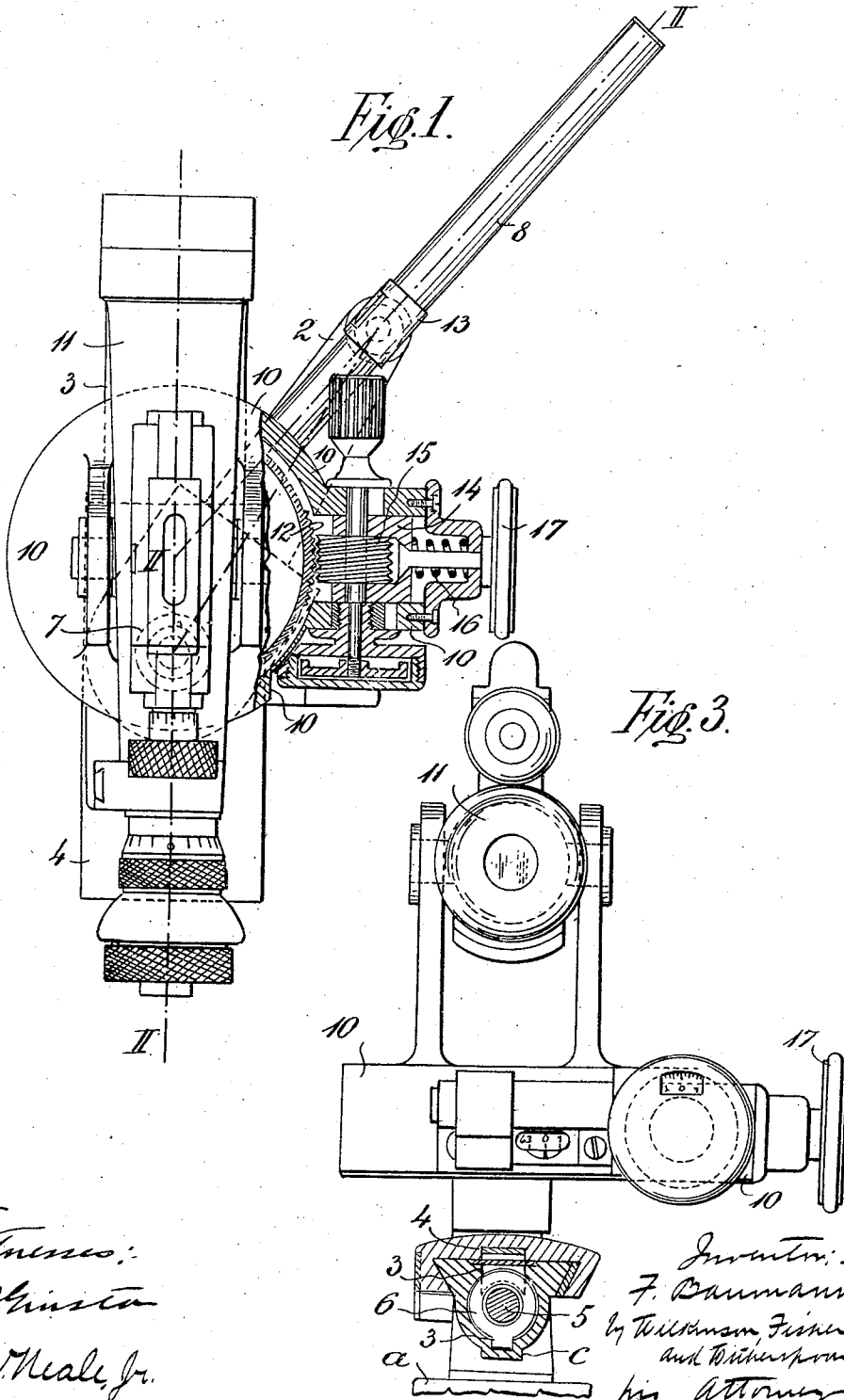


No. 869,129.

PATENTED OCT. 22, 1907.

F. BAUMANN.  
RANGE AND AZIMUTH FINDER.  
APPLICATION FILED MAY 31, 1907.

3 SHEETS—SHEET 1.



Witnesses:  
J. H. H. H.  
A. W. H. H.

