

HEADQUARTERS  
COAST ARTILLERY TRAINING CENTER  
FORT MONROE, VIRGINIA

13 October, 1920.

C. A. B.  
FHS/bc

From: Coast Artillery Board, Fort Monroe, Virginia.  
To: Chief of Coast Artillery, Washington, D.C.  
(through Commanding Officer, C. A. T. C.)  
Subject: Suggestions as to program for test against obsolete battleship.

1. Reference par. 4, file C.C.C.A. 614/A 14, 23 September 1920, "Test against obsolete battleship", the Coast Artillery Board desires to submit the following comments and suggestions:

(a) The Board is of the opinion that the primary problem to be worked out in these service firings is that of penetration of both belt and deck armor, the angles at which perforation is obtained and the effect of the explosion of projectiles which have penetrated to the various sections of war ships.

(b) The state of development of fuses and projectiles limits comparative tests to old material; that is, A. P. Shot with delay fuse and A.P. shell with non delay fuse against belt armor, and A.P. shell with delay fuse against deck armor.

(c) In firing long range cannon at approaching vessels, it will be necessary to continue to maintain angles of fall suited to attack of deck armor up until the target arrives at such a range as to make attack of side armor advantageous. It will not be possible to do this over the whole zone of deck attack with the full powder charge. It is desirable to cover the area with as few powder charge changes as practicable. The firing laid down in par. 2 (e) of the program for the 12" G. on Railway mount is suggested as a first step in the determination of data on this point. When data has been obtained as to minimum angle of fall that will give deck penetration, the number of sections of powder can be definitely and logically decided upon.

(d) The Board has offered no suggestions as to placing animals or accessory equipment aboard as the Navy has already conducted tests on this line.

(e) The ammunition allowances recommended are liberal estimates as there will be subsequent firings in which any excess may be used.

(f) Two incidental tests are recommended.

1. The Joly Chronograph
2. Star Shells

These are being made the subject of separate communications.

2. Suggested program.

(a) Battery Pensacola (12" G) Range, 5000 yds.  
Full powder charge. 1070 # projectiles. Target, main armor belt. One hit each for:

(1) Minimum angle of incidence

A.P. Shot Delay fuse

A.P. Shell Non delay fuse

(2) 10° Angle of incidence

A.P. Shot Delay fuse

A.P. Shell Non delay fuse

(3) Continue test at increasing angles of incidence so long as results are favorable.

(b) Battery Pensacola (12" G) Range 5000 yds.  
Reduced powder charge. 1070 # projectiles. Target, main armor belt.

(1) Adjust charge to give remaining velocity for 10000 yard range and adjust line of fire to give angle of incidence equivalent to angle of fall for range of 10000 yards. Fire A.P. Shot with delay fuses. Test to be continued until Board is satisfied as to possibility of perforation of belt armor under these conditions.

NOTE: Effort will be made to avoid under water hits in above firing. At conclusion of all other firing as laid down in the approved program, if no under water hits have been obtained, special firings with both shot and shell will be conducted from Battery Pensacola until one such hit with each has been obtained.

(c) Battery Warth (12" M.)

(1) 1046 # D.P. Shell, Delay fuse.

Continue until one deck hit has been obtained.

(2) 1046 # D.P. Shell, Sand filled

Continue until one deck hit has been obtained.

(d) 12" M. Railway Mount.

(1) 700 # Shell Delay fuse

Continue until one deck hit has been obtained.

(2) 700 # Shell, Sand filled

Continue until one deck hit has been obtained.

- (c) 12" G. Railway Mount (Batignolle)  
1070 # Shell. Delay fuse, full  
propelling charge. Range 1500 yards  
short of the maximum range which would  
be obtained with a 3/4 charge. Con-  
tinue until three deck hits are ob-  
tained.

5. Ammunition allowance estimated necessary to procure hits  
as covered in the above program.

- (a) Battery Pensacola (12" G)  
20 Shot - delay fuses  
10 Shell - n.d. fuses  
35 charges (25 full; 10 reduced to  
give, at the range of the target, a  
regaining velocity for 10000 yard range)
- (b) Battery Worth  
5 target practice projectiles  
10 d.p. shell - delay fuses  
10 d.p. shell - sand filled  
25 charges - Zone V - VI - VII.
- (c) 12" Railway Mortar  
5 target practice projectiles  
10 d.p. shell - delay fuses  
10 d.p. shell - sand filled  
25 charges - Zone 8B - IX.
- (d) 12" Railway Gun  
5 target proc. proj.  
60 shell - delay fuses  
65 charges

F. H. SMITH,  
Major, C.A.C.,  
President.

(COPY)  
B3

WAR DEPARTMENT  
Office of the Chief of Coast Artillery  
Washington

614/A21

October 23, 1920.

