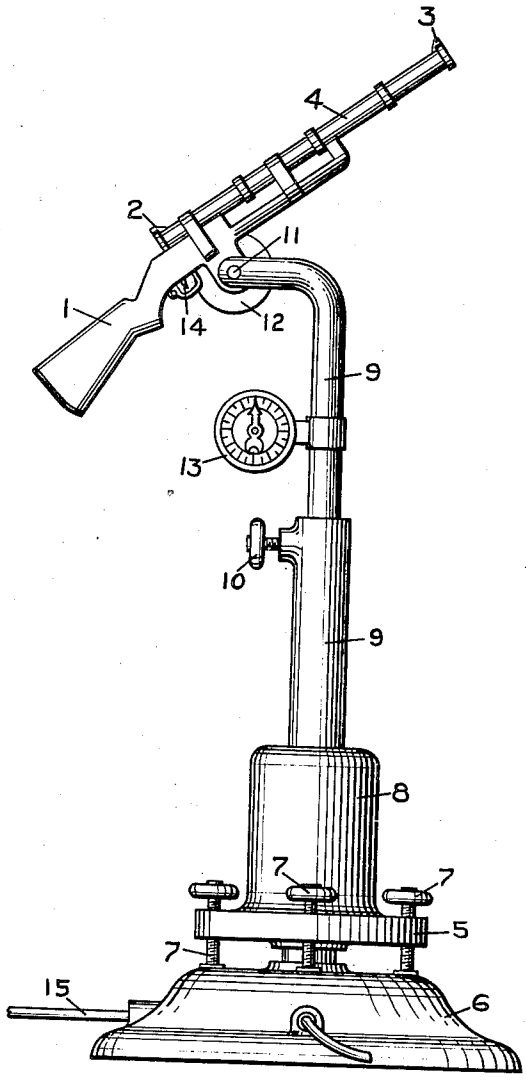
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FIRE CONTROL INSTRUMENT

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FIRE CONTROL INSTRUMENT

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1 Claim. (Cl. 33—69)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to an improved method of and apparatus for the control of gunfire.

Present systems of fire control, which have been most effective against fixed targets or those moving on courses susceptible to prediction of future positions, appear to be too slow and cumbersome in their operation to effectively combat at relatively short ranges equipment moving at high rates of speed, on erratic courses, or through media which render them but momentarily visible.

Dive bombers and other low flying aircraft swoop down and are gone before guns can be brought to bear upon them and tanks and armored cars may appear but momentarily on the horizon. Even if time were available for the ordinary operations of data computation, transmission of such data, and setting off of the same at the firing position, such time could be used to much better advantage in getting shell in transit target ward.

Present systems require the cooperation of a number of men in the various operations of fire control. The coordination of the efforts of two or more men can never equal the responsiveness of an individual to the stimulus of an emergency.

It is therefore an object of this invention to provide a system of fire control of great flexibility and one which is immediately and completely responsive to the control of a single individual.

It is a further object to provide a fire control system which reduces to a minimum the number of men required to be exposed to the hazards of battle.

The specific nature of the invention as well as other objects an advantages thereof will clearly appear from a description of a preferred embodiment as shown in the accompanying drawing in which the single figure is a side elevational view of a fire control unit constructed according to my invention.

Referring to the drawing by characters of reference there is shown in the figure a fire control instrument in which are included a sighting device and data transmitters of the "Selsyn" or other convenient type for causing the components of the motion of the sighting device to be duplicated by repeaters at the gun position. Preferably the gun will be provided with control equipment which will automatically cause the gun to move in synchronism with the movement of the repeaters. The system described herein can, however, be similarly applied to control the movements of the data receivers in certain "follow the pointer" systems of manual gun operation now in existence.

Most of the sighting devices now in use are moved across their field of view by gear mechanisms which require that the components of the motion given to the sight be imparted by separate handwheels controlling vertical and lateral movement of the sight. This analysis of target motion requires in some cases the services of two observers and in all cases a high degree of coordination and skill on the part of the observer. In contrast to this process there should be considered the inherent tendency in most individuals to point directly to an object in space, or if supplied with a conventional firearm, to take an accurate bead on such an object and follow it through space. The arrangement of sights and the shoulder stock of an ordinary rifle contribute to the accuracy and stability with which a target may be followed by this means. Recognizing this tendency the sighting device of this application has been designed to closely resemble a conventional firearm and to be free for universal movement in any plane in response to the motion of the target in space, permitting the target to be followed in the most natural manner.