Inventor:  
F. Baumann  
by William Fisher  
and Dickinson  
his Attorneys

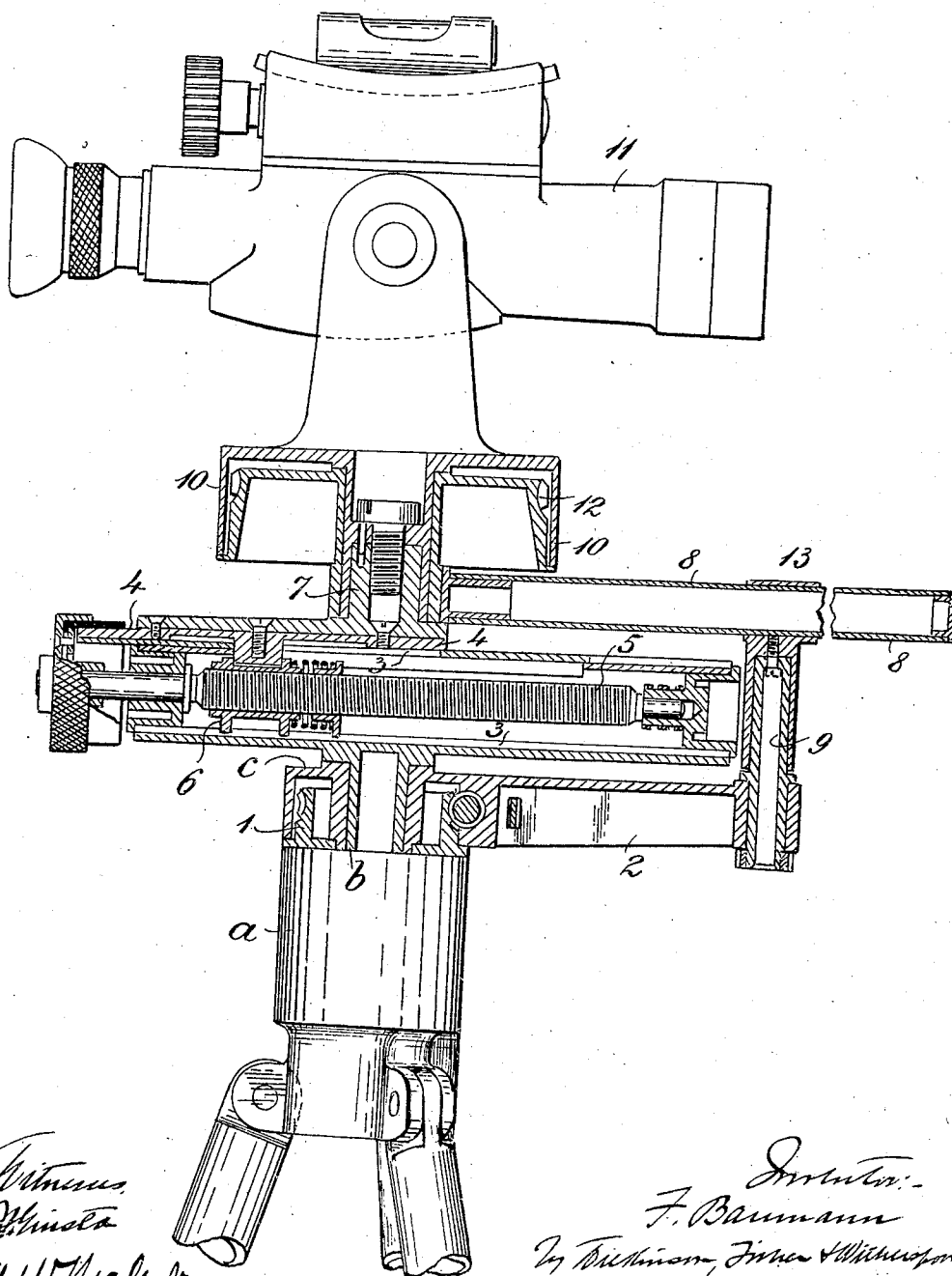
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3 SHEETS—SHEET 2.

