

Industrial History

These are notes that I am writing to help me learn our industrial history. They are my best understanding, but that does not mean they are a correct understanding.



Tuesday, November 15, 2016

Building and Testing Naval Guns

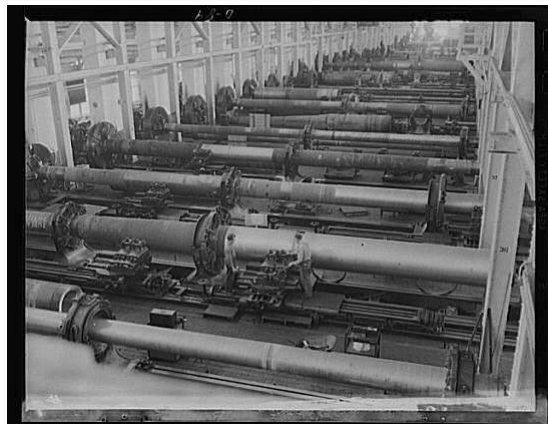
(Update: near the end of WWI, five 14" guns were mounted on special railroad cars to destroy railyards and ammunition dumps up to 25 miles away.)

Whenever I see a video of a big battleship gun being fired, I wonder how the guns are made. The barrels are machined out of cylindrical forgings. The shaft that holds the tool that mills the inside of the barrel slides along a two slide guideway.

The size of the "big guns" on the battleships defined the arms race until aircraft carriers and their airplanes proved battleships were obsolete. (Battleships were obsolete before WWII, but some admirals had to see some sink during the war before they believed it. Fortunately, the Navy started designing and building purpose built aircraft carriers in the 1920s so we had some for WWII. Soon after WWII, the arms race focused on nuclear warheads and intercontinental rockets. I assume satellite and cyber warfare is where the action is now even though we keep building more expensive airplanes.)

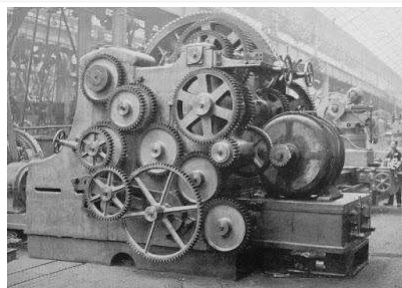


John Abbott posted Naval Gun Factory DC 1943 small



John Abbott posted Naval Gun

Sean Mullen I just happened to look up the muzzle energy on those big 16" guns this morning. It is a stunning 304 million foot pounds!



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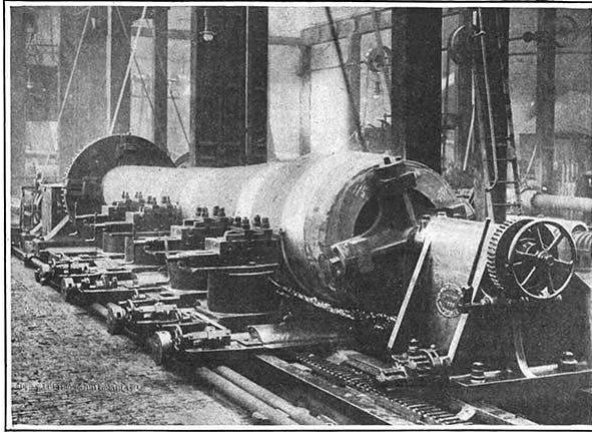
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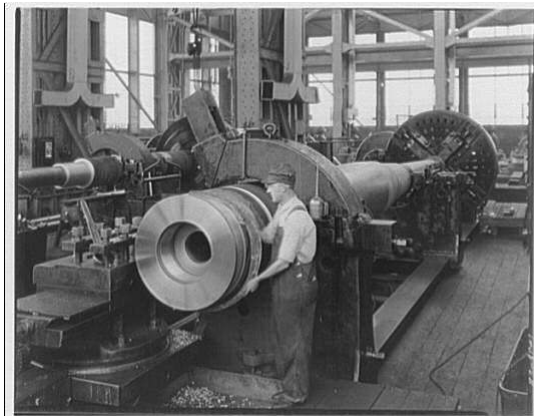
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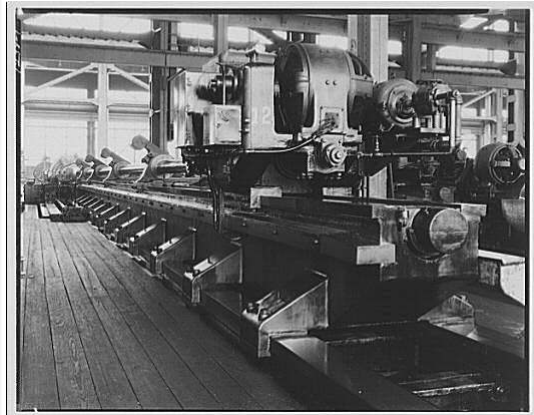
John Abbott posted
 Gun Barrel Boring Machine Gear Drive ...Because ... I couldn't call it a Gear Case ? ... Get the Grease Gun Boy ...
 [It makes you wonder when the industry start putting safety shields on the equipment. People were hurt, and even killed, back then. Now you can understand one reason why.]



