

## Zalinski's Dynamite Gun

David M. Hansen

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“To be sure, it would not be wise to accept the wildcat schemes of every enthusiastic inventor and fill the service with a great variety of weapons of restricted usefulness. But it is certainly important that the minds controlling the armament of a [nation] should be broad-gauged enough to recognize a valuable innovation.”(1) The author of that statement was an American naval officer commenting in 1894, and the “valuable innovation” was the pneumatic dynamite gun, a device which in the last decade of the 19th century, prompted much debate, interest, and outright disagreement as military men and Congress contemplated its role in the nation’s defense. Unlike most new military devices of the time, the pneumatic dynamite gun had a highly visible and eminently successful development, and a surprisingly rapid introduction into the army and navy. That it attained such accomplishments was due largely to one man, Edmund Zalinski. That it was left behind by the services was due to significant prejudice, honest shortcomings, and technical improvements in standard ordnance.

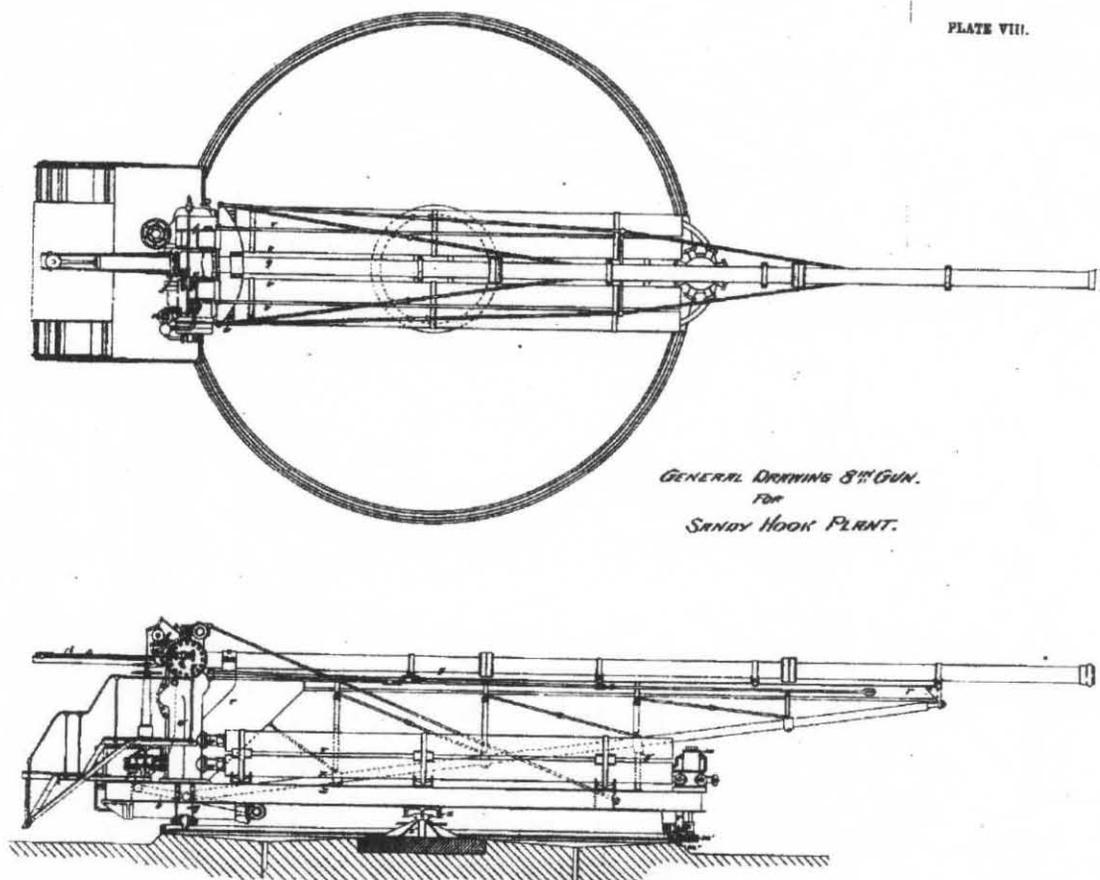
Edmund Louis Gray Zalinski was an artillery officer, Civil War veteran, and Polish immigrant. Gifted with a technical mind, a mechanical facility, and an inventive nature, Zalinski produced one of the most curious pieces of military hardware ever to be used by the United States. The basic idea was simplicity itself: a steam powered compressor would supply a charge of air powerful enough to blast a dynamite-loaded projectile out of a long tube. The idea was an attractive one that fit the sensation of the age. It coupled the destructive energies of dynamite — in the 1880’s still a new and mysterious explosive of almost mythic sensitivity and power — with the omnipotent steam engine.

The military was keen on perfecting some means that would enable dynamite or similar high explosives to be used as a filler for cannon projectiles. Ships now carried heavy iron armor, tough enough to resist the attack of ordinary explosive shells. Dynamite promised a way to rupture the protection, but the enormous heat, shock, and pressure developed by the exploding powder of conventional cannon were certain to detonate any dynamite-charged projectile in the bore of the gun. Zalinski’s weapon produced no heat, almost no shock, and pressures that were extremely low.

An Ohio school teacher named Mefford contrived the first of the pneumatic guns in 1883, and he brought it to Fort Hamilton in New York harbor for trials the next year.(2) It was little more than a long brass tube, attached by a rubber hose to a vessel of compressed air. It came to Zalinski’s attention, and he set about turning the device from a novelty into a practical weapon. He experimented with several models. They were not formidable in appearance, and were described as merely queer looking or reminiscent of a dockside crane.(3) Such editorializing had no impact upon Zalinski — journalists frequently commented upon his modest singleness of purpose — who diligently pursued the perfection of each version

and “bustled about the fort with his wonted energy, and talked of elevations and pneumatics with unabated vigor.”(4) By 1885, he had developed a new and more powerful gun. The smoothbore tube was made of cast iron pipe, bolted and flanged so that it resembled more a piece of plumbing than a piece of ordnance. It was 60 feet long, with an internal diameter of 8 inches. Zalinski had designed it to throw 100 pounds of dynamite two miles with a pressure of 2000 psi, which provided an initial velocity of 1400 fps.(5)

His continued tests caused a great deal of interest. Curious civilians and dubious military alike followed his progress closely, and for visiting dignitaries, a stop at the island (the experiments having been moved to Fort Lafayette) was a must. The pattern for these demonstrations was usually the same. The short, dark, artillery lieutenant greeted his guests as they arrived at the dock and then delivered a brief lecture concerning the different types of dynamite and their uses. Dynamite was held in almost superstitious awe by the majority of the uninitiated. By way of education, Zalinski would place several sticks of the explosive on the ground and then lead the party to the top of the parapet. Here, to his observers’ horror, he picked up large pieces of masonry and hurled them down on the charge below. There would be no explosion. With relief that equaled their momentary shock, the group turned to Zalinski to hear him deliver the perhaps unnecessary pronouncement that dynamite was really quite safe to handle. The next part of the demonstration was equally uncomplicated but certainly more noisy. Using small pieces of the explosive, Zalinski would blow holes in boiler plate.



Appendix 29 1890 1891 2  
8-inch Pneumatic Dynamite Gun.  
*Report of the Chief of Ordnance, 1890, Appendix 29.*

This was intended to be proof positive of the destructive potential of dynamite, and he kept a supply of salvaged iron plate just for the purpose.(6) If a test was scheduled for the gun that day, the visitors might get to see the working of the weapon itself.

Punching holes in scrap iron was one thing, but shooting dynamite out of some strange looking get-up was another. Everyone except those directly involved with the gun greatly feared an accidental explosion. At each test, visitors' confidence seemed to be proportional to distance from the gun as guests walked around the weapon, moving progressively farther away as the time to fire approached. Distinguished visitors were "ready at a moments notice to lie down or be blown up."(7) At a demonstration for a three-member board from the Department of the Navy, the board hid itself behind a tree and "took surreptitious peeps from time to time at the arrangements."(8) Zalinski was quite aware of the discomfort, and to help them save face, he would advise all who wished to retire some distance.