From: The Chief of Coast Artillery.  
To: The President, Coast Artillery Board,  
(Thru Commanding Officer, Coast Artillery Training  
Center).  
Subject: Test against obsolete battleship at Pensacola.

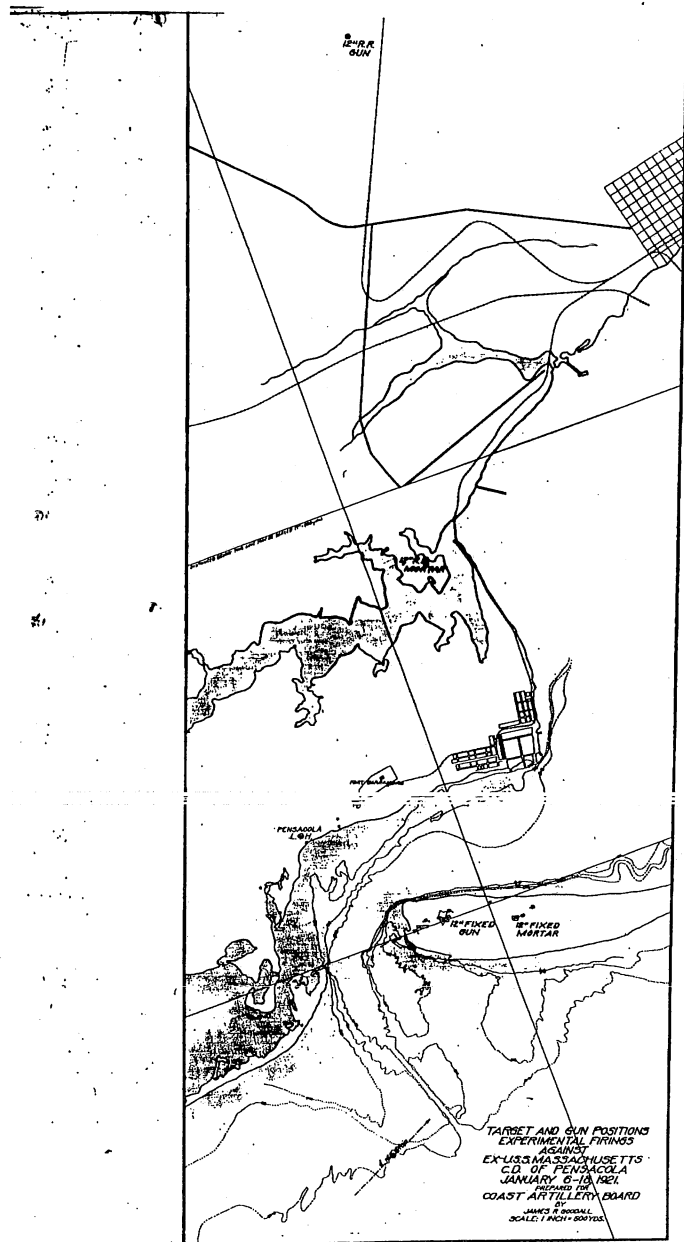
1. The program for the firing test on the battleship Massachusetts, submitted by the Coast Artillery Board under date of October 13, 1920, is approved by the Chief of Coast Artillery, with the understanding that should unforeseen contingencies arise during the tests the Board has authority to modify the program as may be necessary to accomplish the object of the tests.
2. This office has requested that the expenditure of the necessary ammunition be authorized and that a battery from the 30th Artillery Brigade be sent to Pensacola as soon as possible.
3. It is desired that the Coast Artillery Board develop all the details of the test and that full information thereof be communicated to an officer from the 30th Artillery Brigade to be designated by the Brigade Commander to make preliminary arrangements for the transportation and installation of the railway artillery at Pensacola. This officer will be instructed to report to the President of the Coast Artillery Board for consultation before his departure for Pensacola.
4. Copies of letters to Commanding Officer, 30th Artillery Brigade (C.A.C.) and Coast Defenses of Pensacola are inclosed for information of the Board.
5. This office will notify the President of the Board as soon as the Massachusetts leaves the Navy Yard at Philadelphia.