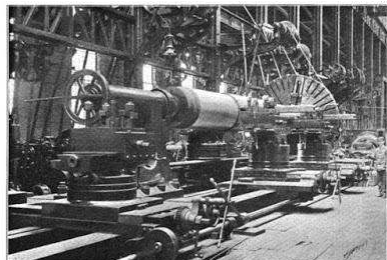
Rich Behrends posted
 Four cutting tools shape the outside of a 12-inch gun.
 Image: Scientific American, December 4, 1915



Rich Behrends posted
 DC Navy Yard turning a cannon 1899



Rich Behrends posted
 DC Navy Yard cannon boring. Year unknown



Rich Behrends posted
 Bethlehem Steel machining big cannon 1899
 [Note, this plant has yet to convert from shafts and belts to electric motors. I wonder if this is the Bethlehem shipyard that made Liberty Ships during WWII.]

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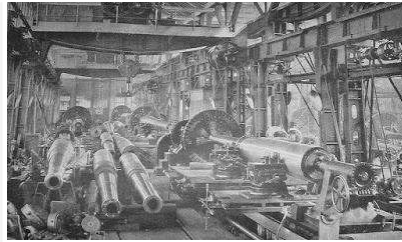
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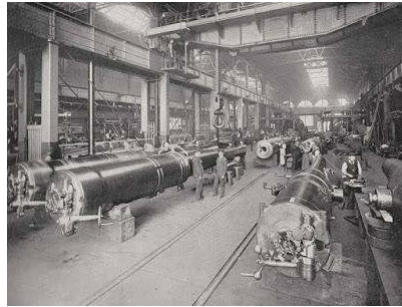
[Dennis DeBruler](#)

The caption of any image that is not mine will indicate the source. My images are © 2014-20, and are licensed by CC BY, <https://creativecommons.org/licenses/by/4.0/>. Attribution: Dennis DeBruler. Since I hit the 1200 byte limit, I have moved my real introduction to <http://industrialscenery.blogspot.com/2014/05/introduction.html>.

[View my complete profile](#)



John Abbott posted
We are doing over time tonight need more Gun Barrels
[Note the line shaft along the right.]



John Abbott posted
royal-gun-factory
Perry Locke Notice man in crane control platform.
Earl Rempel Think how much of that work is lying at the bottom of some ocean...
Roger Hampson A more intact story is here.