*Fig. 2.*



*Witnesses:*  
*J. H. H. H.*  
*A. W. H. H.*

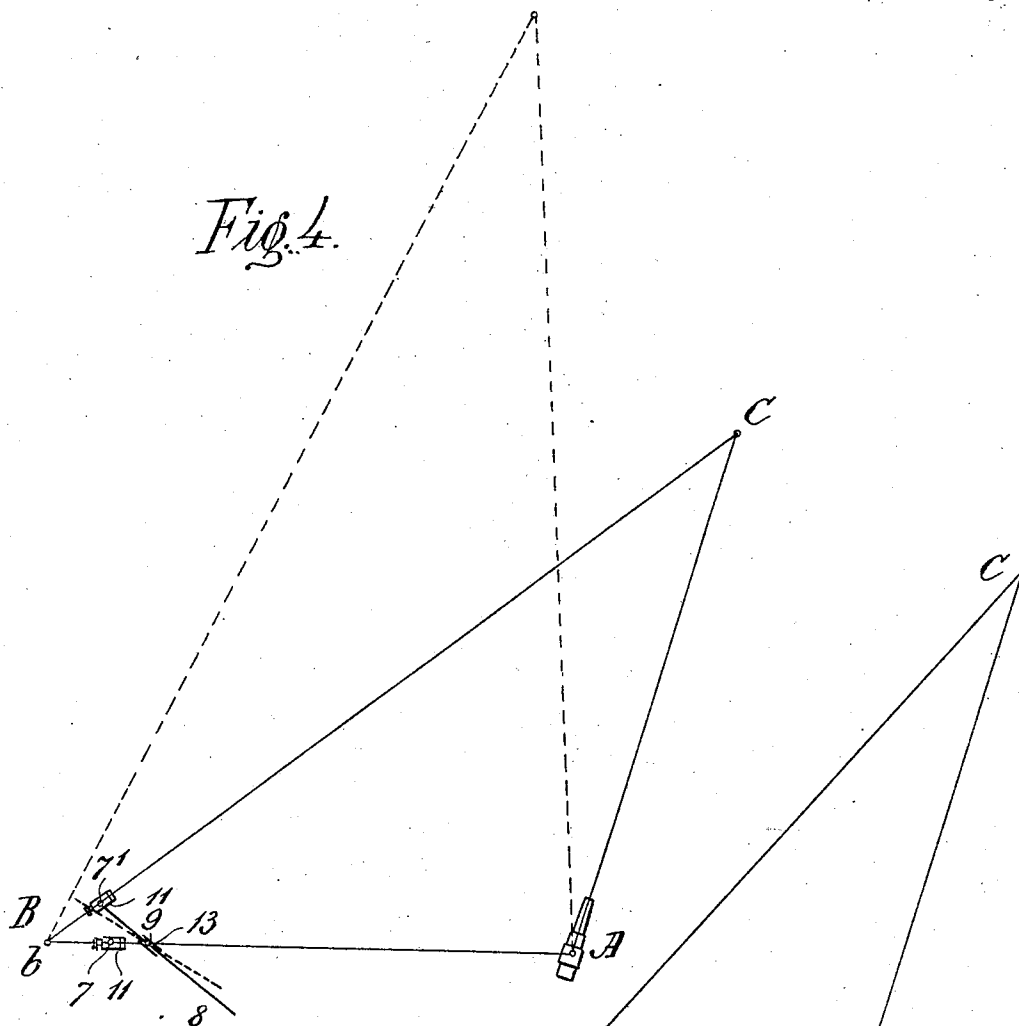
*Inventor:*  
*F. Baumann*  
*By Dickinson, Jones & Willardson*  
*his Attorneys*

No. 869,129.

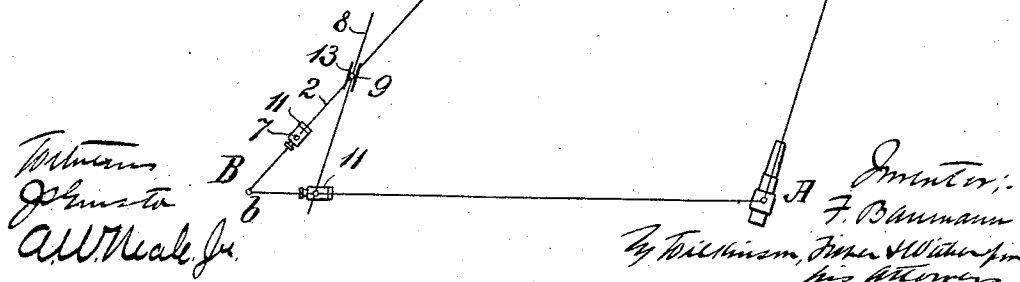
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3 SHEETS—SHEET 3.



