# Super Guns – Part 1
# Most formidable guns the modern world has seen


TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

David C. Smith, P.E, IPT Leader

# Introduction



- Focus of this briefing is to review ‘super’ guns that were actually made and actually fired.
  - A number of ‘super’ guns have been thought of, but never actually built – we will address only those that exist in reality.
  - Importance is to gain a context of what it took to:
    - Make these guns
    - Fire these guns
    - Meet their objectives
    - What real impact they had
- For each weapon – we will look at:
  - Background
  - What set this weapon apart
  - Fabrication/Construction
  - Data
  - Actual Firing
  - Objective
  - Impact (was objective met)
  - Technical Significance

# Super Guns – Planned Series



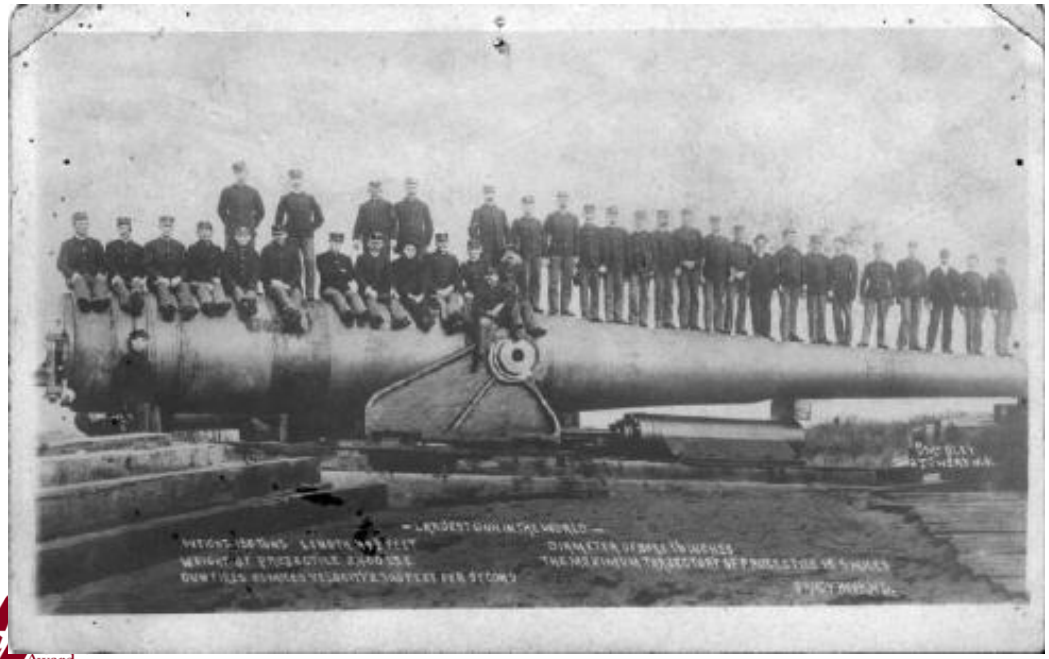
- Definition of a “super” gun: A launch device that was a clear and separate departure from the current state-of-of-the-art and carried a superlative characteristic for its time.

| | | |
|---|---|---|
| • Part 1 | | |
| – 16” Seacoast Cannon | 1901 | USA |
| – Paris Kanone | 1918 | Germany |
| – Schwerer Gustav | 1935 | Germany |
| • Part 2 | | |
| – V-3 Vergeltungswaffen | 1943 | Germany |
| – M65 Atomic Cannon | 1954 | USA |
| – HARP | 1973 | USA/Canada |
| • Part 3 | | |
| – Babylon | 1991 | Iraq |
| – SHARP | 1993 | USA |
| – Xianfeng | 2000 (?) | China |

# 16” M1895 Seacoast Cannon Background



- The Endicott Board report in 1886 found the coastal defenses of the US wholly inadequate and recommended a major upgrade.
- In 1888 Congress created the Board of Ordnance and Fortification to implement the new program and test the new weapons.
- The 16” gun model of 1895 was to be the ultimate weapon in this new system.