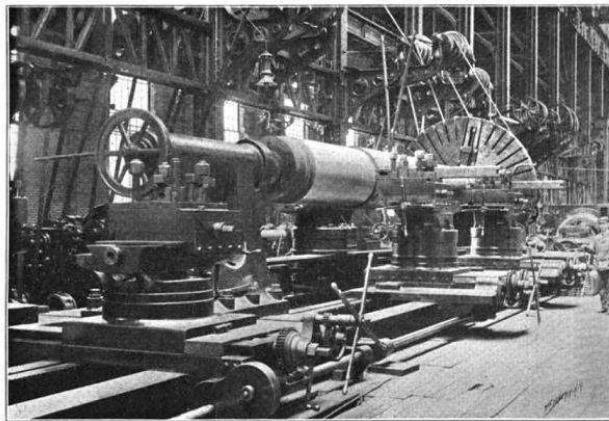


Fig. 2. Screw-cutting engine lathe in "machine shop No. 2," for turning heavy guns and shafts. Face plate 120 inches in diameter and swing over shears 130 inches by 76 feet. It is geared for turning lathes from one in ten to one in four, and there are four carriages with compound rests. Besides this lathe there are five in the shop, with 120-inch face plates and of 100-inch swing. The shaft shown in the lathe weighs 65,000 pounds and is 37 inches diameter at the center and 27 feet 4 inches long.

John Abbott posted
Joe's over there doing the Big Barrels on the Belt Lathe...
[Even at full Facebook resolution the text is hard to read. This is what I saw: "Face plate 120" in diameter and swing over shears 130" by 76". It is geared for turning taper from 1 in 10 to 1 in 400, and there are four carriages with compound rests. The shaft shown in the lathe weighs 65,000 pounds and is 37" diameter at the center and 27'4" long." The word "shears" was a guess. I don't understand what that is.]

This 1:33 video focuses on testing various models of naval guns.

Building And Testing All Types Of Naval Guns (1943)



A 14:25 1952 video about the US Navy's Naval Gun Factory at Washington Navy Yard.



Update: the day after I published this I came across a silent films of various scenes of making the 16" gun used in WWII. The comments describe each scene. This is the forging step.

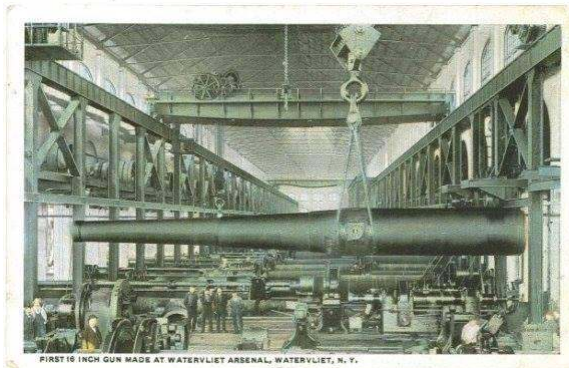


Screenshot of forging a 16" gun

This forging scene does indicate that the cylinder is cast with a hole in the middle that is retained throughout the forging process so that just metal near the edge of the hole needs to be removed by the machining process. The plug also helps hold and manipulate the casting while it is being forged.



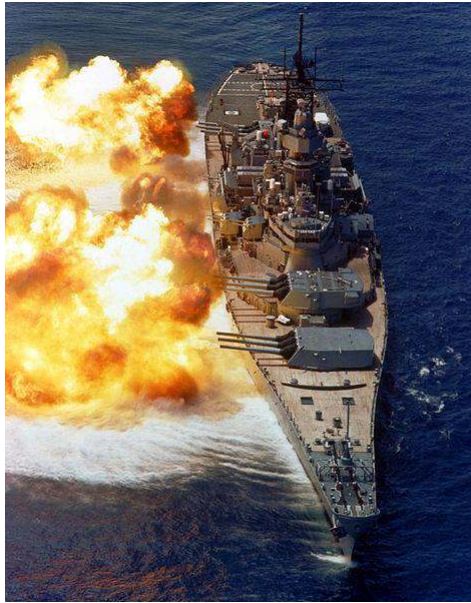
Screenshot



Bob Smith posted

This is the first 16" Cannon Tube Manufactured at Watervliet Arsenal. Unfortunately, the seacoast defenses & the Iowa Class Battleships are history, as well as the machines for making them...