When there was air of sufficient pressure in the reservoir, "an engineer turned a crank up by the breech, there was a sudden hiss as of steam escaping from a locomotive, and the next instant, with a screech like a monster sky rocket, the projectile went sailing out into space."(10) The noise of the projectile through the air was considerable and certainly memorable. One witness felt that it could only be described as a roaring screech, much like the "wail of a discontented elephant."(11)

Sometimes as many as 60 people gathered on the little island for these occasions.(12) Military men of many nations were common, but there were many other officials as well. The Brazilian consul, the Turkish and Chinese ministers to the United States, a Prussian prince, and a Spanish duke were all present at one time or another. Zalinski cared little for the prince and the foppish attitudes of the royal party evidently displeased him. When introduced to the prince, he only turned to one of the aides and asked that the prince throw his cigar away, commenting later that "there is no royalty for me when there is dynamite around."(13)

As the weapon became reality, Zalinski developed his theories for employing the device. The pneumatic dynamite gun was not a cannon, but a machine, an "aerial torpedo projector," used to hurl submarine charges through the air. Before the turn of the century, submarine mines were usually called torpedoes, and they played an important part in defending key harbors and waterways. The powerful battering effect of an under-water explosion could easily rend the hull of warships large and small, making torpedoes greatly respected by all naval commanders. In the United States, the army had placed many groups of them at the entrances to important harbors. They were held in predetermined positions by anchors and could be fired from shore at exactly the right moment.(14) It was not always possible to place the torpedoes at entrances where the water was deep and swift, and for such locations Zalinski proposed that the dynamite guns throw their charges at enemy warships.(15) Exploding underwater near the hull, the projectile would have the same effect as a mine. The dynamite gun could be used another way. Adapting the existing steam engines of warships, it could be easily mounted on a vessel. Zalinski pictured numbers of fast moving ships that would meet an enemy fleet, fill the waters around it with violent explosions, and decimate it before ever reaching the coast.(16)

This then was Zalinski's machine: a very special device for throwing lethal parcels of explosive beneath or near the hull of a ship. The weapon had a "peculiar distinctness which

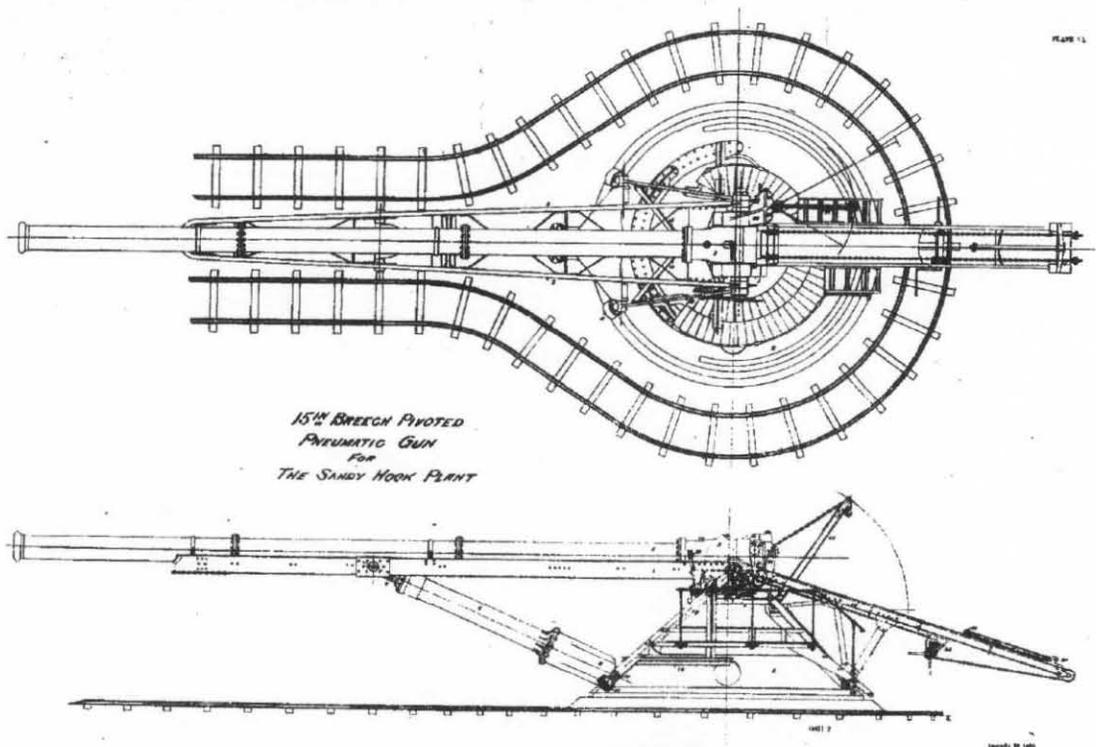
will admit of no comparisons,” but it was a distinctness that many in the military seemed unable or unwilling to appreciate.(17)

Zalinski worked hard to convince the army and the navy to adopt the weapon, or at least give it a fair trial. The results of his own extensive tests were certainly encouraging: the gun was far more powerful than ordinary cannon and it surpassed them in accuracy as well. There were additional advantages. Unlike any other cannon, the dynamite gun would be relatively inexpensive to manufacture. Conventional cannon required carefully tempered steel and elaborate construction facilities, but the dynamite gun could be built of cast iron in an ordinary machine shop. And most conspicuously, it was the only weapon that could fire dynamite filled projectiles without blowing itself up. However, both officials and officers of the services were loathe to admit that the weapon “exceeded anything but mediocrity.”(18)

Convinced of the real value of the machine, Zalinski continued to press, aiming most of his efforts at the Navy Department for several good reasons. He realized that the weapons for the army’s new coast defense system then being designed had been already selected and as yet remained largely untried. The navy, however, was more advanced with its rebuilding program, and might be receptive to a weapon which could destroy any vessel afloat and could even change the tactics of naval warfare. He designed a coast defense gun for the army, but it would be the navy that acted first.

Encouraged by Zalinski, naval officers carefully watched his tests. While many were doubtful, some were impressed. In 1886, the Navy Department proposed a “dynamite cruiser,” and late that year a contractor agreed to build such a ship. It was Zalinski’s personal efforts, combined with the reputation of the weapon, that largely accounted for this first success.(19) It was a remarkable achievement. Although Zalinski had shown that the gun could be fired

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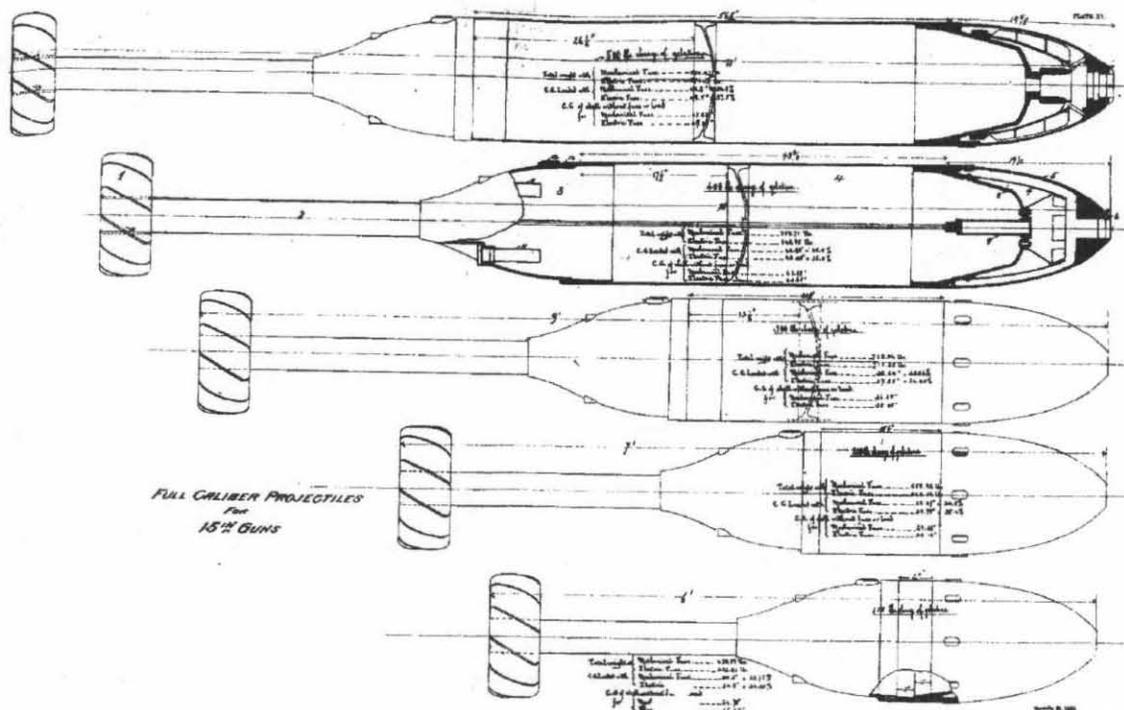


Model 1886 15-inch Pneumatic Dynamite Gun.  
Report of the Chief of Ordnance, 1890, Appendix 29.

accurately, safely, and reliably, he had never done anything to indicate that the weapon could be adapted for shipboard use. The gun even had yet to prove its ability to sink a ship.