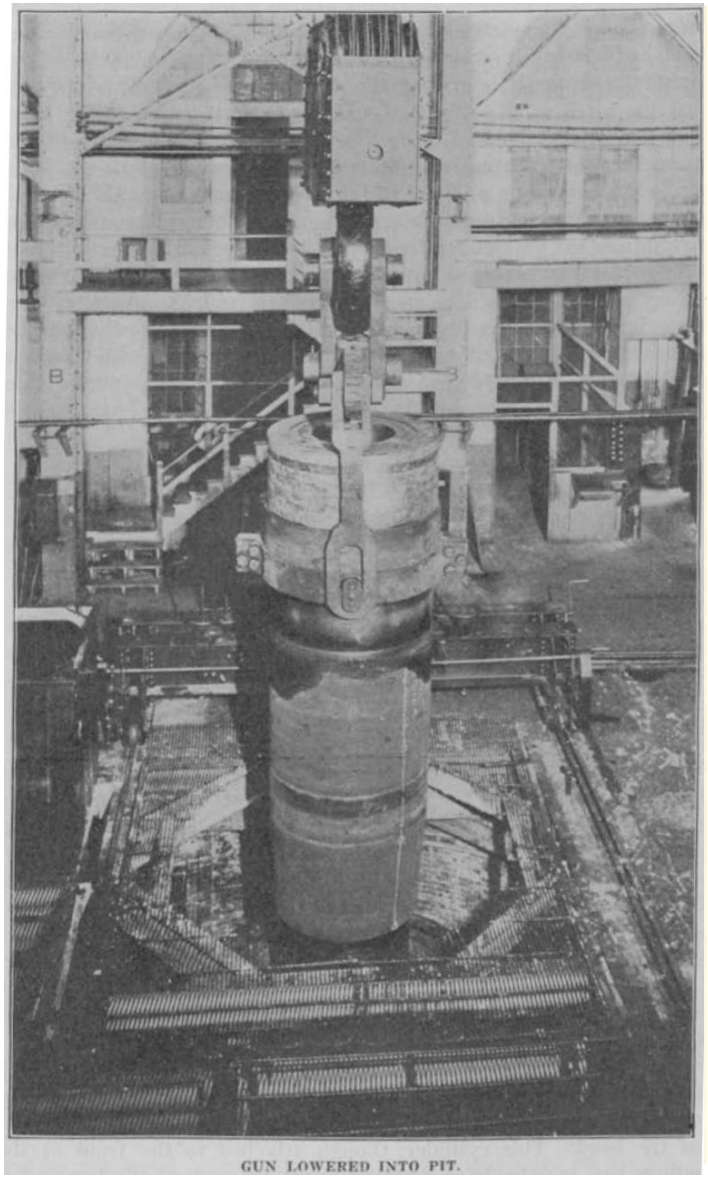
Seacoast Artillery – Sandy Hook Proving Grounds


M1919 16” gun loading on barge

# 16” M1895 Seacoast Cannon (USA)
## What set this weapon apart?



- Several other major countries had built 15-18” guns by this time, with limited success, but this gun would be the first to accurately fire a high pressure charge, with a large projectile and attain a long range capability with the destructive power to take out a major warship.
- Actual contracts for new equipment were let as early as 1893 – including new shrink pit furnaces
- An entirely new manufacturing process, new buildings and skill sets were developed to fabricate this weapon – which took 7 years from start of fabrication to first firing.
- An entirely new corps was formed to support the program - the Seacoast Artillery Corps

