John Hays Hammond Jr. Torpedo Relay Tube

Fig. 1

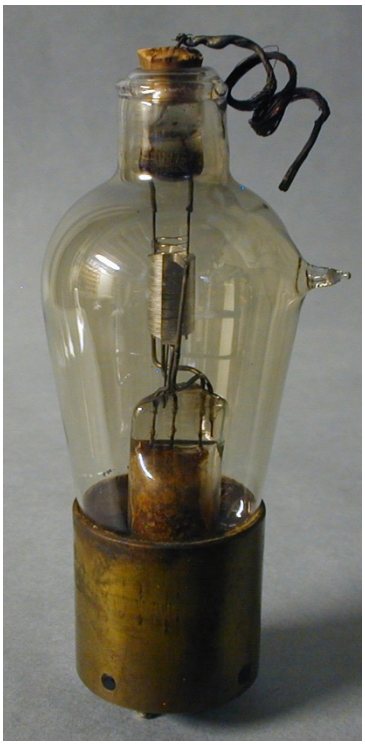


Fig. 2

The Hammond tube uses a gold tipped 4 pin Shaw base and has the internal structure similar to the VT-12 but the internal structure is slightly smaller. Only 3 of the bottom pins are used – 2 for the filament and 1 for the plate. The grid exits the top with a multi-strand wire. The filament structure is spiral and fits closely inside the spiral grid. Dumet wire passes through the press. General Electric documents state they developed this special tube for the military and Hammond as early as 1915 [3], but by appearance around the 1917-18 period. [4]. Two views of the Hammond Relay tube are shown in fig.'s 1 and 2.

Few collectors are familiar with the early work of John Hays Hammond. Graduated from Yale in 1910, he established the Hammond Radio Research Laboratory in 1911. His company invented a remote controlled dog with a photosensitive homing device in 1912. In 1914, Hammond and Miessner developed remote control devices for his torpedo boat, called Natalia, which used wireless waves sent from a shore station to operate a set of relays, receivers and motors on board. The motors controlled the engine and rudder. The Hammond tube was used in these sets of relays on board the boat and his shore station. These tests were conducted for the possible use by the US Coast Artillery Corps, a division of the US Army, for their use as a costal defense. [1] The Natalia could be loaded with up to 4000 pounds of explosives and could be partially submerged. [2].

Benjamin Franklin Miessner was an expert radio aide for the US Navy and Hammonds right hand man during the development of the torpedo tests. Miessner wrote a book called "Radiodynamics- The Wireless Control of Torpedoes and Other Mechanisms" in 1916 that explained in great detail the steps necessary to control the torpedo boat over long and short distances.[5]

For the purposes of this article, we are interested in the steps leading to the devices that received the transmitted signals from the shore stations. Many were tried including filings coherers- decoherers, Lodge-Muirhead mecury- steel- disc coherers with some success. These were finally scraped in favor of the Hammond vacuum tube detector. The reading of the Miessner book is advised for greater detail.

John Hays Hammond, Jr., '10 S.

Announcement was made a year ago of the invention of a radio-controlled torpedo by John Hays Hammond, Jr., '10 S. Since then U. S. A. coast-defense experts have been studying the invention at Gloucester, Mass., and their latest reports show that it is a practical one. Hammond is able to control the speed and direction of a boat by allowing wireless waves from his shore station to act on a set of receivers, relays, and motors on board, the motors controlling an engine or the rudder. Generators on board furnish the current to operate these motors, the shore station controlling the generators. The boat, which could be a partly submerged torpedo, can be sent at any speed up to 35 miles an hour, and in any direction, at the will of the shore director, within his visual radius of fifty miles.