*Fig. 5.*



# UNITED STATES PATENT OFFICE.

FRANZ BAUMANN, OF VIENNA, AUSTRIA-HUNGARY.

## RANGE AND AZIMUTH FINDER.

No. 869,129.

Specification of Letters Patent.

Patented Oct. 22, 1907.

Application filed May 31, 1907. Serial No. 376,595.

*To all whom it may concern:*

Be it known that I, FRANZ BAUMANN, a subject of the Emperor of Austria-Hungary, residing at Vienna, Empire of Austria-Hungary, have invented certain new and useful Improvements in Range and Azimuth Finders; 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 apparatus for determining the laying angles for guns for indirect firing which I call a range and azimuth finder.

The object of my invention is to so construct an apparatus of this class which is compact, efficient and exact and simple in construction and use.

In the accompanying drawing: Figure 1 is a plan view partly in section of my improved apparatus. Fig. 2 is a section on the line II, II, II Fig. 1, the position of the parts being different from that shown in Fig. 1. Fig. 3 is a front elevation partly in section of my improved apparatus. Figs. 4 and 5 are diagrams illustrating the manner of using the improved apparatus.

*a* is a tripod or other suitable standard for the apparatus, *b* is a vertical pivot carried by such standard, 1 is a sleeve adapted to turn round and to be locked in position relatively to said pivot, 2 is a bracket rigidly secured to this sleeve and *c* is a frame free to turn in the sleeve, the axis of rotation of the frame coinciding with the axis of the pivot *b*.

3 is a horizontal guide in the frame, the longitudinal axis of this guide intersecting the axis of the pivot *b*.

4 is a slide movable along the guide, 5 is a screw spindle adapted to revolve in, but locked against longitudinal movement relatively to the guide.

6 is a nut secured to or integral with the slide and engaging the said screw spindle.

7 is a journal pin rigidly secured to the slide 4 or integral therewith and 10 is a casing rigidly secured to the upper end of such journal pin and carrying on its upper

side a suitable sighting device such as a telescope 11, the optical axis of such sighting device being in the vertical plane passing through the longitudinal axis of the guide 3. A worm wheel 12 is free to revolve round the journal pin 7 and is rigidly connected with an arm 8 which

serves as a guide for a sleeve 13 adapted to turn freely round a vertical pin 9 journaled in the outer end of the bracket 2. In the casing 10 there is provided a block 14 in which a worm 15 is journaled that is adapted to mesh with the worm wheel 12. The block 14 is preferably adapted to slide radially to the axis of the worm wheel 12 and is normally forced inwards by a spring 16 whereby the worm 15 is held in engagement with the worm wheel 12.

17 is a button by which the block 14 may be drawn outwards against the action of the spring 16 for disengaging the worm from the worm wheel.

The operation of the apparatus is the following: Assuming that a gun mounted at the point A, Fig. 4 is to fire at a target C, not visible from A and that B is a point from which the gun and the target are visible and that the laying angle for the gun has to be determined from the point B. I first so adjust my apparatus at the point B that the pivot *b* is vertical and that the bracket 2, the guide 3, the sighting device 11 and the arm 8 point all directly towards the gun A. I then so move the slide 4 by means of the screw 5 that the distance between the axes of the journal pin 7 and pivot *b* is in the same ratio to the distance between the pivot *b* and the pin 9 as the known distance AB to the known or estimated distance BC. For the purpose of determining the adjustment of the slide 4, the proper distance is noted on the frame *c*. I then lock the sleeve 1 on the pivot *b* so that the bracket points towards the gun that is to say the pin 9 is in the line AB. The arm 8 on the one hand and the frame *c* with the guide 3, the slide 4 and the sighting device 11 on the other hand, then constitute a device somewhat resembling a fly press stretched out straight in which the pivot *b* and the pin 9 are the bearing points and the journal pin 7 is the turning joint. I then turn the worm 15 by hand whereby the worm wheel 12 is turned relatively to the casing 10 whereby an angle is set up between the arm 8 rigidly connected to the worm wheel 12 on the one hand and the guide 3 and the optical axis of the sighting device 11 that are rigidly connected to the journal pin 7 or in other words the arms of the fly press above referred to are turned the one relatively to the other. In consequence thereof the joint of the fly press that is to say the journal pin 7 must move out of the straight line connecting the bearing points *b* and 9 of such fly press and the frame *c* together with the guide 3 and the sighting device 11 must turn round the pivot *b* while the arm 8 turns round the pin 9 and moves along the sleeve 13. I continue to turn the worm 15 until the sighting device 11 together with the frame *c* point directly to the target C and the journal pin 7 comes into the position 7', Fig. 4. I thus obtain in the apparatus a triangle *b, 7', 9* which is similar to the triangle BAC as angle ABC is equal to angle, 9, *b, 7'* and owing to the adjustment above described  $b7':b9=BA:BC$ ; therefore angle *b, 7', 9* must be equal to angle BAC. The angle *b, 7', 9* or its supplement that is to say the angle through which the worm wheel 12 has been turned may be directly determined by reading on the worm wheel, by means of an index or point on the casing 10, in any well known manner; preferably also the worm 15 is provided with a disk with a scale for per-

