



# COST OF A MODERN SEA BATTLE - \$6,000,000 AN HOUR!



IN THE TURRET LOADING A 12 INCH GUN

meets this fleet on the high seas, with plenty of sea room around in which to pursue the approved fleet tactics. Reasonable assumptions must be made. They may differ more or less, but for the present purpose let it be assumed that the American fleet consists of 12 up to date battleships, such as we have now, built or building, together with four of our latest armored cruisers and a flotilla of torpedo-boat destroyers.

The first squadron, let us say, will be composed of the eight Dreadnoughts, New York, Texas, Arkansas, Wyoming, Utah, Florida, Delaware and North Dakota. The New York and the Texas are now being built; the others are all built, some of them in commission already. The second squadron would be composed of the older battleships, Michigan, South Carolina, New Hampshire, Kansas, Vermont, Minnesota, Connecticut and Louisiana.

This line of 16 battleships would be accompanied by the big armored cruisers Montana, North Carolina, Washington and Tennessee, composing a flying squadron to hunt at weak spots in the enemy's line or to finish up cripples.

In the battleship fleet there would be 20 14 inch guns, 104 12 inch, 48 8 inch, 72 7 inch, 144 6 inch and 144 3 inch. The smaller rapid fire guns may be neglected.

The 14 inch and 12 inch guns are so mounted on all of our battleships that all of them may be brought to bear on either broadside, and from two to four on each ship, either directly ahead or astern. Most of the fighting would be done in broadside. About half of the 8 inch, 7 inch and smaller guns would be brought to bear on either broadside.

The heaviest guns may be fired two or three times a minute and the rapidity of fire increases as the caliber diminishes down to the 3 inch rapid fire guns, which will discharge about 20 aimed shots a minute.

Of course the extreme rapidity of fire is not maintained throughout the night, which will probably open at about six miles range with the 14 inch and 12 inch guns, which are effective and accurate at that distance. More and more of these monster weapons will be brought to bear on the enemy's vessels every minute now, as the fleets

approach each other, until the whole battleship fleet is engaged. At the height of the battle, during the first hour, before any serious disablement is effected, probably nearly all of the big guns will be in action at nearly their full rapidity of fire. But let us give a good margin and say that during the first hour, owing to deliberation in aim, unfavorable position or damage done by the enemy, only 50 per cent of the total volume of fire is maintained as the average.

In single column "line ahead" the two fleets converge. The rear of the great guns of the main batteries becomes heavier and heavier as more guns are brought to bear. It is given and taken. The sound of the shells exploding with the din of hostile shells exploding on board, with the crashing and tearing of steel work as the huge projectiles scatter their high explosives in the stricken hull.

New a turret is disabled and two big guns are thrown out of action, for they can not be turned and aimed properly. A shell bursts right in a gun port and one or two more guns are disabled, possibly, the entire turret crew within is killed or wounded. The volume of fire diminishes with each catastrophe, although such catastrophes are fully anticipated. It is the side that can endure the more and inflict the more that wins.

As the distance between the opposing fleets is lessened the 8 inch and later the 5 inch guns open fire, seeking vulnerable spots, such as the enemy's bridge, his gun ports and the like. At close range the 3 inch guns may be used on the same target, but it is not likely that they will be in action more than a few minutes at a time, for their crews are exposed. A thin gun shield, at best, is all they have in front of them, and even this is apt to be discarded, for in the opinion of many officers and men, a gun shield is really an element of danger, as it will obstruct and explode a shell which would otherwise pass harmlessly beyond or kill only one or two men. Gun shields will keep out bullets from a machine gun, and that is about all, at the close range at which the smaller guns engage.

Still, whenever possible, the crews of the 5 inch and 3 inch guns, who are kept below out of the way when not wanted, are ordered to their stations whenever close quarters are imminent to pour in a rapid fire of small projectiles upon the enemy's gun ports and other vulnerable points or to repel torpedo boats.

Still, adhering to extreme conserva-

tion, let us say that only 50 per cent of the aggregate batteries of the battleships are in action at a time. This liberal allowance is made to provide for slow fire, cessation of fire from various causes, and disablement of guns from the enemy's fire.

With this 50 per cent as an average, with two shots a minute from each of the 14 inch and 12 inch guns, and four from each of the 8 inch and 7 inch guns, there would be 20 14 inch, 104 12 inch, 96 8 inch and 144 7 inch shots per minute. With these shots costing \$500, \$424, \$120 and \$100 each, it is readily found that a total of \$82,016 worth of ammunition will be fired in a minute from the guns of these four calibers, or \$4,320,960 for the hour.

Assume that half of the 5 inch and half of the 3 inch guns are fired, respectively, 10 and 20 times a minute, the shots costing \$40 and \$20 each, and that this fire is maintained for only 10 minutes. This will add \$16,000 making a grand total of \$5,520,960 worth of ammunition fired for the hour's action of the 16 battleships.

