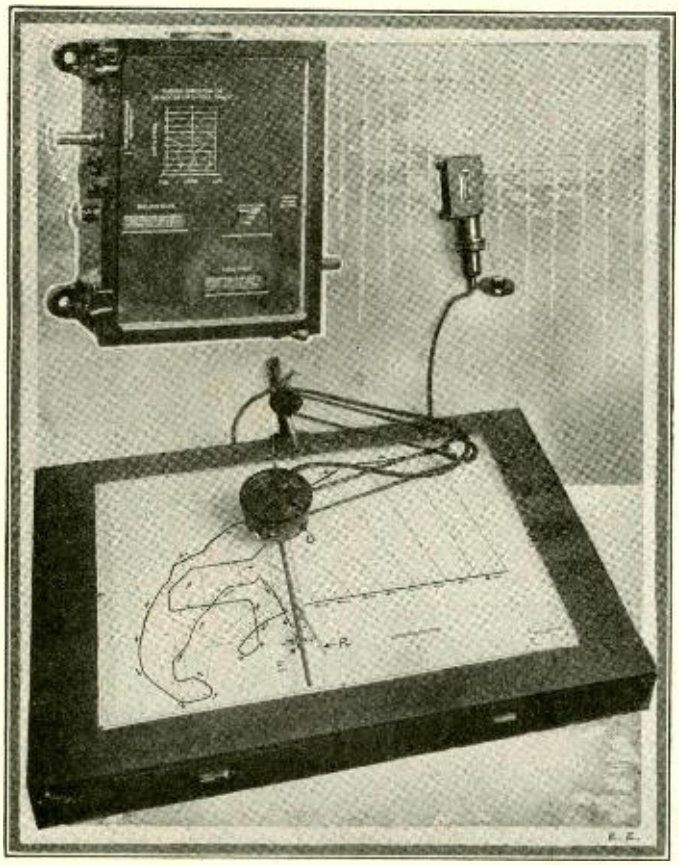
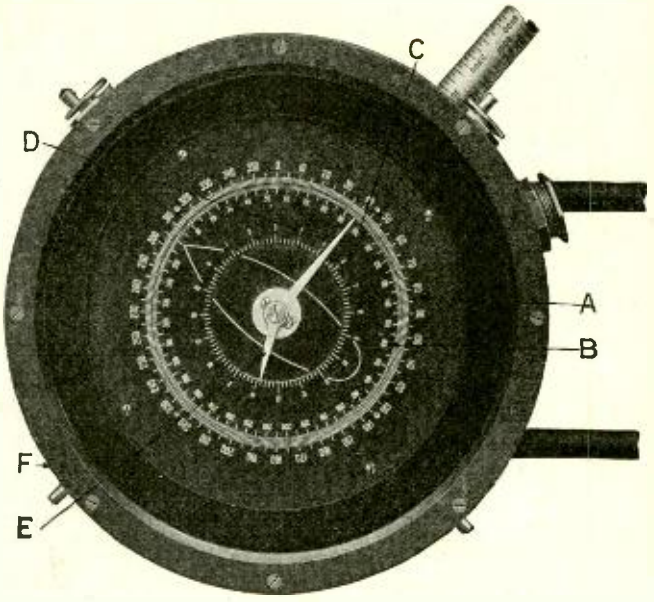
The Battle Tracer



The Sperry "Battle Tracer" Complete, and Also Revolution Converter and Auxiliary Range Transmitter. The "Battle Tracer" Records the Course Followed by their Own as Well as the Enemy Ship. E is the Enemy Arm Tracer and R, the Range Predictor.



Close-Up View of the Battle Tracer Motor Head, Thru Which the Graduated Enemy Arm Passes. This Connects With the Various Range Finding and Spotting Apparatus on the Vessel.

