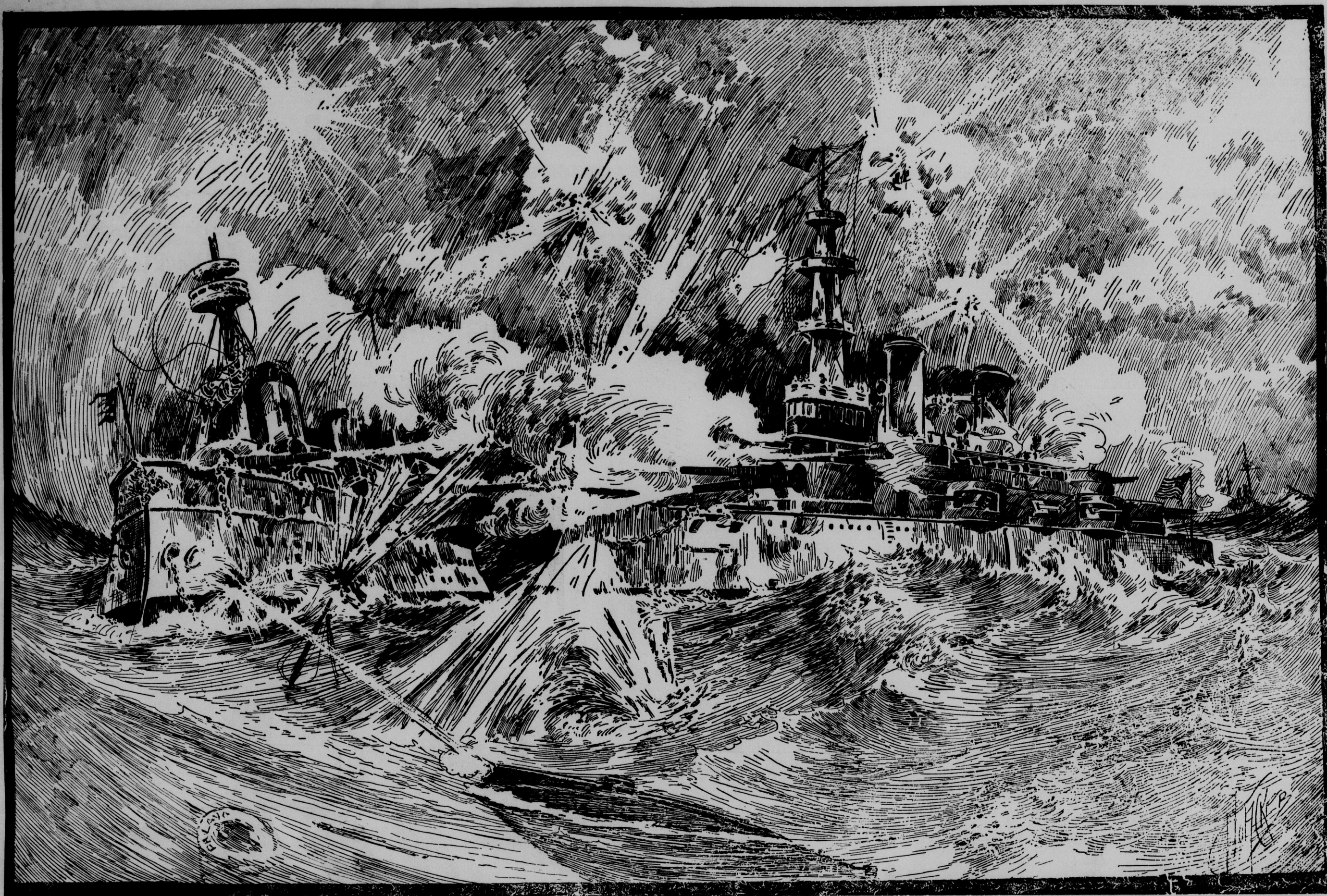


GIANTS OF THE SEAS IN MORTAL COMBAT



AIMING BIG GUNS

A modern monster rifled cannon will hurl a huge projectile, with tremendous force and frightful destructive possibilities through some fifteen miles of space. This is much further than the unaided eye can see clearly or aim a gun with anything like effective accuracy, for it is science that must supplement the eye and bring to its aid certain delicately adjusted instruments, before the shots of these great guns can be made fruitful at long range. Assisted by these instruments it is not only possible but probable that a skilled gunner

would be able to hit an enemy's battleship at a distance of six miles, or even further, from the muzzle of his gun.

In the first place it must be understood that the projectiles fired from these great guns do not travel in straight lines, but in curves; and that their range or point of contact with the earth is determined by the angle of the elevation of the gun barrel. The required angle of elevation of each gun in order to throw a shot a certain distance, is known to its gunner. Hence, if the distance of a ship or other object from the gun is known, the gunner has only to elevate his gun to the proper angle, aim it so that it will be in line with the target and fire, with the certainty that his shot will strike the mark or near to it.