Such an omission was particularly irritating to the administrators of the Pneumatic Dynamite Gun Company, a private firm organized to produce and sell the gun once it was perfected. While Zalinski worked earnestly towards a practical weapon, company agents worked with equal enthusiasm in its promotion. Realizing that there was little continuing publicity value in the routine destruction of the barrel targets in the narrows at the entrance to New York harbor, the firm announced its eagerness to prove the utility of its weapon by sinking one of the navy's monitors.(20) Their enthusiasm was probably encouraged by the pronouncement of Colonel H. L. Abbot, prominent member of the army's Board of Ordnance and Fortification, who stated that even a near miss by a charge of dynamite which the gun was capable of firing would destroy one of the formidable armored warships.(21)

In September of 1887, the federal government supplied a ship, but instead of an iron monitor, the target was to be a small, wooden, two-masted schooner, retired from the Treasury Department. The dynamite gun did its work with violent dispatch, leaving little but memories of the vessel.(22) Those who witnessed the event were terrifically excited. Whistles blew, there were cheers for Zalinski, and those connected with the Pneumatic Dynamite Gun Company ran around and shook hands with everybody. All agreed that the firing had been a tremendous success.(23) The weapon was "terribly effective" and the "stoutest ironclad afloat would have been rendered unmanageable by the explosion."(24) One man thought it prob-

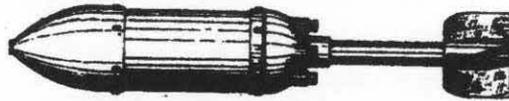


Projectiles for 15-inch Pneumatic Dynamite Gun.  
Report of the Chief of Ordnance, 1890, Appendix 29.

*View of full calibre (15") projectile  
(500 lbs charge)  
during loading and flight.* PLATE XVI.



*View of full calibre (15") projectile  
(200 lbs charge)  
during loading and flight*



*View of subcalibre (10 1/2") projectile  
(200 lbs charge)  
during loading*



*View of subcalibre (10 1/2") projectile  
(200 lbs charge)  
during flight.*

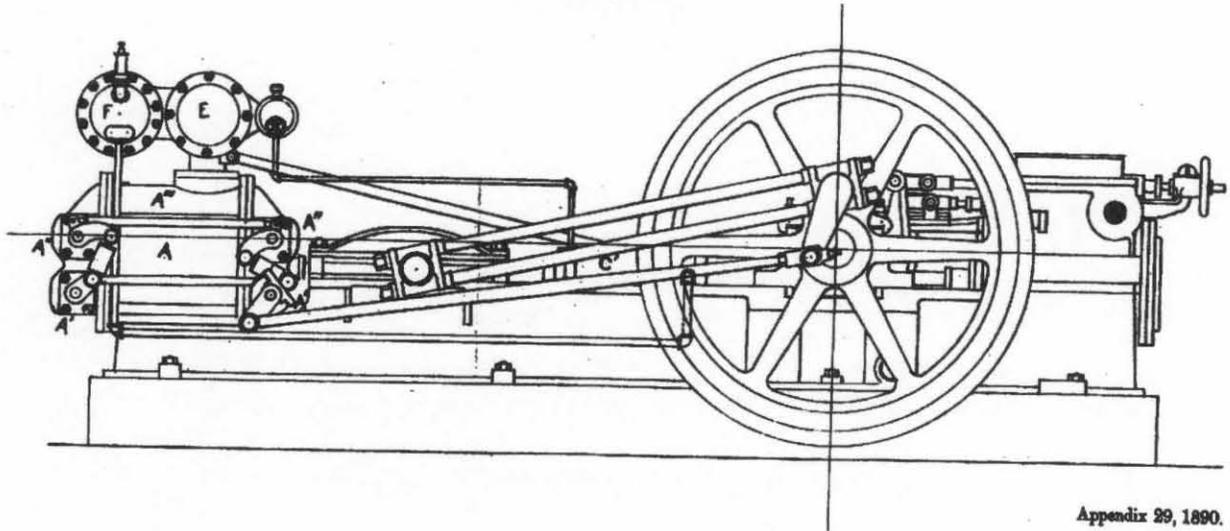


Appendix 29, 1890.

*For 15" Pneumatic Dynamite Gun.*

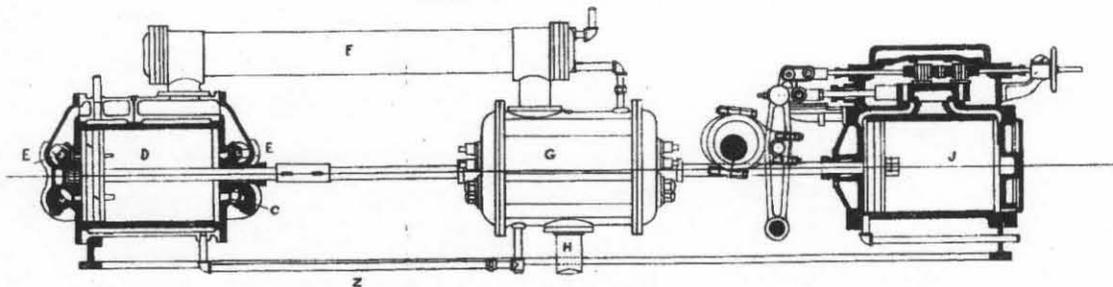
Projectiles for 15-inch Pneumatic Dynamite Gun.  
Report of the Chief of Ordnance, 1890, Appendix 29.

Duplex Engine with Double Air Compression.  
Side Elevation.



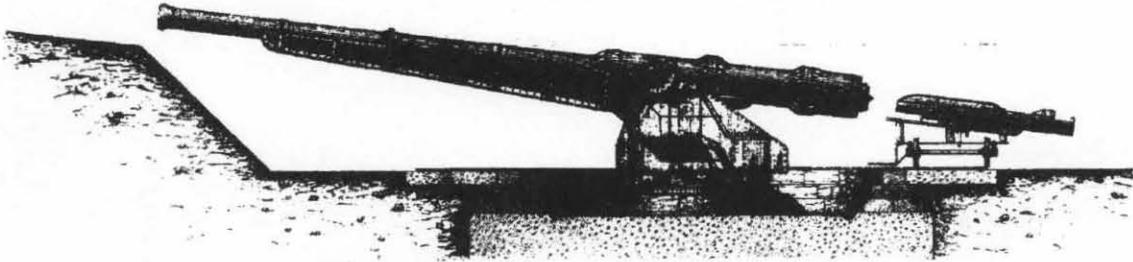
Appendix 29, 1890.

Compound Air Compressor.



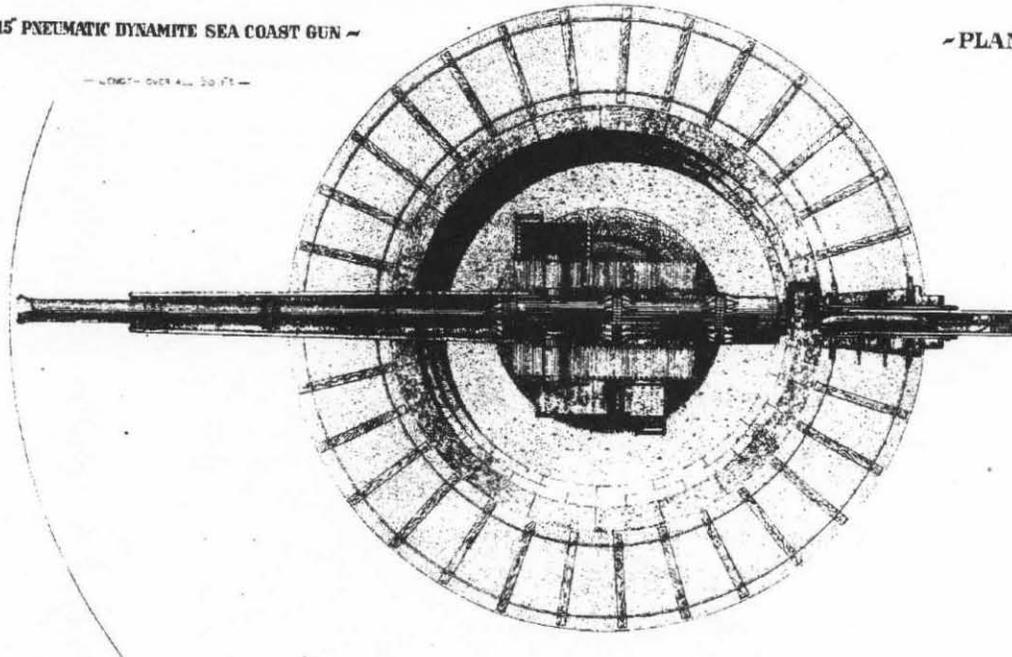
Appendix 29, 1890.

