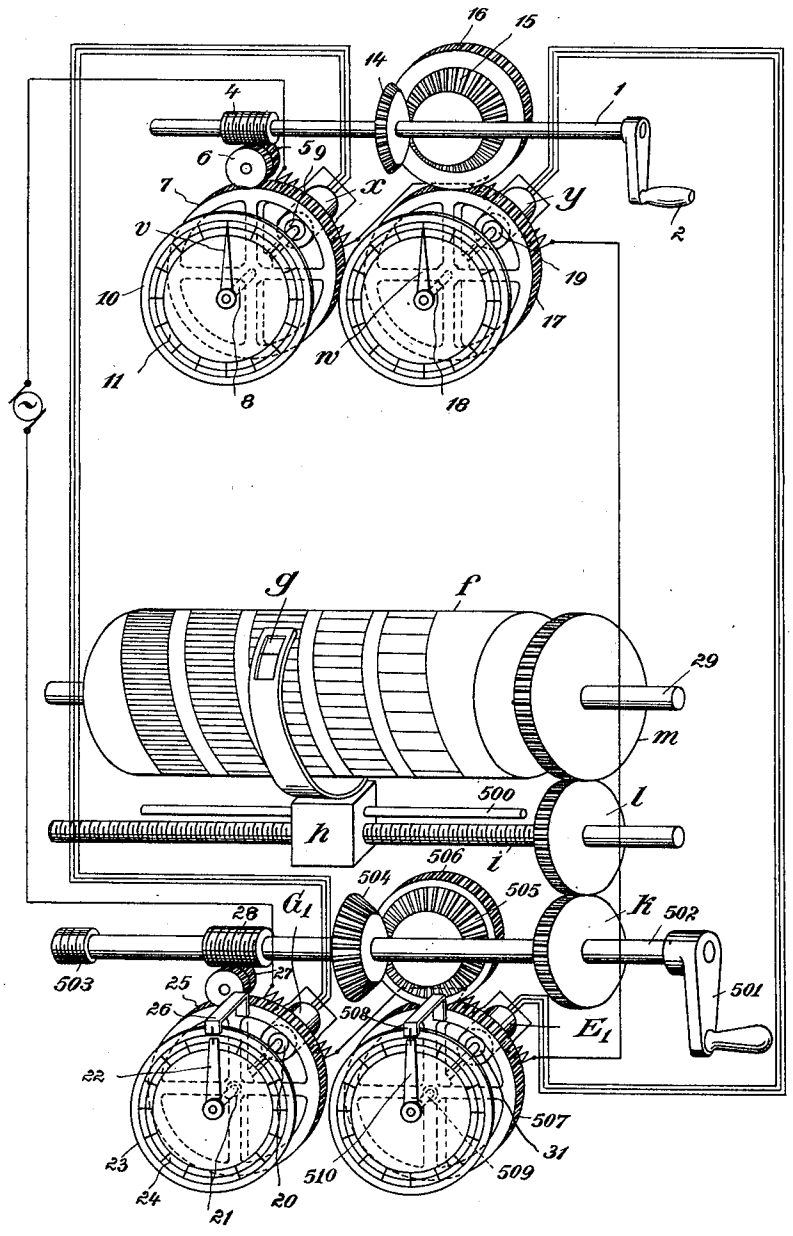
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ELECTRIC SIGNALING SYSTEM

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ELECTRIC SIGNALING SYSTEM.

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To all whom it may concern:

Be it known that I, PAUL KAMINSKI, a citizen of the German Empire, residing at Berlin-Pankow, Germany, have invented certain new and useful Improvements in Electric Signaling Systems (for which I have filed an application in Germany on October 17th, 1916, Serial No. S. 45,895, Patent No. 330,625), of which the following is a specification.

My invention relates to electric signal systems embodying transmitters and receivers for coarse and fine adjustment and a scale with unequal graduations at the receiving station.