The armored cruisers, however, have not been idle while the cannonade has been in progress. Their opportunities for engaging may be few or many. An arbitrary assumption must be made in their case. It is fair to suppose that a full volume of fire from half of their batteries for twenty minutes would be probable. This would give three shots per minute from eight 10 inch guns at \$200 a shot, six from 22 6 inch at \$75 and 20 from 4 3 inch at \$20 - a total of \$39,200 a minute or \$784,000 for twenty minutes of action.

Adding \$784,000 to \$5,520,960, we get \$6,320,960 as the cost of the ammunition that the American fleet would expend during the first hour of a general naval engagement.

As the enemy's ships would not be idle during the battle, the expenditure of ammunition would be less each succeeding hour, but it is safe to estimate that a five hour battle would use up \$15,000,000 worth of ammunition by each fleet, or a grand total of say, \$30,000,000.

In this analysis, the torpedoes and the small rapid fire and machine guns have been neglected entirely. A late pattern torpedo costs about \$5,000. Twenty of them would cost \$1,000,000. Perhaps both fleets together would discharge 100 of them during a five hour engagement. That would add another half million to the battleship cost.

The great cost of modern ammunition is due to the extreme care needed in workmanship, the high quality of both powder and shot, the size of the charge of powder as well as of shell, the cost of the high explosives with which many heavy shells are now provided as bursting charges, and other requirements not known in the old days.

The duration of a modern sea fight depends upon a good many things, but

principally upon the rapidity and accuracy of fire of the opponent. In the battle of Manila and that of Tsushima, the really severe fighting was done within six hours. The fate of each battle was determined in an hour or two.

But in neither of these battles was there anything like the volume and accuracy of fire of which the American warships of today are capable. American naval marksmanship has developed wonderfully within the last few years. Forty per cent of hits with the turret guns, as in the case of the armored cruiser Maryland of the Pacific fleet, last year, at a distance of 10,000 yards, or about six miles; 11 hits per gun per minute with the 6-inch guns and similar results are not rare in our navy, where the present standard is not only number of hits, but number of hits per minute per gun. It is not probable that a battle between two fleets of approximately equal force, developing gunfire at all approaching that of the present American navy in accuracy and rapidity, would last more than a couple of hours unless one fleet sought to escape early in the action. The destruction that would be wrought during the first hour would probably decide the issue.

Enormous as is the expense of the ammunition in a fleet battle, it is small compared with the destruction that it brings. A modern dreadnought, with all its armament, armor, fittings and supplies, costs between \$8,000,000 and \$10,000,000. Half a dozen well placed 14-inch shots out of a score, fired at it might sink it. In other words, \$10,000 worth of 14-inch shots may sink a \$10,000,000 dreadnought. On the other hand, a dreadnought might be hit a hundred times and yet keep in action. It all depends upon where the shots hit.

The value of ships lost and the damage to ships surviving, in a great modern sea fight, would surely mount well up into the tens of millions of dollars. The newest ships, being placed in the first line of battle, would be the first to suffer. The nation having the better second line, composed of older ships held in reserve, would be the better able to continue hostilities with success.

The losses most dreaded in war are those of men. At a modern sea battle, either totally destroyed or so badly damaged that they must be laid up a long time for repairs.

The loss in human life is of secondary importance. There are always plenty of men to take the place, at short notice, of those lost. Men can be produced more rapidly than the ships they are to man.

In the language and philosophy of the old whaler "chantey" song: When the captain heard of the loss of his whale, Right loudly he swore, When he heard of the death of his five brave boys, "Oh," he said, "we can ship some more."

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By Arthur H. Dutton

**S**MOKELESS powder and armor piercing shells come high. An hour's engagement with an enemy would cost a modern battleship fleet of average size upward of \$6,000,000 in ammunition alone. This is a most conservative estimate. Probably it is too low. It is assuming that only fair rapidity and volume of fire are maintained; it makes allowances for guns disabled during the ac-

tion and for varying distances at which the firing is done. Modern ammunition costs big money. When it is considered that a single shot from a 14 inch gun, such as the new American battleships New York and Texas and future Dreadnoughts will use, costs \$500, and that two or three of these shots may be fired every minute; that the shots from the 12 inch gun cost \$424 each, and that those from the lesser guns, while less expensive, are fired with much greater rapidity, it may readily be appreciated that there is no better definition of burning money wholesale than a sea fight under existing conditions of warfare.

The best way to demonstrate all this is to analyze; to find out just how many shots are likely to be fired in an hour's engagement, and what these shots cost in a typical fleet engagement.

Suppose that the United States is at war, that the battleship fleet with auxiliaries the United States will be able to assemble in the near future sallies forth from the Golden Gate to meet a hostile fleet of approximately equal force which is reported to be approaching our coast, and