By direction of the Chief of Coast Artillery.

JOHN B. MURPHY,  
Lieut. Colonel, Coast Artillery Corps,  
Assistant to Chief of Coast Artillery.

2 Incls.  
553.4-(Pensacola)  
To President, Coast Artillery Board.

COPY:  
ack.



CONFIDENTIAL

U. S. NAVAL AIR STATION  
Pensacola, Florida.

AR-AT-JES.

20 January, 1921.

From: Lieutenant Albert Tucker, (CO), U.S.N.  
To: President, Coast Artillery Board, Ft. Monroe, Va.  
Via: Commandant, U.S. Naval Air Station, Pensacola, Fla.

Subject: Report of Shell Fire on the U.S.S.  
Ex-Massachusetts, from January 6,  
1921, to January 18, 1921, inclusive.

Enclosure: (Herewith)  
(A) Report of Shell Fire on the U.S.S.  
Ex-Massachusetts, from January 6, 1921,  
to January 18, 1921, inclusive.

1. There is forwarded herewith a report of the shell fire recently conducted against the U.S.S. Ex-Massachusetts, opposite Fort Pickens in the vicinity of Fort Barrancas, Florida.

2. The booklet plan, showing the location of the hits, etc., as described in the attached report, was delivered to Major Smith, U.S. Army, the Senior Member of the Board, who supervised this test.

Albert Tucker.

AR-AT-JES.

1st Ind.

22 January, 1921.

From: Commandant, Eighth Naval District.  
To: President, Coast Artillery Board, Ft. Monroe, Va.

1. ~~I have forwarded the Ex-Massachusetts~~ since the firing and concur in the report of damage and opinions of Lieutenant Albert Tucker (CO), U.S.N.

N. H. Christy.  
By Direction.

P-R-AR.

COPY  
fwb.

CONFIDENTIAL

AG 353.176 (Misc. Div.)

Wrapper Ind.

HH/ACW/160

War Department, A.G.O., March 11, 1921.- To the Chief of Engineers.

1. Attached hereto is copy of the original report of the Coast Artillery Board, dated February 15, 1921, which has been approved by the Secretary of War.

By order of the Secretary of War:

*Starrin Speer*

1 incl.

Adjutant General.

353.1

- February 15, 1921.

Coast Artillery Board.

Commanding Officer, Coast Artillery Training Center.

Report on Firings at Pensacola, Fla., on Obsolete Battleship.

## 1. Enclosures:

- (a) Letter Chief of Artillery re Program.
- (b) Program submitted by Coast Artillery Board.
- (c) Letter Chief of Artillery - approval of program.
- (d) Report of Naval officer assigned to assist the Board pursuant to letter of November 6, 1920 from Chief of Naval Operations to Commandant, Eighth Naval District. (5 copies).
- (e) Photographs showing effects of hits and detonations (5 prints each of 37 photographs).
- (f) Table listing hits and correlated data. (5 copies).
- (g) Chart of gun and target positions.

2. Pursuant to telegraphic instructions from the War Department received January 1, 1921, the Coast Artillery Board proceeded on January 3, 1921 to Pensacola, Fla., for temporary duty pertaining to experimental firing to be conducted against the obsolete battleship, Ex-Massachusetts. The Board arrived at Fort Barrancas, Fla., on January 5th and organized for the test.

## 3. There were present:

Major F. H. Smith, C.A.C.  
 Major Quinn Gray, C.A.C.  
 Major John H. Pirie, C.A.C.  
 Major Louis B. Bender, S.C.  
 Major W. B. Hardigg, O.B.

(Major Sanderford Jarman, C.A.C. joined the Board on January 15, 1921 and was present during remainder of firing and during analysis of results. All members were continuously present from dates given.

4. Table "A" shows the batteries firing, dates of practice, number of hits and gives index numbers of photographs, showing effect of each.



Photographs carry legends descriptive of each hit represented.