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mitting to read by means of a fixed index, fractions of a complete revolution of the worm. Preferably I so arrange the scales that when the fly press above referred to is stretched out straight as on sighting the gun the indices of both scales point to zero. I then can directly read the sought angle BAC on the scales above referred to. If now the target changes its position or if another target has to be fired at, all that has to be done is to turn the worm 15 until the sighting device 11 points directly to the target in its fresh position or to the fresh target respectively and if necessary to adjust the journal pin 7 by means of the screw 5 in accordance with the fresh distance of the target from the point 13, as indicated in dotted lines in Fig. 4.

I can measure on the arm 8 the length of the side 9, 7' of the triangle above referred to. By multiplying this side 9, 7' by the known factor  $BA:b7'$  or  $b9:BC$  the distance AC that is to say the firing range may be determined. In this way I can determine the laying angle and the elevation necessary for the gun to hit the target.

I can use my apparatus in the manner shown in Fig. 5. That is to say I first direct the sighting device 11, the frame *c* and the bracket 2 to the target and so adjust the journal pin 7 that  $BA:BC=b7:b9$ . I then turn the worm wheel 12 by means of the worm 15 until the sighting device 11 is directed to the gun. The angle through which the worm wheel has been thus turned and which may be directly read as above indicated then gives the laying angle for the gun and the length of the line 9, 7' gives the firing range. I prefer however to use the apparatus as described with reference to Fig. 4, because I then can keep the sighting device pointing to the target during all the time of shooting.

For rapidly returning the apparatus into the normal position in which the fly press 8, 7, *c* is stretched out flat, the worm 15 is drawn back by means of the button 17 so that it comes out of gear with the worm wheel and

the arm 8 and the frame *c*, may be turned directly the one relative to the other.

#### Claims

1. In an apparatus for determining the laying angle for guns for indirect firing in combination with a support, a sleeve adapted to turn round a vertical axis in such support and to be locked in position relatively to the same, a frame adapted to turn around the same vertical axis relatively to the sleeve, a bracket rigidly secured to such sleeve, a vertical pin adapted to turn in such bracket, a slide adapted to move along the said frame on a line intersecting the said vertical axis, means for moving the slide along the said frame, a journal pin rigidly secured to such slide and projecting upward vertically from the said frame, a sighting device rigidly secured to the said journal pin, an arm adapted to turn around the said journal pin and engaging with and guided by the said vertical pin, and means for turning the said frame relatively to the arm, substantially as and for the purpose described.

2. In an apparatus for determining the laying angle for guns, for indirect firing in combination with a support, a sleeve adapted to turn round a vertical axis in such support and to be locked in position relatively to the same, a frame adapted to turn around the same vertical axis relatively to the sleeve, a bracket rigidly secured to such sleeve, a vertical pin adapted to turn in such bracket, a slide adapted to move along the said frame on a line intersecting the said vertical axis, means for moving the slide along the said frame, a journal pin rigidly secured to such slide and projecting upward vertically from the said frame, a sighting device rigidly secured to the said journal pin, an arm adapted to turn around the said journal pin and engaging with and guided by the said vertical pin, a casing rigidly secured to the journal pin, a worm journaled in such casing, a worm wheel concentric to the journal pin and rigidly connected to the said arm and adapted to mesh with the said worm and means for turning this worm, substantially as and for the purpose described.

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

FRANZ BAUMANN.

Witnesses:

ARTHUR BAUMANN,  
ROBT. W. HEINGARTNER.