Follow-the-pointer systems are known, by means of which accurate adjustments on guns,—e. g., of the sighting arrangement of guns are effected by pointers or systems connected with the gun and controlled electrically from a central control station, whilst during the setting of the sighting device by hand, other pointers or systems are moved, which are made to follow the electrically controlled pointer or system.

With such arrangements it is also possible to effect the adjustment of the gun proper or its sighting device and the following pointer or system not by hand operation but, for instance, by means of a motor, the circuit of which is closed selectively by contacts, two of which are provided on the following system, and one on the pointer controlled electrically from the central control station, such as has been described for instance in my patent application Serial No. 468,966, filed May 12th, 1921. In order to enhance the accuracy of such installations, the transmission from the central control station is preferably effected through two systems of transmitters representing coarse and fine adjustment which transmitters are coupled together through a train of gears in such a manner that the fine system makes several revolutions during the period when the coarse system performs one revolution. Double systems coupled together in the same ratio must also be provided at the electric receiving stations at the guns and on the following pointers or following systems depending upon the position of the guns. With such arrangements it is only necessary, in order to accomplish the desired adjustment of the gun, to cause the following pointers or following systems depending upon the position of the gun, to register with the pointers controlled electrically from the distant central control station, without the angle of inclination or the range having to be read off. According to the theory of ballistics, however, the angle of inclination necessary for a gun to hit the target, increases more rapidly than the linear range of the target; hence the receiver system may either be subdivided according to "angles of inclination" or according to "range of the target." As the adjusting device of the sighting telescope sets equal values of angles on the sighting device for equal distances through which it passes, it is favourable from the point of view of accuracy of the transmission of the transmitter movement, to cause also the receivers and, at the same time the transmitters of the following pointer systems, to pass through equal distances for equal angles of inclination of the gun. In this case, a uniform division on the transmitters and receivers will consequently represent "angles of inclination of the guns." In this manner, however, it becomes difficult to indicate by means of the same apparatus also the range of the target, which may be required at the gun for other purposes, this range not increasing uniformly in proportion to the values of the angles. For instance, it might well be possible to provide the coarse system with a non-uniform division for the "range of the target," but for most purposes this scale would not be sufficiently accurate. It would be out of the question, for increasing the accuracy, to resort to the fine system because, as for each revolution of the fine system different distances must be covered on the varying scale of the coarse system, the fine system would have to be subdivided differently for each revolution.

The object of this present invention is to overcome these difficulties and to render possible accurate reading of the range at the gun, notwithstanding the subdivisions on the transmitter being made uniform so as to register the inclination.

Besides the setting device being based on the follow-the-pointer principle or similar arrangements provided in a coarse and fine

adjustment system, this object is accomplished by an indicating drum-scale or the like having a non-uniform graduation for accurate reading and this indicating drum being coupled to the drive of the following pointers through a corresponding train of gears.

In the drawing an example is represented diagrammatically showing how this invention may be carried into effect.