Air Compressor system for Pneumatic Dynamite Gun.  
*Report of the Chief of Ordnance, 1890, Appendix 29.*

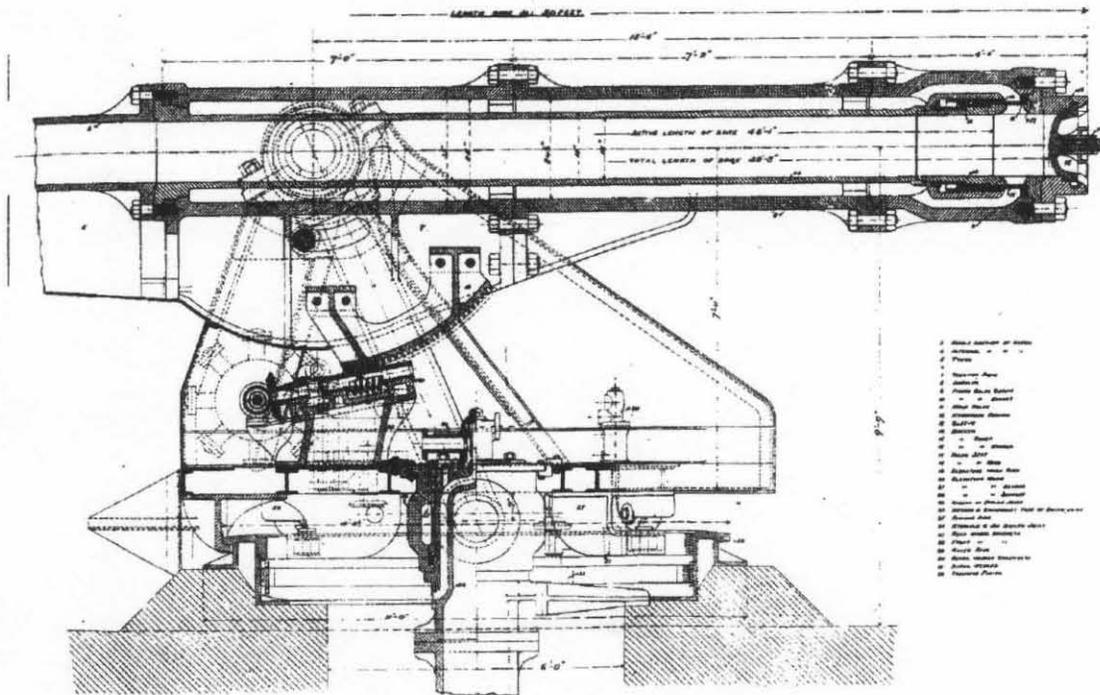


~ 15" PNEUMATIC DYNAMITE SEA COAST GUN ~

~ PLAN ~



15 inch Coast Defence Gun

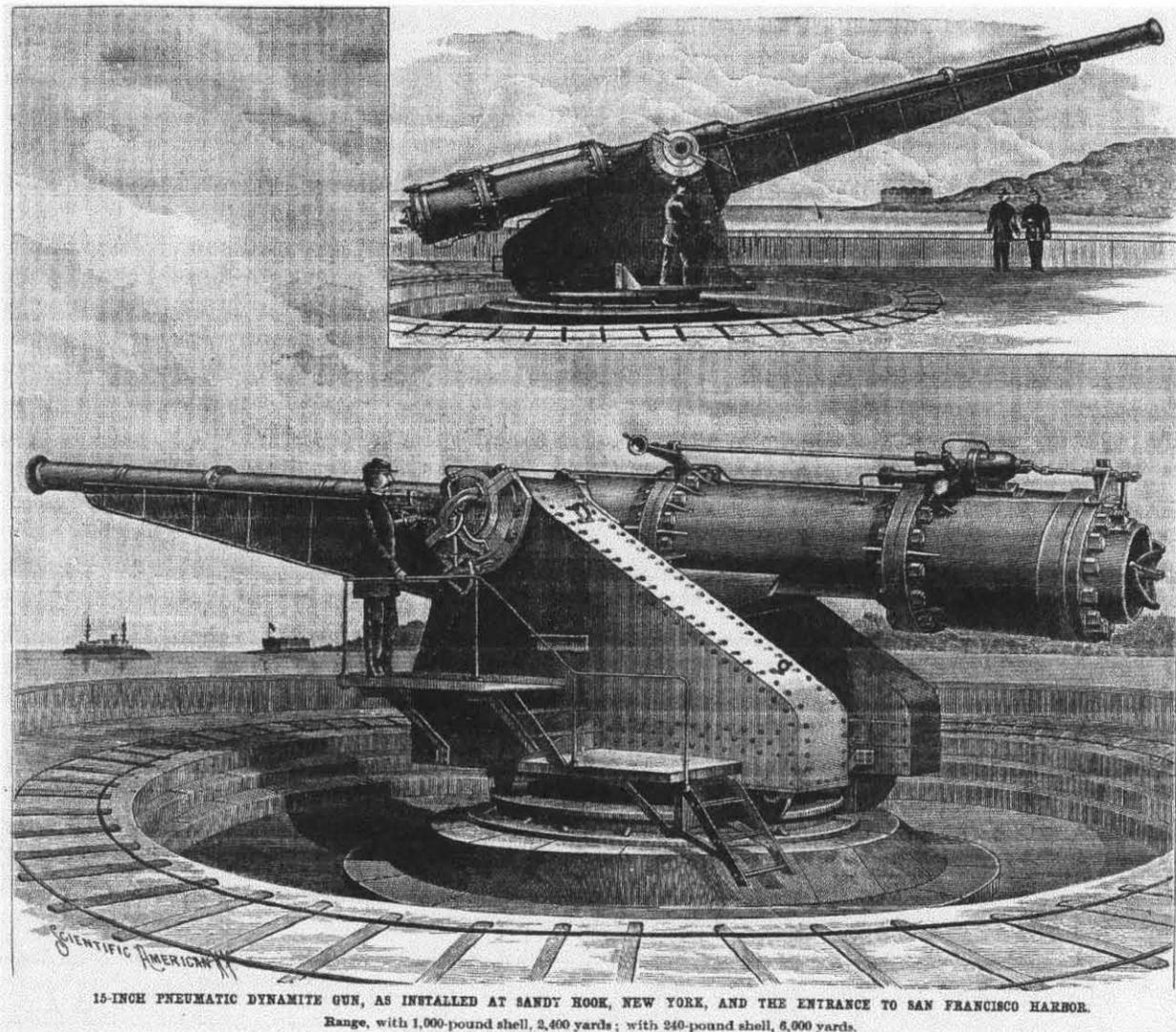


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- 2. Breech Ring
- 3. Breech Bolt
- 4. Breech Bolt Head
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Model 1890 15-inch Pneumatic Dynamite Gun.  
Report of the Chief of Ordnance, 1890, Appendix 29.

able “that all human lives would be instantly destroyed upon any vessel near which one of these missiles should be exploded.”(25)

Following such sanguinary praise, the future looked bright. Zalinski, convinced of the weapon’s value almost exclusively as a projector of mine-like charges, developed a dynamite gun with a bore of 15 inches, almost twice the size of the gun that had sunk the ship.(26) The new model would be able to throw a half-ton projectile at its target, and three of them would be especially built for installation on the *Vesuvius*, the navy’s new dynamite cruiser. Italy and Britain each ordered coast defense models of the gun, and Austria, Denmark, France, and Spain all indicated interest.(27) A harried Brazilian government bought one of the big coast defense weapons and mounted it directly on the deck of a hastily purchased freighter, the entire project meant to defeat a group of rebels. The result, to one man’s eyes, “was unquestionably the most complicated and awkward piece of mechanism ever installed on a floating vessel.”(28)



From *Scientific American* Special Edition of 1898.