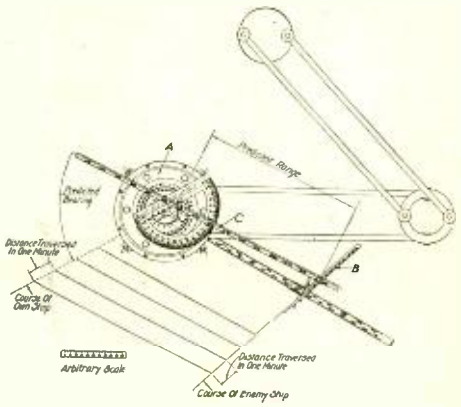


Diagram Showing How Range Is Computed Directly from "Battle Tracer" Plottings So That Guns Can Be Aimed Ahead of Time, to Hit the Enemy Ship, by "Prediction."

"YES, Captain, she was traveling at 18 knots; we were slowly closing in on her, and when 14 miles away we opened fire."

"The shells from the very first salvo struck her squarely amidship and blew her super-structure off——." Thus continued the gunnery officer's report of the Naval engagement just completed in which the very first shots found the enemy and silenced their guns before they had a chance to reply.

It is truly remarkable to think that not even a "finder" shot had been fired. In this case there was no need of firing the guns and wasting the big shells in order to get a "bead" on the fugitive vessel.

The vessel's range was computed to absolute accuracy and predetermined in time for the guns to be set and fired. All this computation with the aid of the device here mentioned *required but* 19 *seconds*, reducing thereby, past calculations several hundred per cent.

What is this remarkable equipment, you will ask. Essentially, it consists of a number of devices all working in conjunction with each other. The most important of which, perhaps, is the *Battle Tracer*, as it is called.

The object of the invention, which has proven itself to be of great practical use, is to provide a means whereby the course of our own ship is plotted automatically on a table similar to the table used for plotting navigation courses. In addition, an arm extending from the instrument proper, called the *enemy arm*, keeps track at all times of the enemy's movements. In this way, regardless of what our own ship's speed may be or what the enemy's speed may be, prediction of its probable location, allowing sufficient time for the gunners to change their range, can be made with remarkable accuracy and the guns can be fired so that very few shots will miss the target for which they were intended.

"Suppose the enemy zig-zags," you will say. "Isn't the art of shelling more a matter of mere guess work than of accuracy?" No, dear reader, no! You must remember that a ship eight to nine hundred feet long traveling at 20 knots, or perhaps, even more, cannot steer and squirm away with the same ease as an automobile.

It is not a question of a few seconds, but *minutes elapse* before one of these large floating fortresses can be turned completely in their course, particularly in view of the terrific speeds at which they move. Hence, when a computation is made via the tracer, and guns can be elevated within nineteen seconds, taking the corrected findings as data to work from; it then gives the enemy very little opportunity to change a predicted and predetermined range or bearing.