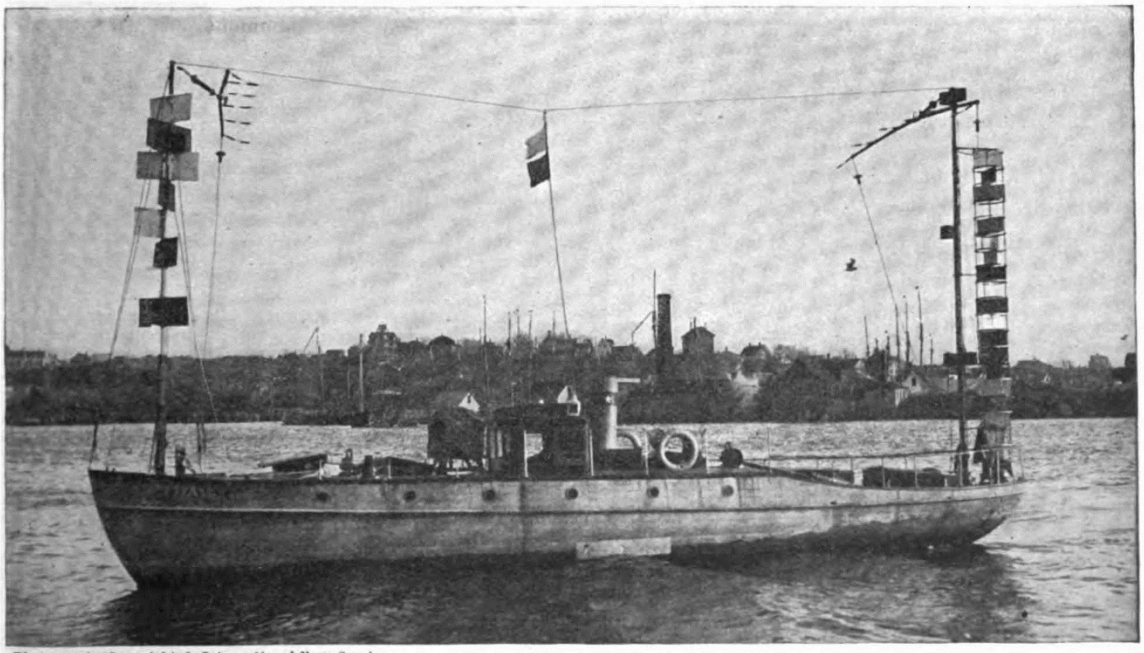
Concerning this new attacking weapon, General E. M. Weaver, Chief of Coast Artillery, says:

"Mr. Hammond has, in the opinion of the Chief of Coast Artillery, at the present time worked out the details of radio control so as to make it possible to apply it in the form of a spar torpedo to a motor boat. His further experiments point to a satisfactory solution of the problem of applying his equipment to a submerged torpedo under radio control from shore. The distance to which this control can be exercised is limited only by the distinctness of vision aided by telescopes. It should be pointed out that this new type of weapon does not displace the submarine mine defense. The radio-controlled torpedo is an offensive weapon, and, like the projectiles of guns and mortars, seeks its own target and seeks it under constantly controlled direction. If such a means of attack were added to those we now have, we would then be able to attack an enemy's ships by mortar fire falling vertically on the decks of the ships, by gun-fire against the side, turret, and barbette armor, and by submarine mines and radio-controlled torpedo below water. The controllable, mobile type of torpedo has been always considered desirable as a feature of coast-defense armament, but no practical solution of the problem has heretofore been offered."

Fig. 3[2]

A SHORE OPERATOR
Directing the "Natalia" by wireless

JOHN HAYS HAMMOND, JR., '10 S.
At his home in Gloucester, Mass.