Bob Smith The process for boring this 68 foot, 267,904 lb varmint rifle took about 60 hours. A woodpacked reamer head with two HSS cutting tools would be in fed at the muzzle end on a Sunday night & the head would exit the breech end on Wednesday morning. The machinists would listen to the cutters "sing" & look at the chips in the oil coolant wash to determine if the bore was being accurately machined...



Bob Smith commented on his posting

Here is that monster in action. All nine guns firing full broadside at once. Rounds weigh 2,700 lb. Range of 24 miles. Accurate within a football field, & took out everything within that area.

Rex Whinery I read one time firing all guns on one side like this shoved the ship 75 ft. I wonder if that was true. Chance O'Neil No. The ship does not move by any noticeable amount. And the shots are not fired at exactly the same time. There is about a .05 second delay between each of the three guns on a turret. That prevents the shock wave of one round from interfering with the trajectory of the round from an adjacent barrel. The water is foaming due to the shock wave. The guns would still create massive shock and vibration in areas of the ship and that caused minor problems occasionally. My uncle was a fire control officer on the new Jersey and the Missouri so I got to learn a lot about those ships when I was growing up.



Bob Smith commented on his posting

16" Rifling Head. The individual broaches were adjusted simultaneously. Each pass took .002" - .005" greater depth of cut than the previous. The head started at the muzzle and came out the breech. After it came out, the broaches were retracted & the head was pulled back. They were adjusted out another .002" - .005" for the next pass. Due to the amount of pressure, every other broach seat was left open. This meant that after the entire length of the liner was rifled to the specified depth, the head was indexed so the the remainder of the honed bore was rifled.



Bob Smith commented on his posting
Close up of the rifling head & broaches.

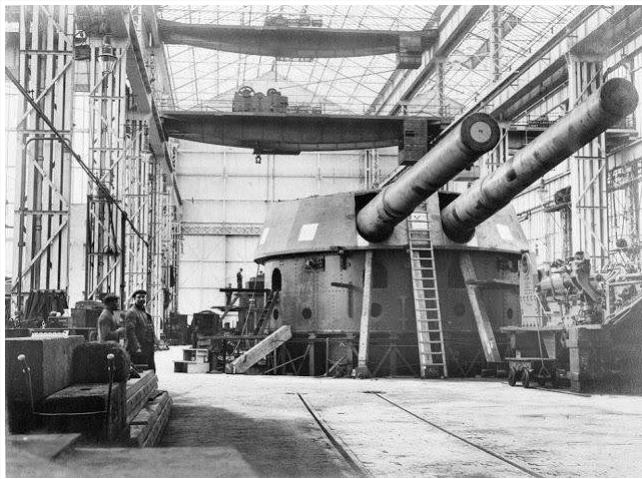


Bob Smith commented on his posting
Finished product.