5. Prior to firing, the vessel had been grounded in approximately 24 feet of water (normal draught of ship 24 feet). A severe storm late in December listed her so that her deck slope was 15° 30' downward away from the batteries. The ship also had swung around so that instead of being normal to the line of fire of Battery Pensacola, she lay with her stem to stern bearing such that the normal line to her belt armor was 56° from the line of fire of Battery Pensacola and 43° from the line of fire of the railway gun. This eliminated completely any possibility of attack of belt armor with the hope penetration and prevented the attempted solution of the problem of determination of the minimum favorable angle for deck attack by long range gun fire. Subject to these modifications the program was carried out as approved.

6. During the test all materiel functioned normally except the delay fuses. One 700 lb. mortar shell, loaded with Explosive "D" and assembled with Mark V. Semple base detonating delay fuse, 1300 R.P.M. is known to have detonated, (See photograph #19, hit #16). There was no evidence of detonation from the following:

Hits #2, 3 and 4, 1046 lb. shell loaded with Explosive "D" and assembled with Frankford Arsenal .08 delay base detonating fuses.

Hits #15, 18 and 19, 1046 lb. shell, loaded with Explosive "D" and assembled with Mark V. Semple base detonating delay fuses, 2000 R.P.M. modified by weakening plunger and interrupter springs to arm at lower number of R.P.M.

Hit #21, 700 lb. shell, loaded with Explosive "D" and assembled with Mark V. Semple base detonating delay fuse, 1300 R.P.M.

While the Board states this negatively; that is, that "there was no evidence of detonation", the proof is quite conclusive. Examinations in several cases were made soon after the firings. There was no odor of gases and no discoloration of the water and no evidence of disruption as far down as could be investigated without a diver. The Board, Naval Advisor and all accompanying officers were unanimously of the opinion that these seven projectiles did not detonate.

It should be noted in this connection that two hits #17 and 20 were obtained with 1070 A.P. shell loaded with Explosive "D" and assembled with Mark V. Semple base detonating delay fuses, 2000 R.P.M.; that both functioned, one bursting after penetrating three 3/8" plates and several supporting braces and after a travel of about 35 feet from the first plate struck, the other bursting in the main deck, the wooden flooring of which it had bitten into with an angle of fall of not over seven degrees. That is, in neither of these cases was there a delay  
permitted to have permitted penetration of the protective deck had the  
location of the hit permitted it. In the case of the detonating 700# mortar shell, the delay permitted penetration of superstructure and the main deck only, the detonation occurring above the protective deck.

7. The analysis in report of Lieutenant Tucker, Construction Corps, U. S. Navy as concurred in by Captain H. H. Cristy U. S. Navy is a full and detailed analysis of the effects, shot by shot. The legends on photographs amplify and elucidate these details. No repetition will be made.

8.

#### Conclusions

- (a) That the relative effectiveness of mortar hits demands imperatively:
  - (1) With our major caliber armament and installations, the employment of high fire whenever possible. This to include the employment of guns for high angle fire, where the elevation limits are such that, with suitable charge, deck penetration may be secured at ranges beyond the limits of assured penetration of belt armor with normal charges.
  - (2) For future construction and installation,-- the provision of a considerably greater per cent. of armament adapted to high angle fire than has heretofore been provided.
- (b) That the decision, based on the battle of Jutland, to have one type of A.P. projectile for all major caliber armament, while not confirmed beyond question in this test, is sufficiently supported by the results to offer no basis for questioning the present decision. (See par.5, as to inability to carry out belt armor test).
- (c) That our present delay fuse is unsatisfactory due to inadequate delay and to uncertainty in functioning.

9.

#### Recommendations

- (a) That the solution of the problem of proper aliquot part charges for major caliber guns to secure deck penetration at all ranges beyond the limit of assured belt armor penetration, be taken up at once.
- (b) That so far as fixed armament is concerned all proposed alterations and extensions of defense projects be considered in the light of the above conclusions, with a view to providing for a given outlay of funds the maximum volume of most effective fire.
- (c) That the Ordnance Department use all available facilities to develop a bore safe fuse which will function when fired from mortars and which will have sufficient delay to insure penetration to the vitals of a ship after passing through protective armor.

*Fredric H. Smith*

FREDERIC H. SMITH,  
Major, C.A.C.

*Quinn Gray*

QUINN GRAY,  
Major, C.A.C.

*Sanford J. Jaman*

SANFORD JAMAN,  
Major, C.A.C.

*J. H. Pirie*

JOHN H. PIRIE,  
Major, C.A.C.

*Louis B. Bender*

LOUIS B. BENDER,  
Major, S. C.