Things looked good for Zalinski as well. His many experiments with the flamboyant weapon had cast him into the public light and he had become well known. He gave talks to a variety of clubs, usually about the dynamite gun, but frequently about new applications of electricity as well. His articles appeared in journals and in the popular press. Military publications sought his opinions about the many new devices being brought into the service with the recent fortification program. His abilities were practical, not theoretical, and he served as an inspiration to others. Several followed his attempts to perfect a workable dynamite gun or projector, and one gave up his position as Professor of Medical Law at Syracuse University to pursue his own ideas for the weapon.(29)

Although the dynamite gun was gaining some acceptance, a great deal of prejudice existed against it in the army, and many found Zalinski's success of little credit. Through a curious sort of logic, some artillery officers felt that the lieutenant's involvement with a cannon that used compressed air instead of gunpowder was demeaning to the service as a whole. Others objected to his work on what they thought was primarily a weapon for ship-board use. Reputedly, Zalinski was asked to drop the project and to devote his time and talents to more conventional concepts. The success of his experiments, his critics claimed, might lead to the downfall of a branch of the service that men had spent their lifetimes perfecting. Even the chief of ordnance reportedly tried to dissuade him. He felt that if the public got the "dynamite idea" into its head, the regular ordnance appropriations might not pass.(30) That fear may have been well founded. Congress itself had become keenly interested in dynamite, and in 1888 contemplated a committee to examine the military uses of the explosive.(31)

There was other adverse opinion, and more telling. The Board of Ordnance and Fortification was also considering the problem of "throwing" high explosives, but in an entirely different manner than Zalinski. It wanted to fire high explosives from ordinary cannon, believing that projectiles should penetrate armor and explode, and not bludgeon a ship externally. The pneumatic dynamite gun did not produce anywhere near the velocity required for armor penetration, nor could its lightly-built projectiles survive an attack on armor plate. The board also found fault with the limited three-mile range of the dynamite gun: even if it were used only as an adjunct of a mine field, it would become the target of capital ships, whose heavy guns had a much longer reach. In short, the dynamite gun could not defend itself against its most likely prey. The board mirrored the policy of the army as a whole; the path that Zalinski had chosen was uphill.(32)

Besides opposition to the invention, Zalinski had to face a certain amount of professional jealousy. That feeling increased in May of 1889, when he was appointed military attache to St. Petersburg.(33) The inspector general stated that he wished to appoint an artillery officer to the choice assignment to symbolize the end of the army as an agent of government Indian policy, and to emphasize its new role in looking outward and guarding against external enemies.(34) No artillery officer was more in the public eye than the one who had perfected the dynamite gun. The appointment was made.

Such a move was unprecedented. Zalinski had only recently been promoted to captain, and most significant of all, he was not a West Point graduate. Much of the jealousy revolved around this one point, and Zalinski himself was especially sensitive about his lack of a formal military education. At one time the hostility grew so virulent that he wished to withdraw his name from those under consideration, but his friends persuaded him to change his mind. Of

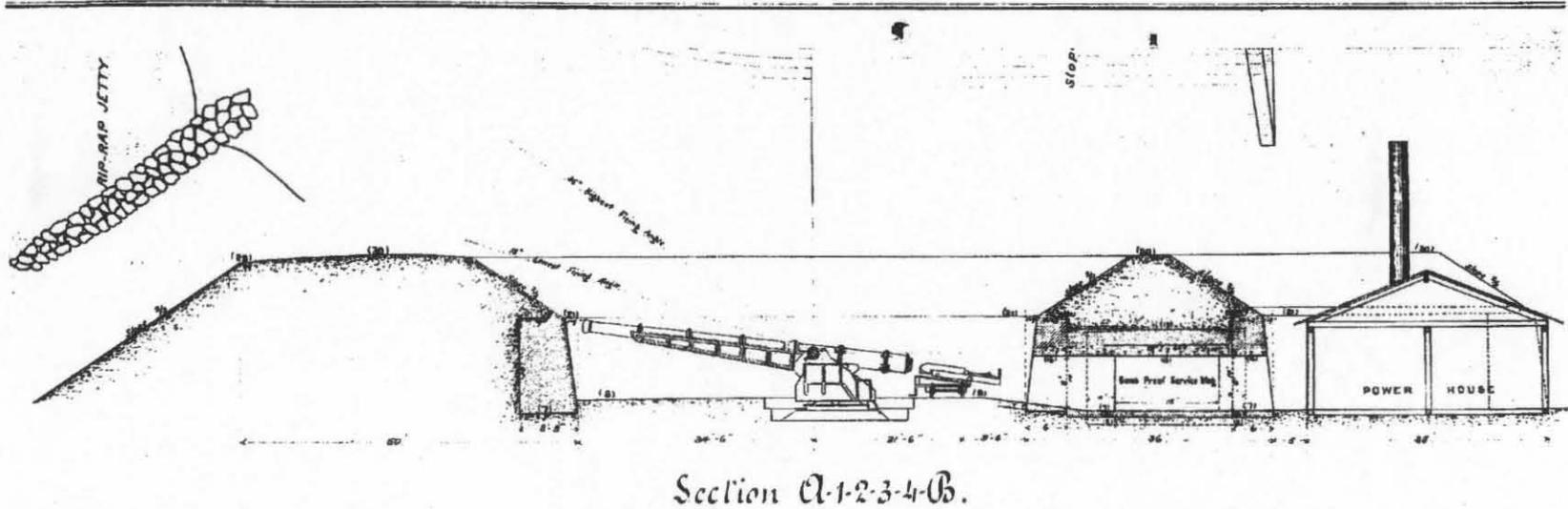
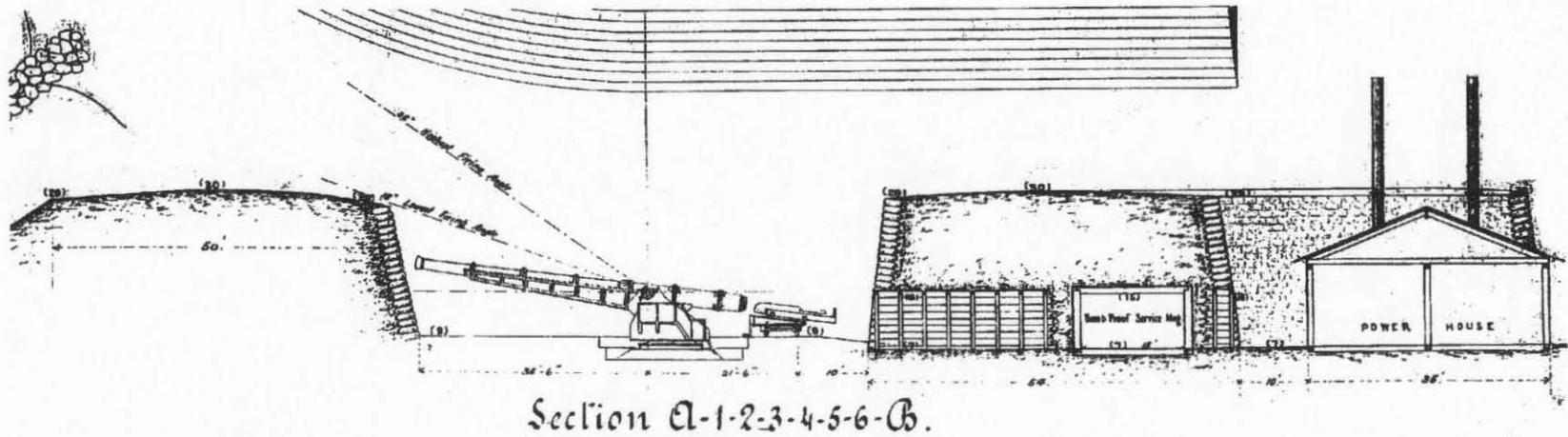
course not all were jealous. Many thought that he was just the kind of man that should be selected: he had achieved his position through drive and ability rather than social grace. The United States Minister to Russia also favored the appointment.(35) There were public attempts to mollify the obvious discord: the adjutant of West Point was among the first to congratulate him, and Zalinski stated that his staunchest supporters had been West Pointers.(36) It was a hollow gesture. Zalinski could never forget the hard feelings, and lived constantly with the idea that he was set upon in small ways because he had not gone to "The Point." Against this background of pettiness were persistent rumors that whispered Zalinski was being sent abroad to get him out of the way and to urge the demise of the dynamite gun in his absence.(37)

Several months before Zalinski left for his new assignment across the Atlantic, the War Department acknowledged the demonstrated abilities of his weapon and at last agreed to use it in the new coastal fortifications. The \$400,000 contract with the Pneumatic Dynamite Gun Company called for a small group of guns to be delivered eight months from the date of signing, but in reality it would take five years. The long delay was due to a series of internal difficulties within the contracting firm, all avoidable and all the result of poor management.