Specifically the sighting device comprises a shoulder stock 1, open sights 2 and 3, and a telescopic sight 4. The telescopic sight is mounted in the same relation to the stock as is the barrel of the ordinary firearm and the open sights are mounted thereon in the usual manner. The purpose of the open sight is to assist in locating the target in space to enable it to be quickly picked up in the field of the telescope which is preferably of sufficient power and has a sufficiently wide field of view to function as an observing instrument as well as a sight. To assist in observation the telescope may be made in dual form to allow stereoscopic vision and facilitate perception of depth.

In order to provide a steadying rest for the sighting device and to make it possible to analyze the motion of the sighting device a stand having a base 5 and a relatively heavy sub-base 6 has been provided on which the sight may be mounted for universal movement. Levelling screws 7 between the base 5 and sub-base 6 make it possible to level the base regardless of irregularity in the ground or platform upon which the sub-base rests. The stator of a "Selsyn" or like transmitter 8 is mounted on the base 5. A vertical ex-

tension 9 of the rotor shaft of the transmitter 8 may be provided with height adjusting means 10 to suit the convenience of the observer. At the upper end of the member 9 a lateral offset is formed and a shaft 11 is journaled therein. The shaft 11 is connected at one end to the rotor shaft of a second transmitter 12, the stator of which is secured to the offset portion of the member 9. The sighting device is connected to the shaft 11 for rotation therewith in a vertical plane. Movement of the sighting device through an angle will be analyzed by the rotation of the shaft 11 of the transmitter 12 into the component of elevation and by the rotation of the shaft 9 of the transmitter 8 into the corresponding component of azimuth. The transmitter 8 will hereinafter be called the azimuth transmitter and the transmitter 12 will be called the elevation transmitter. The azimuth and elevation transmitters will control repeaters at the gun position which in turn control the azimuth and elevation of the gun whereby the gun may be maintained in parallel relation to the sighting device. While the elevation and azimuth transmitters have been described as being single units it should be recognized that each unit will preferably consist of a "coarse" and a "fine" transmitter geared together in 16 to 1 ratio, the "coarse" transmitter making one revolution for each 6,400 mils of angle transmitted while the "fine" transmitter makes one revolution for each 400 mils of angle transmitted. Such an arrangement serves to greatly increase the accuracy of transmission. A fuse data transmitter 13 may be mounted on the member 9 in a convenient location to allow changes in fuse range to be transmitted to a suitable indicator at the gun position or to an automatic electric fuse setter. An electric firing trigger 14 is mounted on the stock in the conventional location to govern the initiation of the firing cycle of the gun which will be preferably fully automatic in operation. A control cable 15 leads from the control unit to the gun position.

The system described herein finds its greatest utility within the zones in which the trajectory is practically flat, and time of flight is sufficiently short to permit an experienced "wing" shot to estimate the required lead. It is within such "point-blank" ranges that high speed fighting craft are most destructive and it is within this zone that conventional systems of fire control are virtually useless. In the event, however, that it is desired to use this control system at greater ranges means may conveniently be supplied by which the angular relation between the sighting device and the gun may be varied to account for the elevation required at greater ranges and for the changes in azimuth necessary to have proper lead due to increased time of flight at greater ranges. Such corrections may preferably be applied by varying the angular relation between the line of sight or telescope axis and the rotors of the data transmitters.

Obviously this type of fire control unit can be applied to guns on stationary or portable mounts, to search lights or similar apparatus.

Preferably the fire control unit will be located as near the gun position as practicable to minimize the effect of parallax. A further advantage may be gained from mounting both gun and fire control unit on the same platform, this advantage being that variations in level due to derangement of the platform during firing will be applied similarly to each unit and will not interfere with the synchronism thereof.

When such a system is used with a gun provided with automatic control of azimuth and elevation, equipped for automatic fuse setting and capable of sustained fire from a magazine or other mechanical loading device it will be seen that the chance for errors due to the human factor involved in most teamwork operations is minimized. All of the operations will be controlled in a simple, natural manner by one observer and only that observer and the personnel required to replenish the supply of ammunition in the magazine need be exposed to hostile fire.

I claim:

A fire control instrument comprising a base, an azimuth transmitter having a stator and a rotor having a protruding shaft, the stator of said transmitter being secured to said base and the rotor shaft of said transmitter being extended upwardly normal to said base, an elevation transmitter having a stator and a rotor having a protruding shaft, the stator of said elevation transmitter being secured to the upper end of said extended shaft with the rotor shaft of said elevation transmitter normal to said extended shaft, and a sighting telescope having open sights thereon mounted on the rotor shaft of said elevation transmitter for rotation therewith through a plane normal thereto, and a shoulder stock also mounted on said rotor shaft and secured to the rear portion of the telescope for the direction thereof.

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