*W. B. Harding*

W. B. HARDING,  
Major, O. D.

To:- Chief of Coast Artillery.

J. C. G. Jr.

U. S. NAVAL AIR STATION  
Pensacola, Florida.

REPORT OF SHELL FIRE ON THE U. S. S. EX-MASSACHUSETTS,  
JANUARY, 1921.

The vessel is resting on bottom with a list of 15° - 30° to starboard. The fore and aft center line lies 33° - 40° to the right of the normal line of fire exposing the port side of the ship to the batteries.

A print of the booklet plan of the Ex-Massachusetts accompanying this report is marked to show location of hits and direction of flight path of projectiles.

REPORT OF MORTAR FIRE AGAINST BATTLESHIP EX-MASSACHUSETTS,  
JANUARY 6, 1921.

12" shell fired from Porter Battery, Fort Pickens, in the morning of January 6, 1921, at a range of 4700 yards. Weight of shell 1,046 pounds. Four hits were made, which are numbered consecutively below and on booklet plan.

#1. 12" shell, sand loaded. Shell entered forward side of forward smoke stack just above water shed passing aft and to starboard in its downward path, tore out a large section of outer and inner stack about 5 feet above the top of the uptake, passed through bulkhead on frame #39, demolishing it for a space of 4 feet in width and 6 feet in height, and through the armored fire room grating at the berth deck. From the appearance of the flight path of this shell, it is thought probable that it continued in a straight line through the bottom of the ship.

#2. 12" shell loaded with explosive. Shell struck topside plating just below upper deck edge at frame #46, passed through main deck at frame #47 and about 18" inboard, passed through berth deck between frames #47 and #48 about 2 feet inboard. Further trace of shell could not be seen because of water in the ship, but by probing through the hole in berth deck with a long piece of piping it was found that the shell had apparently been deflected forward and passed through orlop deck about 5 feet forward of hole in berth deck. It is thought that shell passed on through bottom of ship. Shell did not detonate.

#3. 12" shell loaded with explosive. Shell passed through upper deck at frame #47 about 14 feet inboard on port side, entered 3" ammunition hoist on main deck at frame #48 and completely demolished the hoist between main and berth decks. The inboard side of the hoist in this space was curled upwards against the main deck overhead, and the remainder of the hoist was broken and twisted. The shell passed through the berth deck about 2 feet abaft of hoist connection at this deck. It is practically certain from the line of flight of this shell as traced on the booklet plan that it passed through the boiler in compartment B - 4. Shell did not detonate.

#4. 12" shell loaded with explosive. Entered vessel through bridge deck at frame #40 just to starboard of center line, passed through galley on upper deck at frame #42, passed through main deck at frame #43 at the junction of main deck and starboard longitudinal bulkhead of C. P.O.'s quarters, and passed through the corresponding bulkhead between main and berth decks. No indication of a detonation.

It is believed that all four of the shells described above passed completely through the vessel.

REPORT ON RIFLE FIRING AGAINST BATTLESHIP DEL-MASSACHUSETTS,  
JANUARY 10, 1921.

6 - 12" A.P. shell fired from Pensacola Battery, Fort Pickens on the afternoon of January 10, 1921, at a range of 4200 yards. Of these, five were direct hits, and one burst short scattering fragments from end to end of the ship. In the following report, the result of hits are number #5 - #9 in continuation of report on mortar hits.

#5 entered port side plating between frames #51 and #52 about 12" above main deck edge, passed aft through corner of enclosure plating and Hbl. #52, touched the after port 8" armored tube, carrying away a large fragment of the armored tube, and burst about as marked on plan. The explosion carried away all surrounding bulkheads, some of the supporting brackets of the 8" turret, and some of the foundations of the cage mast. Voice tubes leading up the mast were broken and twisted, and the water distilling plant was completely demolished. The face of the after 12" turret armor was scored by shell fragments, but no damage done to turret.

#6 entered port side plating between frames #7 and #8, about 2'-0" above berth deck edge, and burst about on the face of Hbl. #14 at the center line of the ship. The effect of the explosion will be ~~described~~ together with that from hit #7.

#7 entered port side plating between frames #12 and #13 just below main deck edge, and burst apparently just as it passed through the side plating. The effect of the explosion of this shell and #6 completely demolished Bld. #14 clear across the ship, swept away five beams under the main deck, tore Bld. #7 loose from the deck and shell plating on starboard side, raised a portion of the main deck over eighteen inches and carried away all stanchions.