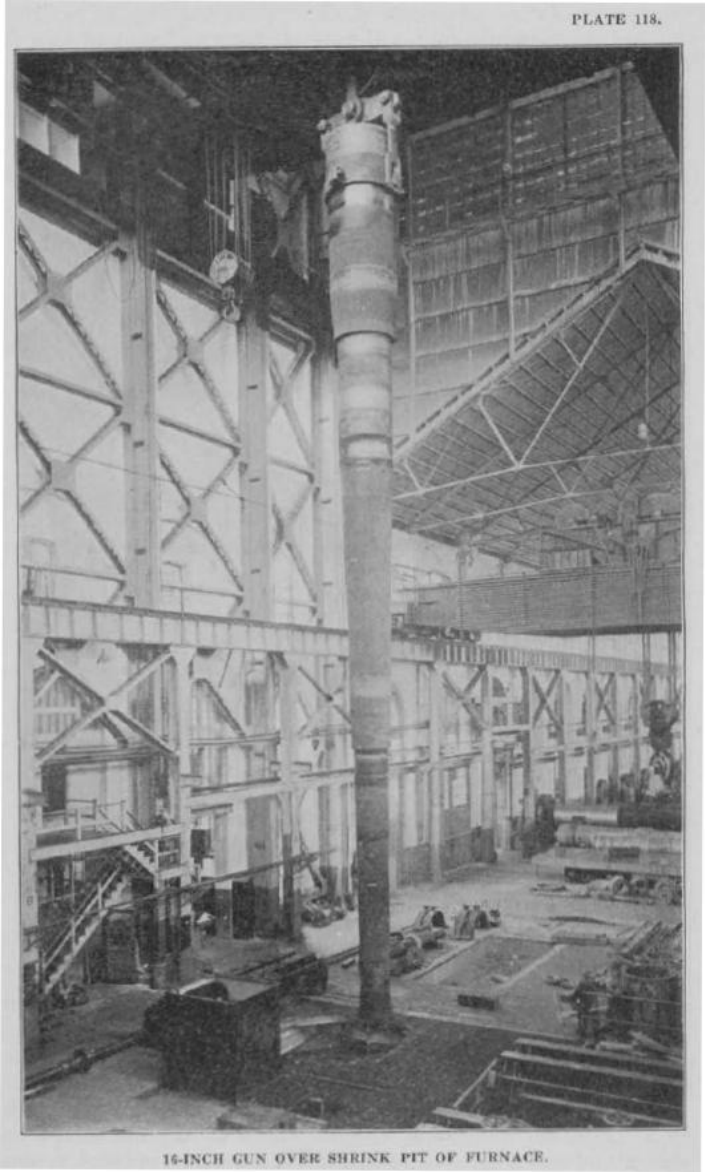


GUN LOWERED INTO PIT.

# 16” M1895 Seacoast Cannon (USA)
## What set this weapon apart



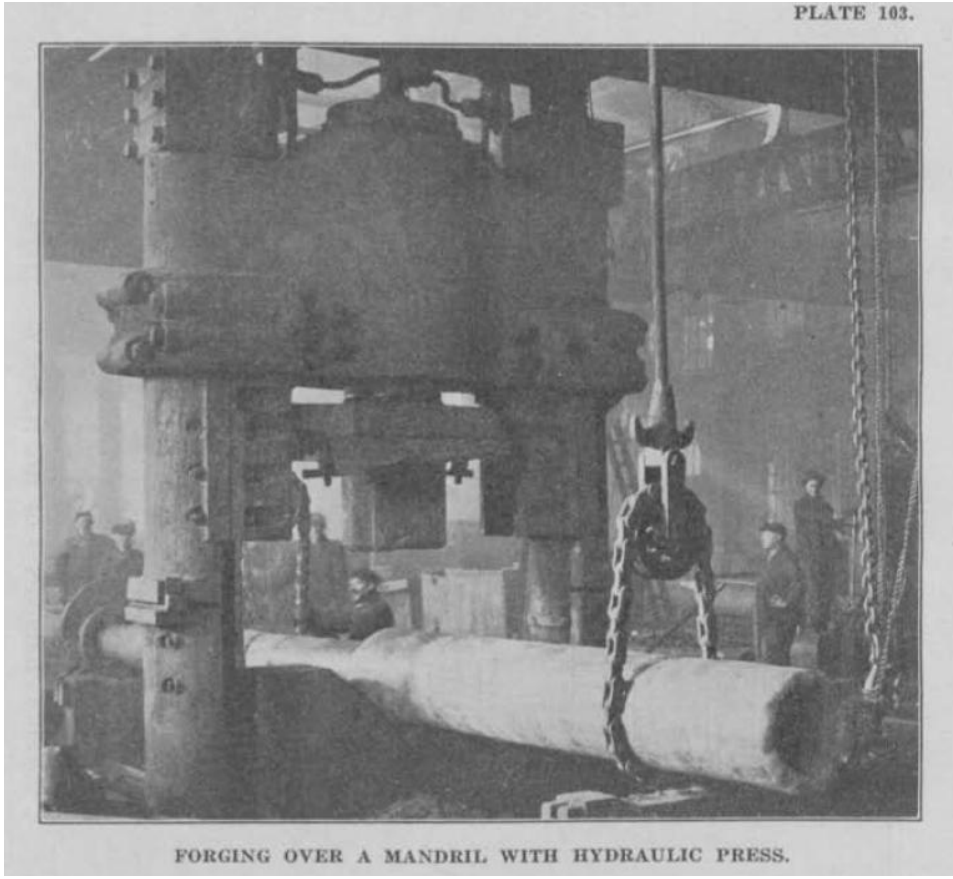
- Use of built up tubular sections heat shrunk together was well known and in use in both the US and Europe for some time. The M1895 16” gun was based on this type of construction.
- The M1895 set itself apart from these other weapons by using the shrink fit process to pre-stress the inner liner, allowing the cannon to be fired at a much higher pressure.