In the drawing, x represents the electrical transmitter of the main or coarse adjustment system and y that of the fine adjustment system. G_1 is the receiver of the main system and E_1 that of the fine system. The stators of the transmitters and receivers are connected in series to a common source of alternating current. The rotors of the main system of the transmitters are connected to the rotors of the main system of the receivers and the rotors of the transmitters of the fine system with corresponding receiver rotors by means of a three phase system as known in the art. The spindle 1 supported in the casing (not shown) of the transmitter may be turned by means of a hand-crank 2, thus turning the worm 4. This worm 4 rotates a worm wheel 5 and, simultaneously a gear wheel 6 which is mounted together with the worm wheel 5 on a common shaft supported in the casing of the apparatus. This gear wheel 6 engages a gear wheel 7. The latter gear wheel 7 is fixed upon a shaft 8 supported in the apparatus casing, shaft 8 carrying at one end, the rotor 9 of the main system and at its other end the pointer v. The pointer v moves about a fixed scale 10 on the apparatus casing which is provided with a uniform division, e. g. according to degrees of inclination. Similarly the shaft 1 turns the shaft 18 by means of the bevel gears 14 and 15, and spur gears 16 and 17 but with a transmission ratio different from the main system containing pointer v. The shaft 18 turns the rotor 19 of the fine transmitter y and the pointer w which moves over a corresponding scale 12. In this manner, by turning the hand crank 2 of the transmitter arrangements, the transmitter rotors 9 and 19 are angularly displaced relative to their stators by a certain amount. The rotor 20 in the receiver system of the main system and rotor 31 of the fine receiver system are thus adjusted by the same amount respectively. The rotor 20 is fastened upon a shaft 21 which is likewise supported in the apparatus casing and which carries a pointer 22 moving over a graduation 24 of a scale 23 supported in the apparatus casing. The gear wheel 25 is mounted freely rotatable on the shaft 21 and carries a following pointer 26 which also sweeps over the scale 23. The gear wheel 25 is rotated corresponding to the indications of pointer 22 by gear wheel 26, worm gear 27 and the worm 28. Worm 28 is mounted upon a shaft 502 supported in the apparatus casing and may be rotated by the hand crank 501. This shaft carries at its free end a worm 503 or other suitable means which the desired adjustment of the object itself, not shown on the drawing may be effected. The construction of the fine receiver corresponds with the one just described. The shaft 509 and the pointer 510 are moved by the rotor 31. The following pointer 508 is fastened to the gear wheel 507 which is freely rotatable on shaft 509 and is likewise operated by the shaft 502 by means of gear wheel 506 and bevel gears 505 and 504. By turning the crank 501, therefore, on the one hand the following pointers are made to register with the receiving pointers and, on the other hand through the worm 503 the desired movement is also transmitted to the objects to be adjusted. Fixed to the shaft 502 is the gear wheel k which by means of gear wheels l and m turns the spindle 29 supported in the apparatus casing. The shaft 29 carries a drum f, which is graduated according to the range of the target. As the adjustments on the transmitter are to transmit the angular values of the inclination, whereas the linear range does not increase uniformly with the angle of inclination, this graduation must not be uniform. The index g sweeps drum f and is supported by a screw block h. The block h is prevented from turning by guide rod 500 supported in the apparatus casing and block h is operated by the screw spindle i, likewise supported in the apparatus casing the spindle being rotated through the aforementioned gear wheel l which is mounted on it. By turning the crank 501, therefore, the drum f is also turned at the same time and the index g is axially moved over it so that the range of the target may be read off.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:—

1. In an electrical arrangement for the tele-control of guns having coarse and fine adjustment according to the follow-the-pointer principle, electrically operating transmitters having pointers and uniformly divided scales therefor to indicate jointly the desired angular amount of the inclination of the gun, a control means for adjusting said transmitters, electrically operating receivers connected to said transmitters and having corresponding indicating pointers for indicating the position of the transmitter pointers, an adjusting device adapted to move the gun and having following pointers and adapted to simultaneously cause the following pointers to coincide with

said indicating pointers, in combination with means operated by said adjusting device for indicating at the receiver the range increasing non-uniformly with the inclination of the gun.

2. In an electrical arrangement for the tele-control of guns having coarse and fine adjustment according to the follow-the-pointer principle, electrically operating transmitters having pointers and uniformly divided scales therefor to indicate jointly the desired angular amount of the inclination of the gun, a control means for adjusting said transmitters, electrically operating receivers connected to said transmitters and having corresponding indicating pointers for indicating the position of the transmitter pointers, an adjusting device adapted to move the gun and having following pointers and adapted to simultaneously cause the following pointers to coincide with said indicating pointers, in combination with a scale, non-uniformly graduated according to the non-uniform variation of the range relatively to the inclination and a reading mark for said scale, and means operated by said adjusting device, for operating said scale and reading mark to indicate the value of the range relative to the value of inclination indicated at that time.

In testimony whereof I affix my signature.

PAUL KAMINSKI.