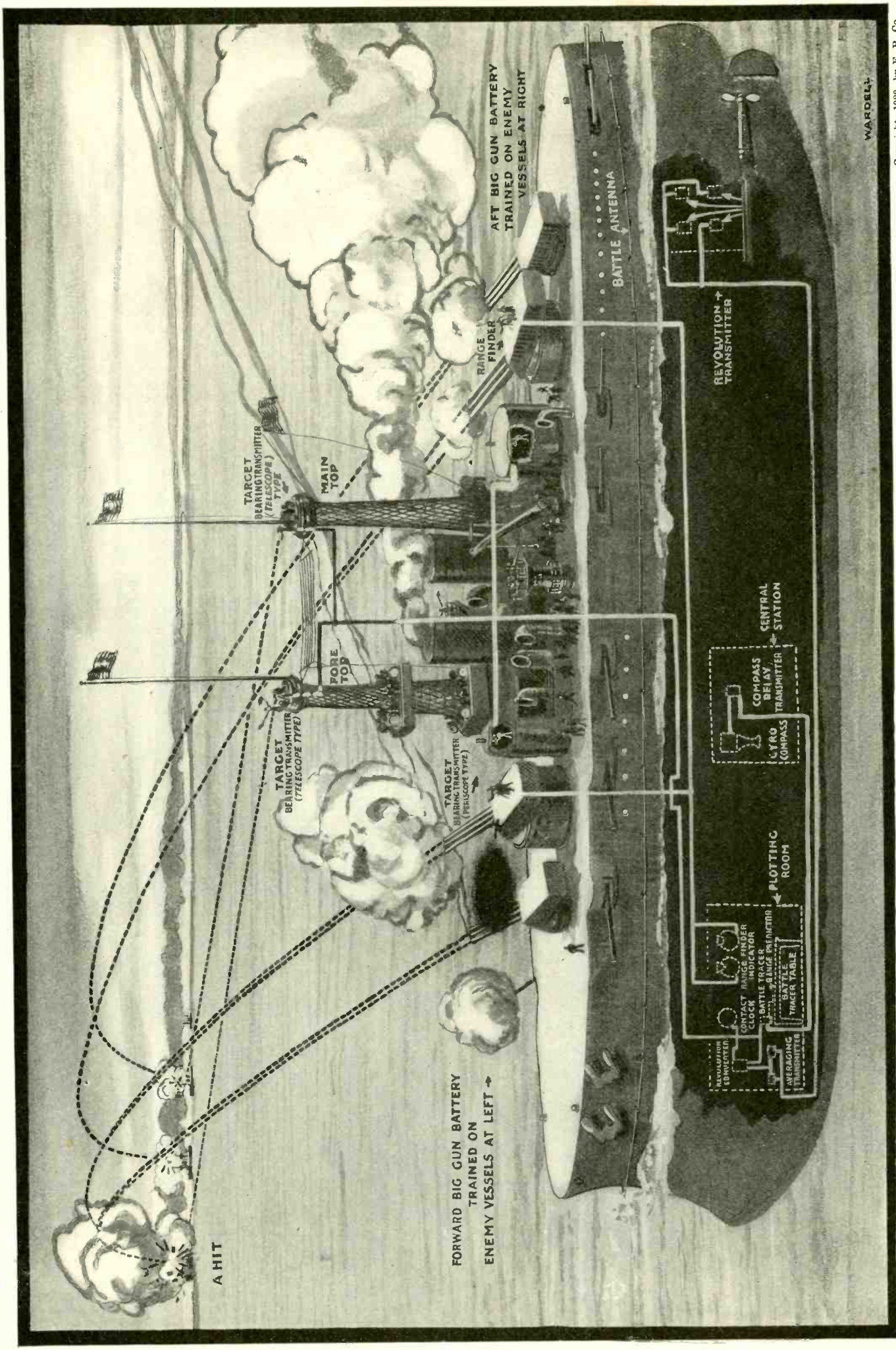
Essentially, the apparatus consists of a cylindrical box about 7 inches in diameter and 5½ inches deep, containing four motors, and necessary gearing. It is mounted upon a tracer table and guided by a system of parallel arms which allow free movement in any horizontal plane, at the same time, however, preventing the Tracer from turning on its axis. This allows the outer dial (A) of the Tracer to be kept in one position continually with reference to the table. (Accompanying letters refer to close-up view of Battle Tracer dials.)

This dial of which we have just spoken, is one of the three dials which perform varied functions. As will be noted, the outer dial is graduated to 360 degrees and is held on the table so that zero of the dial is north on the chart and is always at the upper edge of the table, altho capable of movement in any way except the turning movement.

Just inside of this dial and operating in juxtaposition with it, is another dial (B) similarly graduated but movable. This dial is controlled from the gyro-compass by one of the four motors inside the Battle Tracer head.

A pointer coming from the center of the Tracer head extends to the edge of this dial and the outline of a ship with its bow at zero is also engraved upon it. This pointer (D) which we have just spoken of is connected to the enemy arm and operates in conjunction with it, being moved by another motor connected to the Target Bearing Transmitters. Both the pointer and the enemy arm are capable of complete revolution. This movable dial (B) is mounted upon a movable post, to the bot-

(*Continued on page* 1332)