After the navy launched its dynamite cruiser *Vesuvius* in the spring of 1888, the immediate reaction was so favorable that there was talk in the Capitol of building similar ships. The company financed the contract for the coast defense guns with the hoped-for monies that would appear when the appropriations for the new ships came through.(38) But Congress was chary and wanted the *Vesuvius* thoroughly tested before it purchased others. Testing was slow, and when finally completed, the results were not conclusive.(39) The company foundered and went under, and for the next several years, it suffered through a long series of directors, receiverships, and setbacks. But while the firm was passing from one manager to another, a strange thing was happening. After the government ordered its weapons, there was very little news of the company's activities. What news there was did not concern the financial difficulties but rather subtle improvements to the gun itself. A valve change here, an attempt to increase range there, altering the temperature of the compressed air, the possible manufacture of a new gun that could hurl a ton of dynamite, all combined to give the impression that there was much more going on than might otherwise be suspected. Observers commented that developments were being kept exceedingly quiet, which was a notable contrast to the near carnival atmosphere of the earlier tests.(40) The consensus was that the pneumatic dynamite gun had improved so much that it was now a real threat to the continued use of ordinary cannon.(41) Enthusiastic reports from England that said the military there was "astonished" by the new gun only added to the growing glamour.(42) The most dramatic endorsement came finally in the summer of 1894 when, five years late, the United States tested its first coast defense dynamite gun battery.

Located at Fort Hancock on New Jersey's Sandy Hook, the battery was a collection of three different dynamite guns. One was the machine of eight-inch bore that had sunk the little Treasury Department vessel some seven years before. Another was the first 15-inch gun which had been built originally for the Italian government but was later sold to the Americans. The third was a newer 15-inch gun, improved and superior to the first.(43)

On August 23, the day was at hand. One of the guns in the battery fired, the long projectile arced slowly, "cut the water like a spear, and there was scarcely a splash as it disappeared beneath the surface. Suddenly, on the spot where it had landed, and for a large space on all



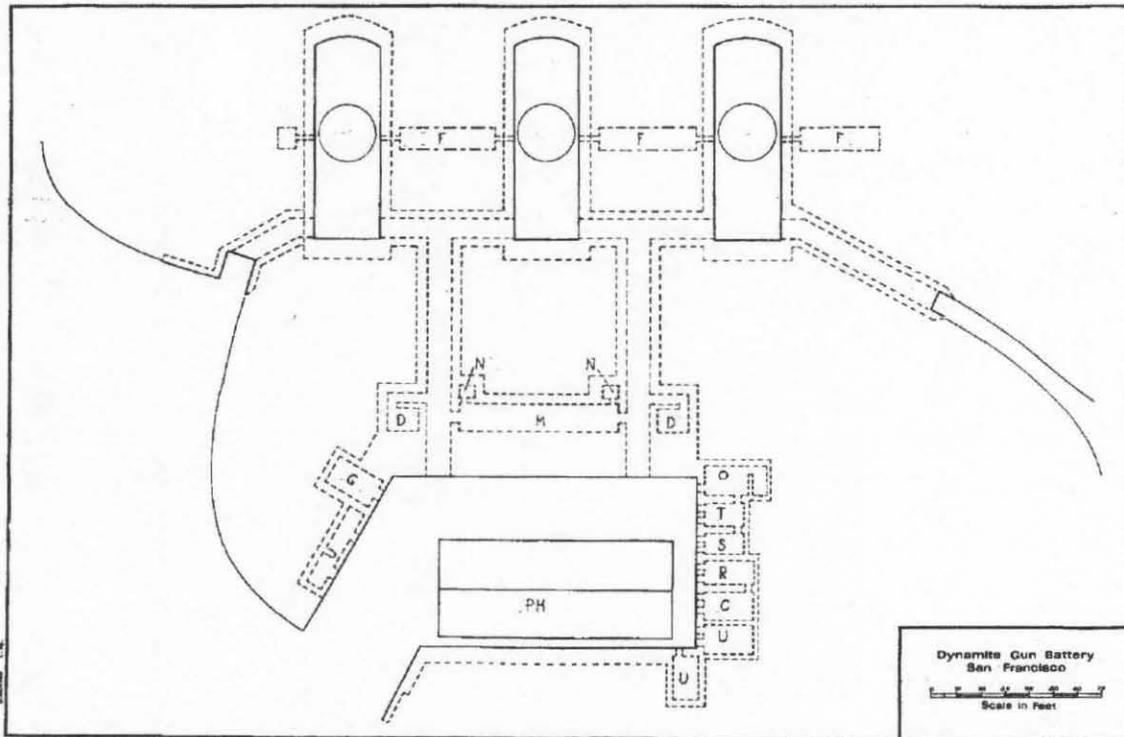
Two versions of the proposed battery to be constructed for dynamite guns mounted at Fort Hancock, The upper drawing depicts an emplacement constructed of sand bags and earth fill; the lower drawing represents a more traditional approach using concrete, but with an approach that is a modest shadow of the elaborate and expensive battery erected at San Francisco. Portions of drawings in drawer 45, Sheet 109-1 and 4, Record Group 77, National Archives and Records Administration.

sides, the water seemed to rise up in a solid mass. Then came the sound of a tremendous explosion, and, with the most terrible commotion, the water fell back, leaving the air full of spray and the surface an expanse of angry white waves.”(44) The United States had the ultimate weapon.

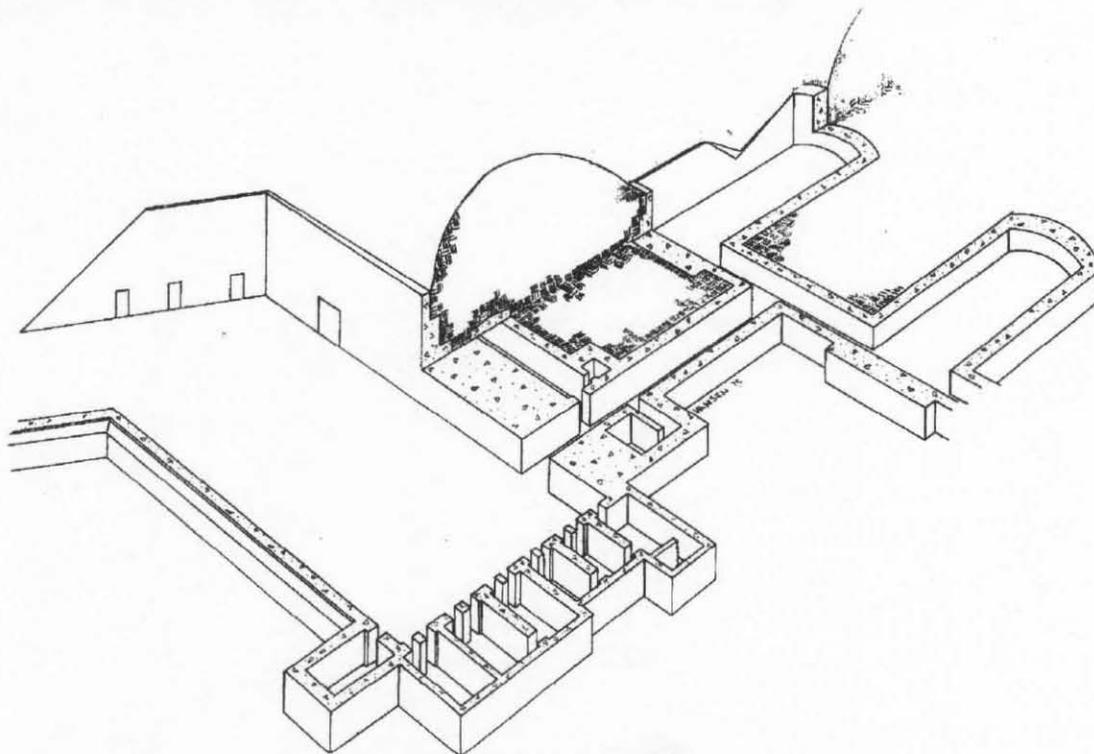
The battery was described as a “wonder,” and New York was declared “safe against the strongest Navy afloat.”(45) Against the dynamite gun, “. . . any vessel, armored as heavily as they like, becomes like newspaper; it cannot stay afloat. No ship would even dream of approaching the coast where dynamite guns of proven efficiency are known to exist — They might as well sail straight over Niagara.”(46) Proponents of the gun declared accurately that the dynamite gun was the most destructive weapon available at the time. It could, they said, destroy the largest vessel afloat or the most heavily defended position on land. “Just imagine,” rhapsodized a company brochure, “the effect of five hundred pounds of high explosive exploded on the deck or in the water alongside a vessel, in the streets of a thickly populated city, or in the precincts of a garrisoned fort.”(47) It was a “great and memorable step toward the final abolition of all war.”(48)