#8 entered port side plating between frames #11 and #12 just below berth deck and burst just under berth deck, probably in the chain locker. It was impossible on account of water in the ship to determine the effect of the explosion below the berth deck, but a large hole was blown in the berth deck itself at about frame #15 and there was a fire smoldering somewhere below. This fire was of a smoldering nature and was evidently caused by woodwork in storerooms below. It is to be noted, however, that the account fiber cellulose in coffer dam #48 was burning. A handful of this fiber was tested as to its burning qualities and it was found to burn readily.

#9 struck the side belt armor at frame #43, port side, scarred the face of the armor and loosened several rivets in the strap covering the seam between the casemate and side belt armor. Shell glanced off. No detonation.

In addition to direct hits described above, one shell burst short of the ship. One large fragment entered the side plating at frame #1 and #2, port side, and struck and glanced off from forward bulkhead #4-1/2. Small fragments swept the ship from end to end, causing minor damage to masts, funnels, crow's nest, yard arm and pilot house.

In connection with hit #5 that raised the port side of the cage mast foundation, buckling the elements a few feet above the foundation, that all voice tube connections were carried away at the base and were shifted inboard for about three feet. It is not believed this would have happened if the voice tubing were not attached to the elements close to the base. In other words, it is believed a similar occurrence could be prevented by having voice tube connections both below and above cage mast deck of flexible copper tubing, with some play.

#### REPORT ON RIFLE FIRING AGAINST BATTLESHIP EX-MASSACHUSETTS, JANUARY 11, 1921.

12" A.F. shot fired from Pensacola Battery, Fort Pickens, on the afternoon of January 11, 1921, at a range of 4000 yards. Weight of shot 1,070 pounds. Five direct hits were made. Numbers in following report are in continuation of report on rifle fire hits of January 10th. Owing to the list of the ship to starboard and away from the firing point, the trace of all hits tends upward across the ship from the point of entrance.

#10 entered port side plating between frames #15 and #17 just below berth deck, passed through cofferdam and all compartment bulkheads in line of flight on orlop deck, ripped open the berth deck plating for a length of about 15 feet, and burst against the face of the 13" barbette at the level of the berth deck. Damage to armor - large scar and flaking of metal to a depth of about 6 inches. Armor plate displaced about 3 inches in direction of flight of shot.

#11 entered port side plating on frame #22 just below main deck, passed through all main deck beams and ripped steel and wood deck from near deck edge to 13" barbette. Struck barbette a glancing blow just above main deck level and burst on face of barbette armor scarring armor to a depth of about 4 inches. Fragments deflected aft and did considerable minor damage to superstructure plating.

#12 struck glancing blow on forward upper edge of forward 13" turret, taking out a small piece of armor. No damage to turret.

#13 entered port superstructure plating at about frame #33, 4 feet above main deck, passing aft and slightly upward completely through the ship. Struck under side of upper deck about on the center line and ripped planking from this point more than half way to starboard hammock berthing. Detonated about where shown on plan, the main fragments passing out through hammock berthing.

#14 struck just under bridge deck stringer plate at frame #34, ripped bridge deck planking from that point almost to forward smoke stack, passed through smoke stack, just above bridge deck, and out through ventilator. This shot did not detonate.

In addition to definite hits reported above, the observers reported another hit a little aft of amidships. No sign could be found of this hit on the ship unless the shot struck a glancing blow on the side armor at exactly the same spot as reported for hit #9. An examination of this spot, however, did not give positive indications of a hit.

It is not believed that any of the foregoing armor piercing shell would have made this vessel hors de combat as the lowest hit was well above the water line, and the hit through cofferdam would have been in the same plane transversely but a few feet higher on barbette than that noted had vessel been on an even keel.

#### REPORT OF RIFLE AND MORTAR FIRING ON THE U. S. S. IZ-MASSACHUSETTS.

Summary of Hits

Hit #15, D.P. shell, 1,046 lbs., range 4700 yards - mortar fire, entered vessel at frame #61, as shown on main deck plan, passed through berth deck between frames 61 and 62 in Junior Officers' pantry ricochet against barbette without any apparent damage and through orlop deck where trace was lost at frame 85. This shell apparently did not detonate and in all probability went through the vessel's bottom.