This Picture Diagram Shows the Location of the Wonderful Electric "Battle Tracer" Now Installed on Uncle Sam's Battle-ships and Which Was Used During the War. With This Device, Which Is Always Installed Well Below The Water Line in a Secret Part of the Vessel, the Ship's Mighty Guns Can Be Trained Ahead of Time So As to Hit the Enemy With Great Accuracy, As He Rushes Thru the Water At 30 Knots Or More Per Hour, At Any Position from The Vessel Which Carries This Equipment. The "Battle Tracer" Proper Comprises a Motor-Actuated Arm, Fitted with a Range "Predictor." All of Which Is Traversed Electro-Mechanically Over a Sheet of Paper Secured to the Top of the Battle Tracer Table. Connected with the Battle Tracer Are All of the Necessary Apparatus for Properly Coordinating the All Important Factors, Such As the Revolutions of the Ship's Screws or Propellers, the Direction of the Target As Recorded by the Men in the "Fighting Tops," Who Are Spotting the Enemy Thru the Telescopes of the "Target Bearing Transmitters," As Well As the Compass Bearings Transmitted to the Device from the Master Electric Gyroscopic Compass. The "Battle Tracer" Performs All of Its Functions in Exactly Nineteen Seconds, When It Is Possible to Telephone Directions to the Men Behind the Guns Just Where to Aim to Hit the Enemy Ship At a Later Point In Her Course. She Might Zig-Zag You Will Say, and Fool the Battle Tracer and Range Predictor, But You Cannot Zig-Zag a Ship 600 Feet Long, or Switch Her Course At 20 to 30 Knots an Hour, As You Would a Baby-Carriage.—and Thus the Battle Tracer Gets in Its Deadly Work.

The Battle Tracer

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tom of which is attached a driving wheel with a perifery of sharp teeth preventing the Tracer from slipping off the table.

When a distant transmitter is actuated, this motor in the Battle Tracer is simultaneously operated, causing the driving wheel underneath the Tracer to move slowly along the table, carrying the Tracer with it. The distance traverst in this way is exactly proportional to the actual distance traverst by the ship itself.

Lines of perforations are made by the teeth of the driving wheel to trace the course of our own vessel. The inner dial likewise is made to turn by a third motor, and the picture of the ship engraved upon it will show the direction in which our vessel is traveling. In other words, the engraved outline of the ship on the movable dial is kept in plane with the rotation of the driving wheel carrying the Battle Tracer along the table.

The pointer (D) heretofore described going to the outer surface of the movable dial and the inner surface of the fixt dial indicates on the outer dial (A) the true compass bearing of the target, and when read with reference to the inner dial (B) indicates the true bearing of the target with respect to the ship.

A second pointer (E) controlled by another electric motor passes to the smallest of the three dials and gives a reading of the speed of our own ship transmitted, as has been stated, on the revolution converter.

The enemy arm is continually being moved in accordance with the range, coming from the target bearing transmitter. On this arm is located a small carriage having two pencil points, and traveling on tiny rollers. The distance of this carriage to the center of the Tracer is directly proportional to the range of the target. This distance is regulated by a fourth motor, actuated by the auxiliary range transmitter. On the big gun turrets of the battleship are the *range-finding* instruments. These instruments consist of an arm 30 feet long with mirrors and lenses at each end; one is set at a 90 degree angle and is moved until the operator's eye, looking thru a hole near the center of the instrument, spots the enemy. Immediately he attempts to twist the other end mirror so that the enemy may be observed at the same time. The angle thus formed allows the computation of the range. The range thus determined is transmitted to the Tracer room, where an operator turns the Auxiliary Range Transmitter in accordance with the information he receives from the *range-finding* instrument. In this way communication to the Tracer is obtained.

Scales are provided for reading the range directly. Likewise, pencil points operated on the ends of magnets controlled by a clock, produce dots along side of the course. Now, then, let us see what all these results come to. First, we plot automatically by communications directly from the propeller shafts and gyro-compass the course and speed of our ship on a large sheet of paper.

This is one definite factor that is known. Secondly, instruments, on the mast-heads of the vessel, keeping a "line" upon the enemy vessel, cause the enemy arm to trace another course upon the table. See diagram herewith.

All of this is figured out to mathematical accuracy and system of ratios so that if the enemy is eight miles away, the pencil