In 1895, the builders, reorganized now as the Pneumatic Torpedo and Construction Company, completed the installation of three dynamite guns on a bluff high above San Francisco’s Golden Gate. The guns were Model 1890, the last and most sophisticated of the series, and the battery — as ultimately completed in 1898 — was the most elaborate establishment made for any dynamite guns. The guns were 83 feet apart, each gun slightly lower than the one on its left. The power house was some distance away, and it contained the boilers, engines, compressors, intercoolers, air storage tanks, and electrical plant necessary to the functioning of the weapons. An underground distribution system conducted air at 2000 psi to reservoir vaults beneath the guns and to the guns themselves.(49)

The tests of the battery were a complete success in every way, and as the workers were putting the final touches on the impressive earth and concrete emplacements, the Pneumatic Torpedo and Construction Company approached the government again. The president of the firm had noticed that there was a \$200,000 balance in the appropriations made for the purchase of dynamite guns; since the batteries at Sandy Hook and San Francisco had been accepted as satisfactory, would the government like to purchase several additional guns to eliminate the balance?(50) The answer was a quick “No,” but close on the heels of that reply was the Spanish-American War and its accompanying fears that a Spanish fleet could have its way in any harbor in the United States.(51) Major General Nelson Miles, commanding general of the army, believing more in the dynamite gun than did most of his fellow officers, requested that construction begin at once with the balance available. The chief of engineers, Brigadier General John Wilson, suggested several sites for mounting the guns, but urged that the money be spent on conventional artillery. General Miles was not moved, and ordered that construction begin for two guns on the east coast. Each gun was to cost \$100,000, or nearly three-fourths again as much as they did in 1889.(52) A new company president, T.S. Darling, explained that mounting guns singly was more expensive than doing so severally, and the company had lost heavily on earlier contracts.(53) Fearful that the appropriation might not be released, he wrote to the secretary of war; for the funds “not to be used in time of war means ruin to our company in the eyes of the world as all nations are watching it.”(54) Rather than have that happen, he offered to turn over all plans for the guns to the government so they could be built in its own facilities.(55) Despite Darling’s dramatic sug-



Plan of the dynamite gun battery, Fort Winfield Scott. Legend: F- Compressed air flasks below emplacement level; G-Guard Room; D-Dynamite magazine; N-Detonator magazine; M-Projectile magazine; O-Commanding Officer; T-Telephone; S-Storage batteries; R-Relocating room; C-Chart room; PH-Power house; U-Unidentified use. Drawing by David M. Hansen,



Sectional axonometric through emplacements one and two of Fort Winfield Scott dynamite gun battery. Drawing by David M. Hansen.

gestions of sacrifice, the guns were built in the company's own shops and emplaced, one at Hilton Head, South Carolina, and one on Fisher's Island at the eastern entrance to Long Island Sound, but only after three years of repeated delays caused by cold weather, strikes, rising water, and smallpox. Finally finished in the winter of 1901-02, Darling called the construction "a tedious, long and expensive job but in the end far superior to anything we ever built." (56) Eighteen months later, the guns, steam engines, compressors and other appliances were sold as scrap.

Shortly after New Year's Day, 1904, Darling sent a message to the Ordnance Department. No longer using the richly engraved stationery of his firm, he wrote from the Hotel Victoria in New York, and asked in a brief note if he might be informed when the battery at San Francisco was to be sold. (57) With that last request, the dynamite guns were gone.

If Zalinski had opinions about the passing of the device which had absorbed so much of his ingenuity, he did not record them. He was eclectic in his interests, and as early as 1887, he was ready to move on to other matters; "I do not care to be and remain simply a 'Dynamiter,'" he said. (58) His stay in Russia was brief, and in 1890 his orders sent him back to Washington, assigning him to the Pneumatic Dynamite Gun Company to ensure that it produced what was contracted for. Then he went to the Presidio at San Francisco where he remained less than a year before falling ill. Recovery was slow. He was sick for three months and then took leave for a year and a half to recuperate. In 1893, he returned to duty, staying in the office to handle paper work, but late in September he had a relapse and went on sick leave again. In February of 1894, he was retired. (59)

He fought hard to stay in the army. Only days before the retirement orders were written, he wrote an urgent and unsettling note to the adjutant general of the army, asking that he be allowed a year more service so that he might complete his current projects. To be retired at this time, a little more than a year short of three decades of service, would be a "beheadment." (60) He had done so much for the army; surely it would be unjust to shut him out now. He listed some of his achievements — there were many — and noted that others had taken credit for some of what he had done. Although Zalinski made no reference to it, an employee of the Pneumatic Dynamite Gun Company was claiming credit for the device. (61) Perhaps, he thought, years of dedicated service were not enough, and he said, "I never felt it necessary to cultivate any outside support. I find I was wrong." (62) He wondered again, as he had so often wondered, if those above him were influenced by the fact that he was not a West Point graduate. (63) The letter did no good. The retirement order in hand, Zalinski fell from view. After years of failing health, and suffering the lingering effects of an unshakeable pneumonia, Zalinski died in 1909.

That his dynamite gun ultimately came to be such a limited contribution lay in a combination of opinions and results. Despite its great initial triumphs, it was crippled at the outset by the attitude of the Board of Ordnance and Fortification. While the board had an announced philosophical difference with the weapon, it was also miffed by the fact that it had no control over the purchase and testing of the dynamite gun. The board was conducting its own experiments with high explosives, and suggested icily in 1892 that the results were so favorable that the contracts for the independently developed dynamite gun be closed. (64) Five years and many failures later, the board reluctantly admitted that the pneumatic dynamite gun was indeed the only weapon that could accurately throw large charges of dynamite,

although that conclusion did not at all dissuade the board from its belief that powder cannon should be able to do the same.(65)

The launching of the *Vesuvius* seemed a complete endorsement of the weapon, yet the vessel did not prove itself during its trials and in later service. There were difficulties with the breech, with the auxiliary and main valves, with condensation of oil and water on the valve orifice which affected the range in an unpredictable manner, with the fuses, and with more general problems of manipulating the apparatus.(66) In addition, it still was not clear how the *Vesuvius* or others like her would be used in battle. She would almost certainly be destroyed by the long range fire of heavy guns, and even if fortunate enough to get within striking distance of a target, there was no method of aiming the dynamite guns that rigidly projected through her deck. The feeling seemed to be that although the dynamite gun had great promise, its installation on the *Vesuvius* was premature and greater refinement was necessary. It also appeared to naval officers who had experienced the *Vesuvius* that the dynamite gun might be a useful supplement but not a main battery, and that its real potential lay with the army in coast defense. After expending considerable time and effort, the navy deferred further consideration to the army.(67)

The army, however, was not keen on more tests. As far as it was concerned, the dynamite gun was of benefit only in those limited instances where submarine mines could not be planted effectively. While dynamite guns were cheap when compared with steel cannon, they were an expensive addition to mine fields, which had been advertised to Congress as an especially economical protection. Moreover, it cost almost as much to build an emplacement to protect a dynamite gun as it did for a high-powered 10- or 12-inch gun, which had much greater utility.(68) Dynamite guns would also attract the fire of the most threatening ships in an attacking fleet, with the result that other parts of the defense close by might be incidentally damaged. The possible explosion of the dynamite stored in the battery was unnerving, as was the rupture of a high pressure line: a pipe burst in the Sandy Hook battery in 1894, blowing out the front of a building and scattering fragments of metal like shrapnel.(69) Additionally, the gun and its complex of machinery had to be continually maintained by skilled engineers, while other coast defense weapons could stand for many months with no attention at all. Given all these factors, and the feelings of the Board of Ordnance and Fortification, it came to no one's surprise when the board declared the pneumatic dynamite gun obsolete in June of 1901.(70)

In its message, the board alluded to "more recent developments in the means of defense," probably indicating growing success with slow acting smokeless powders and more potent explosive charges in conventional cannon. (71) The army adopted varieties of smokeless powder in 1895 and 1900, and began to use "Explosive D" (ammonium picrate) as a projectile filler in about 1901.(72) Both materials improved the destructive capacities of existing ordnance, but they did not duplicate the ability of the pneumatic dynamite gun in accuracy and volume of explosives delivered.

Supporters of the device emphasized that the dynamite gun was valuable to the mine defense in a special way, but their comments were obscured by the spectacular effects the weapon produced. In accepting the Sandy Hook battery in 1894, the examining group of ordnance officers endorsed the gun, but what the reporting officers said also contained portent of failure. The pneumatic dynamite gun took its "proper place in the class of torpedo throwers."(73) The only problem was that there was no class of weapons called "torpedo

throwers.” The final pronouncement was summed up by a naval officer commenting on the failure of the dynamite cruiser *Vesuvius*: the weapons were not “fish, fowl, or even good red herring.”(74)

The brief career of the pneumatic dynamite gun preceded the greater development of the coast defense arsenal that came in the 1890s. It was a remarkable achievement, and was not surpassed in its specialized application by other material that came after it. That it enjoyed any capacity at all was due to Edmund Zalinski, who not only lifted the device from a crude model to a functioning military tool, but who also described a tactical role for it. Zalinski did not invent the gun — and he repeatedly gave credit to the many individuals who had aided its physical progress — but he guided its improvement. In retrospect, it is easy to dismiss the dynamite gun as another Victorian curiosity, yet it is something more. It was representative of the entire philosophy of the coast defense program of the 1890s: that the United States, with or without fantastic weapons, could disassociate itself from foreign enemies simply by making itself invasion proof.