Thus, it will be seen, that the important thing is to determine quickly and accurately

the distance of the object to be hit from the gun that is to do the hitting, and right here that science steps in with the range finder, the stadimeter, the range indicator, the range telegraph and other similar instruments. These instruments have been perfected until today the distance of an object from a given point can be determined from them with marvelous quickness and accuracy.

The basic principle of the modern range finder is found in trigonometry. There are two methods employed. The simpler method requires but one operator, and is used where the distance from an object to the instrument has been previously ascertained. The adjusting telescope is first directed at the object whose distance is known, and then turned until pointed at the object the range of which it is desired

to determine. The angle made between the two points is recorded; and thus the finding of the distance to the second object becomes an easily solved problem in trigonometry. It will be seen that this method would not be available on board a constantly moving battleship, or where it is impossible to fire measure the distance between a given object and the point of observation. It is used in harbors to find the range of approaching vessels, and the operator is usually stationed on an elevation near the batteries, with which he is in close communication. The instant the range of a hostile vessel is found, it can be signaled to the battery, and the guns aimed and fired at once.

The second method is based on the same principle, but requires two operators and constant telegraphic communication be-

tween them and the batteries. Two men, with their instruments and adjusting telescopes, are stationed at a known distance from each other. Each points his telescope at the object whose range it is desired to find, and the angles made between the known base line and the two imaginary lines drawn from the observers to the object are measured. Thus one side and two adjacent angles of a triangle, whose vertex is the object, are known; and a simple mathematical calculation gives the required distance.

This is the method employed on board battleships, where the target, as well as the point of observation, may be in constant motion and the range is continually changing. To make the range-finder effective under such conditions, the different distances indicated by the range-finder

must be instantly and constantly transmitted to the gunners. This work is done by the range telegraph, by means of which the ascertained range, at any given moment, is indicated silently and accurately to each gunner. In this way the guns of a ship can be kept constantly trained on an approaching or retreating vessel, and their fire be made very effective.

The wind and the condition of the atmosphere must also be taken into account when firing one of these great guns. The denser the air the greater resistance it offers to the passage of the projectile. A wind will also change considerably the path of a missile. In preparing the range tables for the use of the gunners the variations for different wind velocities and of atmospheric density have all been indicated, so that the gunner, knowing from

his instruments what the velocity of the wind or the density of the atmosphere is, can adjust his aim accordingly.

This, briefly, tells the story of how these great guns are aimed with such deadly accuracy that their heavy projectiles can be sent crashing through the sides of a hostile war vessel or hurling death and destruction in city or fort, miles away from their black muzzles. No armor has ever yet been invented capable of resisting the force of the impact of one of their heaviest missiles, and solid walls of hardest rock cannot stand up against their blows.

The gunnery of today is a science, requiring skilled and especially educated men to direct it, and has reached a condition of effectiveness never dreamed of by the smoke-begrimed heroes of a hundred or even fifty years ago.—Buffalo Times.

Freedom Forever!

A New National March

SONG.

LESLIE SYNDICATE.
Music by L. C. WEDGEFUTH.
Author of "Life's Game of See-Saw"
"When the blossoms on the clover"
"Papa's Footsteps" etc.

Words by F. SMITH.

Con brio.

Voice.

Piano.

Tempo di Marcia.

1. Co-lum-bia, land of free-dom, to thee our hearts are true, We
2. Co-lum-bia, Queen of na-tions, the fair-est of the Earth, Re

p Tempo di Marcia.

love thy star-ry ban-ner the red, the white, the blue, On
served through count-less a-ges to wit-ness free-dom's birth, From

land or sea un-conquered, the ban-ner of the free, Shin-ing for all the world the
ev-ry land and King-dom, you welcome the oppressed; Suck-ing for lib-er-ty, be-

star of lib-er-ty. When hon-or calls to con-flict and sounds the bat-tle cry For
neath thy flag they rest. Thine hon-or still un-tar-nished, thy spir-it strong and free. "For

free-dom thy star-ry sons will brave-ly fight and die! From sea to sea u-ni-ted, the
jus-tice" thy mot-to is, for all who look to thee, Tho' Na-tions shall as-sail thee, thy

gray be-side the blue, Stand-ing to-gether now, with loy-al hearts and true.
stand-ard still shall be, Ev-er and ev-er more, the star of lib-er-ty.

REFRAIN:

Free-dom for-ev-er! Our star-ry flag shall ev-er be un-con-quer-ed.

Free-dom for-ev-er! Our hearts are strong to fight for "Old Glo-ry!"

Free-dom for-ev-er! On land or sea our arms shall guard thine hon-or,

Free-dom for-ev-er! Col-um-bia the free-men's home.