Hit #16, D.P. shell, 700 lbs., range 10,000 yards - mortar fire, entered bridge deck at frame #48, as shown on bridge deck plan, passed through upper deck at frame #49 and main deck at frame #50, as shown on main deck plan starboard side. This shell detonated between the berth and main deck plating, lifting the main deck plating about three feet and for a distance of about ten feet from ship's side between frames 46 to 51 inclusive. The deck further inboard was bulged upwards more or less to within about six feet of longitudinal bulkhead on starboard side inboard. Damage to berth deck plating could not be determined on account of water.

Hit #17, A.P. shot 1070 lbs., range 19,264 yards - rifle fire, struck vessel at frame #30, as shown on main deck plan, port side, and detonated in same place. A hole about 5 feet square was made at this point, also carrying away a part of coal scuttle frame, fragments of shell striking and penetrating shell plating of main and upper deck house in numerous places.

Hit #18 D.P. shell, 1046 lbs., range 4700 yards - mortar fire, entered vessel at frame 46, as shown on bridge deck plan, passed through upper deck at frame #47, main deck at frame 48, and berth deck at frame 49, where trace was lost. This shell evidently did not detonate but passed through the bottom of vessel.

Hit #19 D.P. shell 1046 lbs., range 4700 yards - mortar fire, passed through upper deck, as shown on upper deck plan, at frame #42, port side, berth deck frame 43 and orlop deck at frame 44, at which place trace of shell was lost, the hole in orlop deck being about six feet inboard at frame 44. This shell apparently did not detonate, but went through bottom of vessel.

Hit #20 A.P. shot 1070 lbs., range 19,264 yards - rifle fire, entered vessel on port side at frame #4 in after corner of doubling plate, as shown on main deck plan, and passed diagonally across the vessel to frame #12. Also, its path was downward and apparently detonated a few feet inboard at frame 12 in the space between berth deck and orlop deck plating. The two outboard strakes of berth deck plating were torn up and distorted for ten feet on each side of frame 12, also in the wake of this damage for about ten feet forward of frame 12 the shell plating was opened up about two inches, and further damage could not be determined.

Hit #21, D.P., 700 lbs., range 10,000 yards - mortar fire, entered vessel between main and berth decks at frame 20, as shown on outboard ~~profile, passed through berth deck at frame 21, about 4 feet inboard~~ port side, also inboard cofferdam bulkhead. Shell apparently did not detonate but in all probability passed on through the bottom of vessel.



In summing up the damage to the Ex-Massachusetts as the result of twenty-one hits from shell fire from the various type guns, I am of the opinion that rifle fire either with A.P. shell or A.P. shot, (the difference between shell and shot, I am informed, being, the shell has a thinner wall with a higher percentage of explosive than the A.P. shot), only in one instance would have seriously interfered with the movements of the vessel, that being hit #20, which no doubt would have flooded the vessel forward and put ship down by the head and seriously interfered with the vessel's maneuvering readily. It is to be noted that had vessel been on an even keel the damage as the result of detonation in all probability would have been greater. A.P. shell hits #5, 6, 7 and 8 did considerable damage without question; however, the vitals of the ship are intact and battle efficiency unimpaired, except voice tubing carried away in after oge mast and damage to port quarter 8" armored tube. This turret could have been supplied with ammunition by hand power.

High angle mortar fire, whether shell detonates or not, is apparently superior to rifle fire, if vessel is within range. It cannot be conceived how it would be possible for a vessel struck with two or more shells in the wake of fire and engine room spaces to remain afloat more than a short period of time. Hit #16, a 700 lb. shell, fired from a range of 10,000 yards, apparently did as much damage as any heavier shell that detonated, and there is no question about a number of shells having gone through the vessel's bottom, as a sectional pipe was used where same was practicable and was pushed downward through holes made by path of shell into the sand.

The booklet plan of the Ex-Massachusetts, upon which the hits were plotted, etc., was delivered to Major Smith, U. S. Army, personally, by the writer of this report.

A. Tucker,  
Lieutenant (CG), U.S.N.

COPY  
fwh.

WAR DEPARTMENT  
Office of the Chief of Coast Artillery  
Washington

94/A14

September 23, 1900.

From: The Chief of Coast Artillery.  
To: The President, Coast Artillery Board (Then Commanding Officer,  
Coast Artillery Training Center).  
Subject: Test against obsolete battleship at Pensacola, Fla.