### Notes

1. Lt. William F. Fullam, commenting upon the article by LtCdr Seaton Schroeder, “The USS *Vesuvius*, with Special Reference to her Pneumatic Battery,” *Proceedings of the United States Naval Institute*, Vol. 20, No. 1 (1894), pp. 60-61.
2. Lt. E. L. Zalinski, “The Pneumatic Dynamite Torpedo Gun,” *Journal of the Military Service Institution of the United States*, Vol. 8 (June 1887), p. 170.
3. *New York Times*, November 29, 1885, p. 3.
4. *New York Times*, June 26, 1886, p. 8.
5. “Zalinski’s Dynamite Gun,” *Engineering*, February 12, 1886, p. 149.
6. *New York Times*, October 16, 1885, p. 8.
7. *New York Times*, March 27, 1887, p. 3.
8. *New York Times*, June 25, 1886, p. 3.
9. *New York Times*, March 27, 1887, p. 3.
10. *New York Times*, November 29, 1885, p. 3.
11. *New York Times*, March 27, 1887, p. 3.
12. *New York Times*, October 16, 1885, p. 3.
13. *New York Times*, June 26, 1886, p. 8.
14. Emanuel Raymond Lewis, *Seacoast Fortifications of the United States*, (Washington: Smithsonian Institution Press, 1970), p. 88.
15. Edmund Zalinski, “Torpedo Guns Afloat and Ashore,” *Journal of the United States Artillery*, Vol. 10, No. 2 (September-October 1898), p. 191.
16. Zalinski, “The Pneumatic Dynamite Torpedo Gun,” pp. 190-194.
17. *New York Times*, January 6, 1889, p. 2.
18. *New York Times*, February 19, 1890, p. 8.
19. *New York Times*, January 31, 1890, p. 8; see also House Report 4056, 49th Congress, 2nd Session. The story of this ship is beyond the scope of the present paper; the relation of its authorization, construction, and testing is fully a topic all its own.
20. *New York Times*, January 29, 1889, p. 5.

21. *New York Times*, June 25, 1886, p. 3.
22. *New York Times*, September 21, 1887, p. 2.
23. Ibid.
24. *New York Times*, September 21, 1887, p. 4.
25. Ibid.
26. Zalinski, "Torpedo Guns Afloat and Ashore," p. 191.
27. Italy, *New York Times*, May 24, 1888, p. 4; Britain, *New York Times*, February 13, 1890, p. 6; Austria and Denmark, *New York Times*, September 21, 1887, p. 2; Spain, *New York Times*, October 1, 1887, p. 3; France, *New York Times*, February 8, 1889, p. 8.
28. Howard P. Elwell, "Arming of the Brazilian Cruisers Nictheroy and America," *Proceedings of the United States Naval Institute*, Vol. 19, No. 4 (1893), p. 393.
29. *New York Times*, May 28, 1890, p. 1.
30. *New York Times*, February 19, 1890, p. 8.
31. See Senate Bill 2955, 50th Congress, 1st Session.
32. House Executive Document 12, 52nd Congress, 1st Session, "Report of the Board of Ordnance and Fortification," October 24, 1891, p. 26 [hereafter cited as RBOF with year of issue].
33. "Statement of the military service of Edmund L. Zalinski," November 11, 1893, Military Service Records of Edmund Louis Gray Zalinski, Records of the Adjutant General's Office, 1780s-1917, RG 94, National Archives, Washington, D. C. [hereafter cited as Zalinski MSR].
34. *New York Times*, February 11, 1889, p. 5.
35. *New York Times*, May 14, 1889, p. 5.
36. *New York Times*, May 16, 1889, p. 4.
37. *New York Times*, February 19, 1890, p. 8.
38. *New York Times*, July 7, 1891, p. 8.
39. *New York Times*, April 15, 1893, p. 8.
40. *New York Times*, February 28, 1890, p. 3.
41. *New York Times*, February 20, 1890, p. 5.
42. *New York Times*, February 21, 1891, p. 5.
43. *New York Times*, October 22, 1893, p. 10.
44. *New York Times*, August 23, 1894, p. 1.
45. Ibid.
46. "Dynamite Guns - United States," *Journal of the United States Artillery*, Vol. 3, No. 4 (October 1894), p. 737.
47. *The Pneumatic Aerial Torpedo System*, (New York: Pneumatic Torpedo and Construction Company, 1898), p. 2.
48. "Dynamite Guns - United States," p. 737.
49. House Executive Documents, 54th Congress, 2nd Session, *Annual Report of the Chief of Ordnance*, Appendix 32, "Report of Board for Inspecting and Testing the Pneumatic Dynamite Gun Battery and Plant near Ft. Winfield Scott, Cal.," pp. 559 and 560 [hereafter cited as ARCO with year of issue].
50. Gen D. W. Flagler to the Secretary of War, April 27, 1897, File 12727. "Price Torpedo and Construction Company," Office of the Chief of Ordnance, New Series 1894, Records of the Chief of Ordnance, RG 156, National Archives, Washington, D. C. (hereafter cited as Dynamite Gun Papers NA). The contracts with the Pneumatic Dynamite Gun Company and its successor firm were made in accordance with the acts of September 22, 1888, and March 2, 1889, and required the company to

produce a total of ten dynamite guns. Because of the failure of the original contracting firm, only three weapons were delivered (to Sandy Hook), with the result that there was a balance of greater than \$200,000 left in the 1888 act. The 1889 act provided \$187,500 for the three guns mounted in San Francisco. Protective emplacements were not provided under these acts, but came under separate appropriations in 1898 (\$150,000 for the San Francisco battery) and 1900 (\$180,000 for the guns at Sandy Hook, Fishers Island, and Hilton Head). Senate Document 94, 54th Congress, 1st Session.

51. Gen D. W. Flagler to the Pneumatic Dynamite Gun Company, January 30, 1896, Dynamite Gun Papers NA.
52. The exchange between Wilson and Miles was initiated by Miles with his letter of April 19, 1898, to the chief of engineers and is recorded in the many endorsements to that letter. Dynamite Gun Papers NA.
53. Ibid.
54. T. S. Darling to the secretary of war, June 15, 1898, Dynamite Gun Papers NA.
55. Ibid.
56. Enclosure 243, Dynamite Gun Papers NA.
57. T.S. Darling to the secretary of war, June 15, 1898, Dynamite Gun Papers, NA.
58. Zalinski, "The Pneumatic Dynamite Torpedo Gun," p. 195.
59. "Statement of the military service of Edmund L. Zalinski," Zalinski MSR.
60. Zalinski to BG George D. Ruggles, January 31, 1894, Zalinski MSR.
61. *New York Times*, August 25, 1894, p. 2.
62. Zalinski to Ruggles, Zalinski MSR.
63. Ibid.
64. RBOF 1892, p. 30.
65. RBOF 1897, p. 14. Other systems considered by the board at this time included the Maxim, the Mefford, the Justin, and the Sims-Dudley. The Sims-Dudley cannon actually reached service in the Spanish-American War, but it was a light gun intended for use with mobile troops and was thus not a competitor of the pneumatic dynamite gun. In the Sims-Dudley weapon, a powder charge fired in an isolated chamber provided a propelling force of compressed air for the small dynamite-loaded projectile.
66. Schroeder, pp. 6-26.
67. Ibid, pp. 26 and 36.
68. House Executive Documents, 56th Congress, 1st Session, *Annual Report of the Chief of Engineers*, 1899, Appendix 4 U, "Defenses of San Francisco, California," p. 981 [hereafter cited as ARCE with year of issue].
69. ARCO 1894, Appendix 32, "Tests of a Battery of Pneumatic Dynamite Guns at Sandy Hook," p. 353.
70. ARCE 1901, p. 10.
71. Ibid.
72. War Department, *Handbook of American Coast Artillery Materiel*, Ordnance Department Document 2042, (Washington: Government Printing Office, 1923), pp. 22 and 39.
73. ARCO 1894, Appendix 32, p. 359.
74. *New York Times*, April 10, 1895, p. 4.