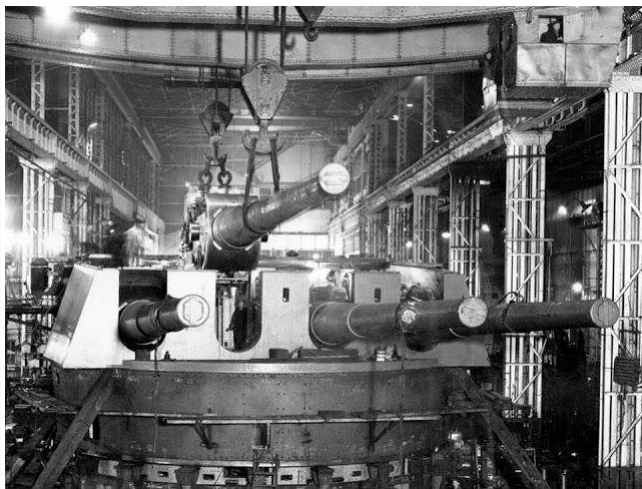
John Abbott posted

Bob Gaston Caption for this photo reads "WW 1 - NAVY YARD: Washington, Sight shop, big gun section. 1917" Joshua Gasparovic Cannon for Navy Destroyers or Cruisers, it looks like .5" and maybe 8" cannon? James Miller The rifle in the center looks to be a 14" 45 caliber Mk2 (BB-34 or 35; New York or Texas) main battery. John Genna In most cases the rifling was cut into liners, and some by rifling machines, and almost all smaller barrels are broach rifled. many projectiles were made with a bronze rifling ring that took the rifling and most of the shell was smooth. The bronze ring also served as a gas check for the powder gases, which achieved a much higher velocity than the projectile, and if they got around the projectile would cut and burn the rifling, which was designed for 250 to 290 shots. After WW-2 the powder was switched to a cooler burning type, which extended the life of a 16" x 50 cal (50 times 16inches) barrel to 350 shots. Roger Hampson Looking at the end of that barrel it looks like it is sleeved



Ian Wilson posted

Dont forget guys prior to WWI Britannia ruled the waves!! Armstrong Whitworth Elswick Works Newcastle upon Tyne 1911



Ian Wilson commented on his above posting
In 1927 they become Vickers Armstrong. This quadruple gun mount being manufactured in 1940
Chris Schafer King George V class 14 inch guns.



John Abbott posted
Where is your Tag Line ?
[At first I did not know what a Tag Line was. But, gathering from the comments, it is the ropes they put on the end that are held by guys to keep the load from turning while being moved.]

[\(new window\)](#)

Moving 16" Battleship Guns



1918 mounting of a 14" naval gun on an armored railway car.

Mike Savad has colorized a 1917 photo of a Navy Yard Shop and posted it with the comment:

Scene in color 1917

Location: Washington DC

This is the Navy Yard shop in Washington DC, built in 1799 (though this structure was probably built later). Over the years they have built all kinds of things. Special cannons, torpedo's, steam ships, and so on.

During World War I they are built torpedo launchers (which is what we see here).

A torpedo launcher is a tube that holds a torpedo, mounted to a battleship, but it works just like a normal torpedo once it hits the water. This factory makes both things, but this room just does the tubes.

By World War II, this location was the largest ordinance plant in the world.

By 1960 they had 188 buildings, across 126 acres. For the most part, just the guns and torpedo's were made here.

But by 1961 they closed this place down, and by 1964 they turned most of the buildings into office space.

Bonus: Can you find these items?

A single shoe on a shelf

A guy wearing a fez (hint his back is turned to us)

There is a tomato can high up.
There is also a large saw blade.

A [video](#) of a modern gun drilling machine. Note that it is made in Taiwan. America geared up for WWII production by converting existing manufacturing plants and their skilled labor. [We no longer have those plants and skills to convert to war production.](#)

A [video](#) of a gun lathe in operation: tool cutting, measuring, grinding and boring.

Posted by [Dennis DeBruler](#) at [4:14 PM](#)



Labels: [machineTool](#), [manufacture](#), [military](#)

4 comments:

Anonymous [December 26, 2018 at 8:30 PM](#)

Regarding your guess at where the Bethlehem Steel photograph was taken, to my knowledge, that would have been the no. 2 machine shop in Bethlehem, PA. For many years, that was the largest machine shop in the world. The once-mighty Bethlehem Steel made a large number of the U.S. Navy's 14" and 16" guns.

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Unknown [January 24, 2020 at 11:15 PM](#)

I was looking for the density of the metal used in "battleship gun" construction.

[Reply](#)

Unknown [July 7, 2020 at 6:28 PM](#)

Were the turret housings cast as a singlepiece or electrically welded out of armor plates?

[Reply](#)

Forging-process [July 26, 2020 at 1:07 AM](#)

Carbon steel forgings are utilized in a wide assortment of [drop forging diagram](#) enterprises. Here we take a gander at the sort of metal carbon steel is and what you have to know to work with it for your up and coming undertaking.

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