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THE WIRELESS TORPEDO BOAT "NATALIA"
Which responds to radio waves and is capable of carrying 4,000 pounds of explosives; directed at night by an arc light of 1,000,000 candle-power

HAMMOND, '10 S., AND HIS RADIO-CONTROLLED BOAT

Fig. 4[2]

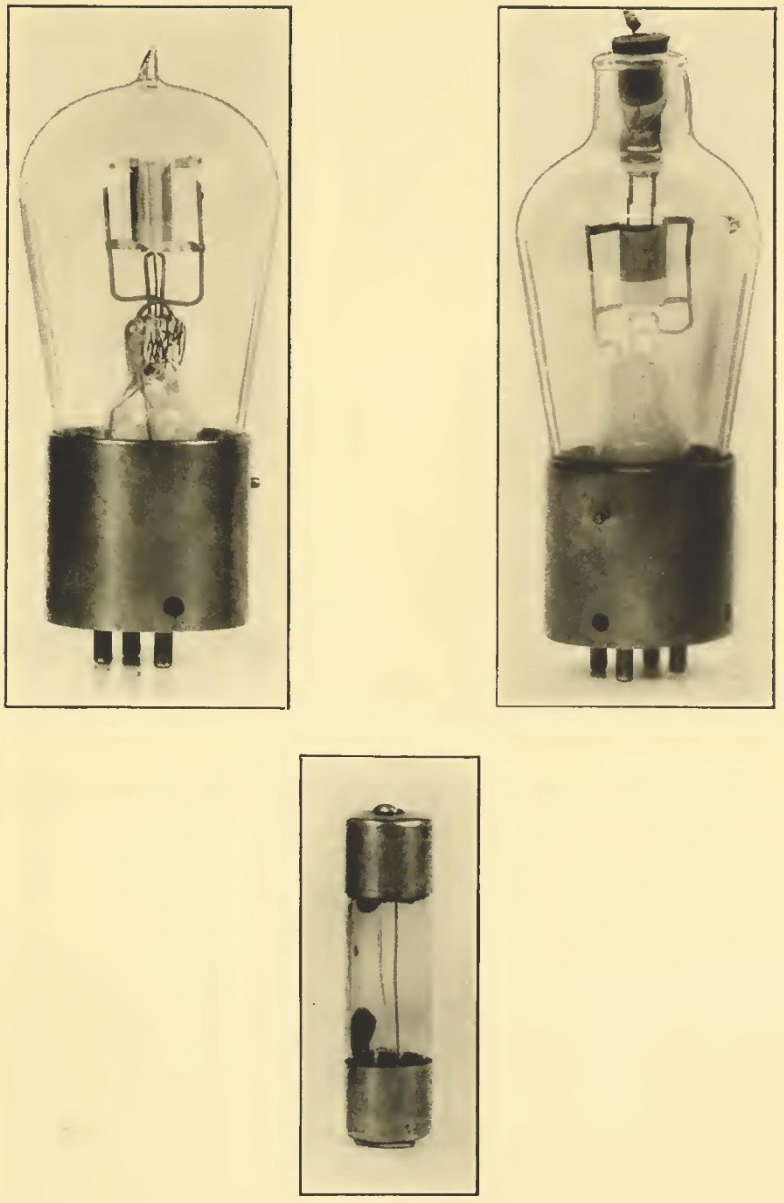
The Hammond boat "Natalia" is shown in fig.4 during one of the tests conducted by the US Army. It's said to have covered a 120 mile course perfectly under remote control and using the homing device. The boat could be used as a partially submerged torpedo and could be directed from shore up to a fifty mile radius. Hammond was also working on controlling surface and submerged torpedo's at the time the boat tests were being conducted and for the US Military in the years 1916-18. All the Hammond patents were eventually purchased by the US Military.

The Grid Leak and Special Tubes

The grid leak tube, a small cylindrical vacuum tube, was developed as a necessary auxiliary tube to be used in connection with the larger transmitting and receiving vacuum tubes in wireless telephony outfits, as a leak around the blocking condenser used in the grid circuit. Grid leaks were made having a resistance of 500,000, 2,000,000, and 10,000,000 ohms. The resistance is formed by deposits of metallic tungsten in a film between the two terminals of the grid leak.

A special relay tube was also developed for John Hays Hammond, Jr. This was a specially designed tube used as a relay in connection with the wireless control of torpedoes.