1. The War Department has secured from the Navy Department an obsolete battleship (the Massachusetts) for use as a target in certain firing tests which the Chief of Coast Artillery desires to hold.

2. The ship is not at the Navy Yard, Philadelphia, Pa. and is being dismantled preparatory to being turned over to the War Department. The work of dismantling will be completed about October 31, 1900, and the ship will immediately thereafter be towed to Pensacola and turned over to the War Department at that place.

3. It is desired that the tests be conducted under the direction of the Coast Artillery Board. At the proper time, this office will request orders for the members of the Board to proceed to the Coast Defense of Pensacola.

4. For the information of the Board, a copy of the general program as drawn up in this office is inclosed. The details have been worked up only in part. Before the program is submitted for approval the comments and suggestions of the Board are desired.

5. The necessary details will be arranged for by this office after consultation with the President of the Coast Artillery Board. While it is desired that the test begin shortly after November 15th next that date is tentative and the exact date should be fixed to conform with the work of the Board.

6. A copy of the program has been furnished the Commanding Officer, Coast Defense of Pensacola with instructions to make pro-

liminary preparation for the test including estimates for funds,  
railway material and arrangements with the local naval commander  
for placing the ship in the position desired.

By direction of the Chief of Coast Artillery.

JOHN B. MURPHY,  
Lieut. Colonel, Coast Artillery Corps,  
Assistant to Chief of Coast Artillery.

3 Incl.

353.17-(Pensacola)

1st Ind.

Adm. - GSW/whk.

HQ., C. A. TRAINING CENTER, Fort Monroe, Va., 26 September, 1920. - To:  
President, Coast Artillery Board, Fort Monroe, Va.

3 Incl.

G. S. W.

COPT:  
esh.

Table listing hits and correlated data. Experimental firing against obsolete battleship.

Serial No. of Hit. (Report of Naval Advisor)	Date of Practice.	Range	Battery	Projectile	Shell Filler	Fuze	Detonation	Index Number of Photographs.
1	1/6 '21	4700	12" M (Fixed)	1046 D.P. Shell	Sand	F.A. 08 Delay	none	1, 1-A
2	"	"	"	"	Explosive D.	"	"	2-A
3	"	"	"	"	"	"	"	
4	"	"	"	"	"	"	"	
5	1/10 '21	4300	12" B (Fixed)	1070 A.P. Shell	"	Mk. V. Sample M.D.	High order	2, 3, 4, 5, 3-A, 4-A, 5-A, 6-A, 7-A, 8-A
6	"	"	"	"	"	"	"	6, 8, 9, 10, 11, 9-A
7	"	"	"	"	"	"	"	6, 7, 10-A
8	"	"	"	"	"	"	"	6, 10, 11-A
9	"	"	"	"	"	"	none	12-A
10	1/11 '21	"	"	1070 A.P. Shot	"	Mk. V. Sample Delay	Not high	12, 14-A
11	"	"	"	"	"	"	"	13, 14, 22, 13-A
12	"	"	"	"	"	"	"	15
13	"	"	"	"	"	"	"	16, 17
14	"	"	"	"	"	Mk. V. FA 08 Delay	"	13, 18, 15-A
15	1/18 '21	4700	12" M (Fixed)	1046 D.P. Shell	"	Mk. V. Sample Delay	none	3
16	1/14 '21	10000	" (Ry)	700 D.P. Shell	"	Mk. V. Sample Delay (Modified)	Apparently good	19
17	1/18 '21	19264	12" M (Ry)	1070 A.P. Shell	"	Mk. V. Sample Delay	High order	13, 21, 22
18	1/18 '21	4700	12" M (Fixed)	1046 D.P. Shell	"	"	none	20
19	1/18 '21	4700	"	"	"	Mk. V. Sample Delay (Modified)	"	
20	1/18 '21	19264	12" M (Ry)	1070 A.P. Shell	"	Mk. V. Sample Delay	High order	11
21	1/14 '21	10000	12" M (Ry)	700 D.P. Shell	"	Mk. V. Sample Delay	none	22

\* Modified, changing arming from 2000 to 1400 R.P.M.

Experimental Firing  
Against Ex-U.S.S. MASSACHUSETTS  
Coast Defenses of Pensacola  
January 5-18, 1921  
by  
Coast Artillery Board