sight, with means for moving said slides separately, substantially as described.

5. In a sight for guns, the combination with a sight-bar, of a plate adjustably connected to said bar and carrying a scale registering with an index on said bar whereby correction may be made for errors in elevation, a frame carried by said bar with laterally-movable slides mounted thereon, whereby correction may be made for lateral errors, and means for rotating said frame through one hundred and eighty degrees on said bar, substantially as described.

6. In a sight for guns, the combination with a sight-bar and a reversible frame mounted thereon and a spring-catch for holding said frame in the desired position on said bar, of a laterally-movable eyepiece, of a plurality of slides each independently adjustable and moving said eyepiece all mounted on said frame, substantially as described.

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

ELMER W. HUBBARD.
SAMUEL C. VESTAL.

Witnesses to signature of Elmer W. Hubbard:

H. H. KIMBERLY,
J. S. PINKETTE.

Witnesses to signature of Samuel C. Vestal:

ZACH. A. WOODRUFF,
T. W. WINSTON.