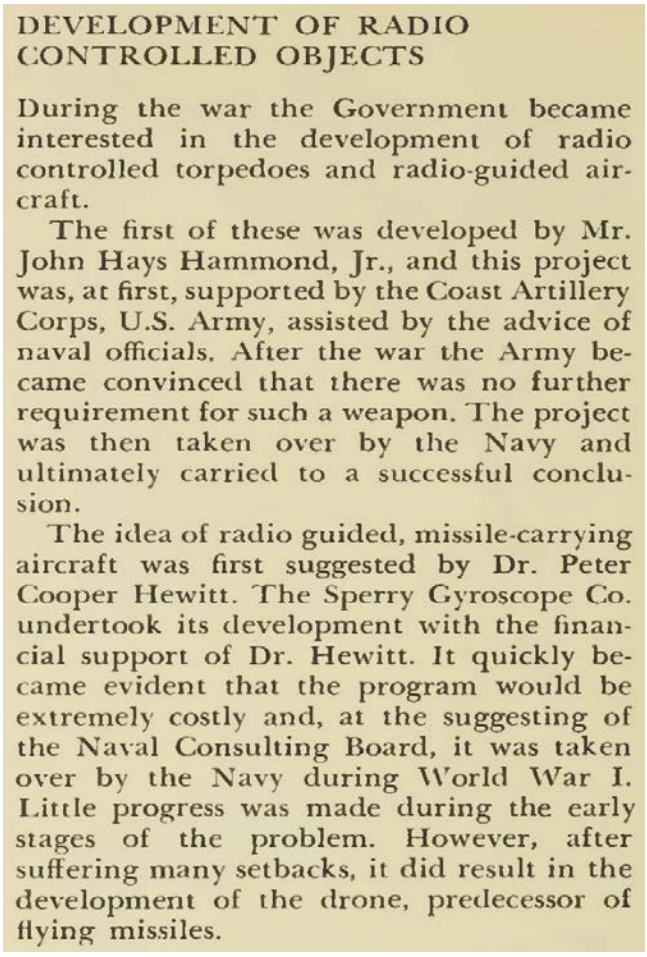
Fig. 5[4]



Special Vacuum Tubes Made by the Vacuum Tube Division

Left to right—The TB-1 Regulator Tube which was used in Wireless Telephone Sets in the Air Service; the Grid Leak Tube; the Relay Tube which was designed for Wireless Control of Torpedoes.

Fig. 6[4]



DEVELOPMENT OF RADIO CONTROLLED OBJECTS

During the war the Government became interested in the development of radio controlled torpedoes and radio-guided aircraft.

The first of these was developed by Mr. John Hays Hammond, Jr., and this project was, at first, supported by the Coast Artillery Corps, U.S. Army, assisted by the advice of naval officials. After the war the Army became convinced that there was no further requirement for such a weapon. The project was then taken over by the Navy and ultimately carried to a successful conclusion.

The idea of radio guided, missile-carrying aircraft was first suggested by Dr. Peter Cooper Hewitt. The Sperry Gyroscope Co. undertook its development with the financial support of Dr. Hewitt. It quickly became evident that the program would be extremely costly and, at the suggesting of the Naval Consulting Board, it was taken over by the Navy during World War I. Little progress was made during the early stages of the problem. However, after suffering many setbacks, it did result in the development of the drone, predecessor of flying missiles.

Fig. 7[6]

Footnote: The Hammond tube resides in the Joe Gruber collection.

1. John Hays Hammond Jr. Papers, 1908-1965 (bulk 1912-1953) Manuscript Division, Library of Congress.

2. *Yale Alumni Weekly, Jan. 8, 1915*

3. *White, William, "The Story of Electronics Development at the General Electric Company*", page 19. TCA Special Publication No. 23.

4. General Electric Company, book, *"The National in the World War, April 6th, 1917-November 11th, 1918"*, pages 246 and 339.

5. Miessner, B.F. *"RadioDynamics- The Wireless Control of Torpedoes and Other Mecvhanisms."* 1916.

6. Howeth, Captain L. S. *"History of Communications-Electronics in the United States Navy", 1963*, pages 210, 337-339