16-INCH GUN OVER SHRINK PIT OF FURNACE.

# 16” M1895 Seacoast Cannon (USA) Fabrication/Construction



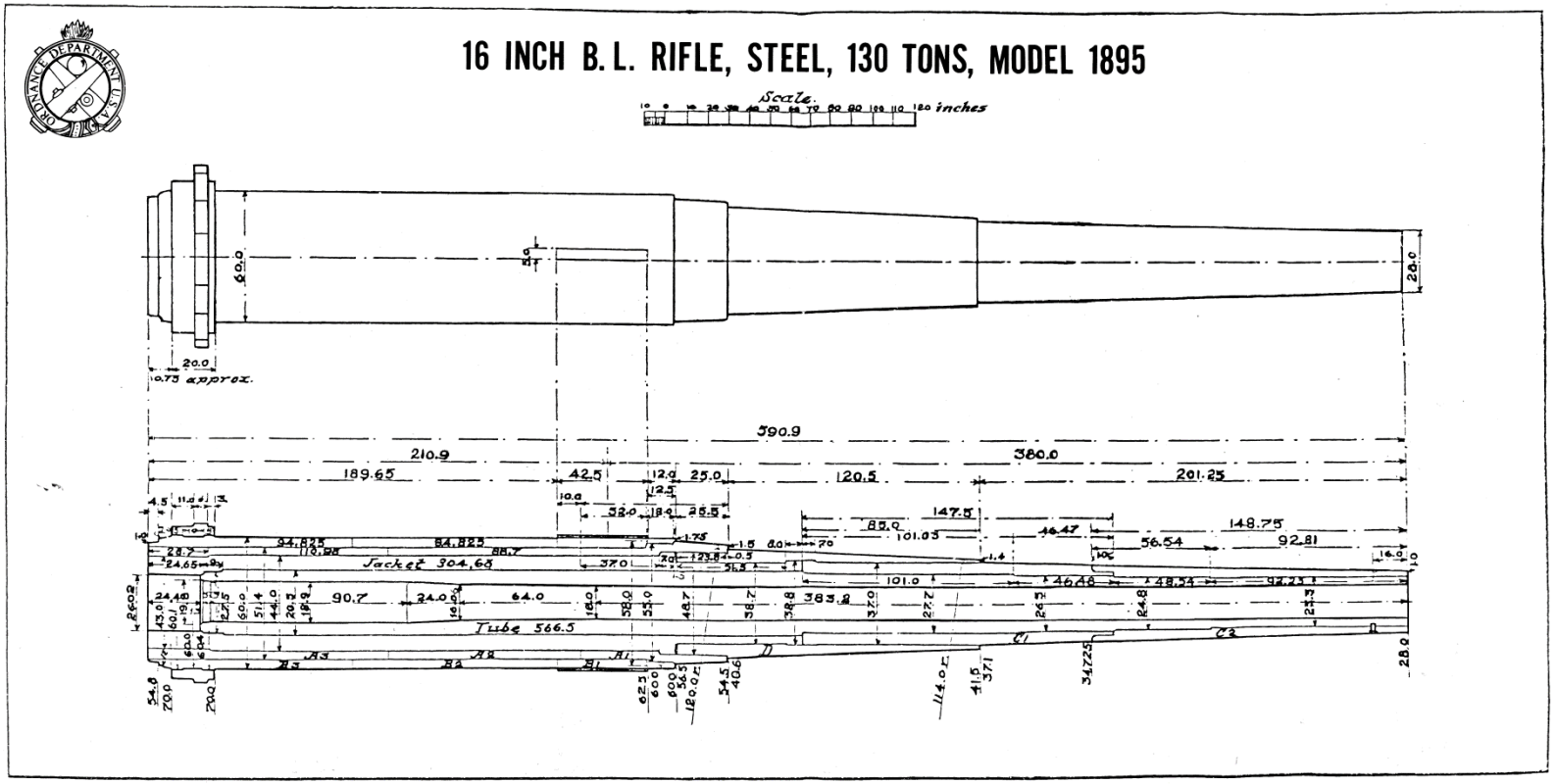



FORGING OVER A MANDRIL WITH HYDRAULIC PRESS.

# 16” M1895 Seacoast Cannon (USA) Fabrication/Construction:



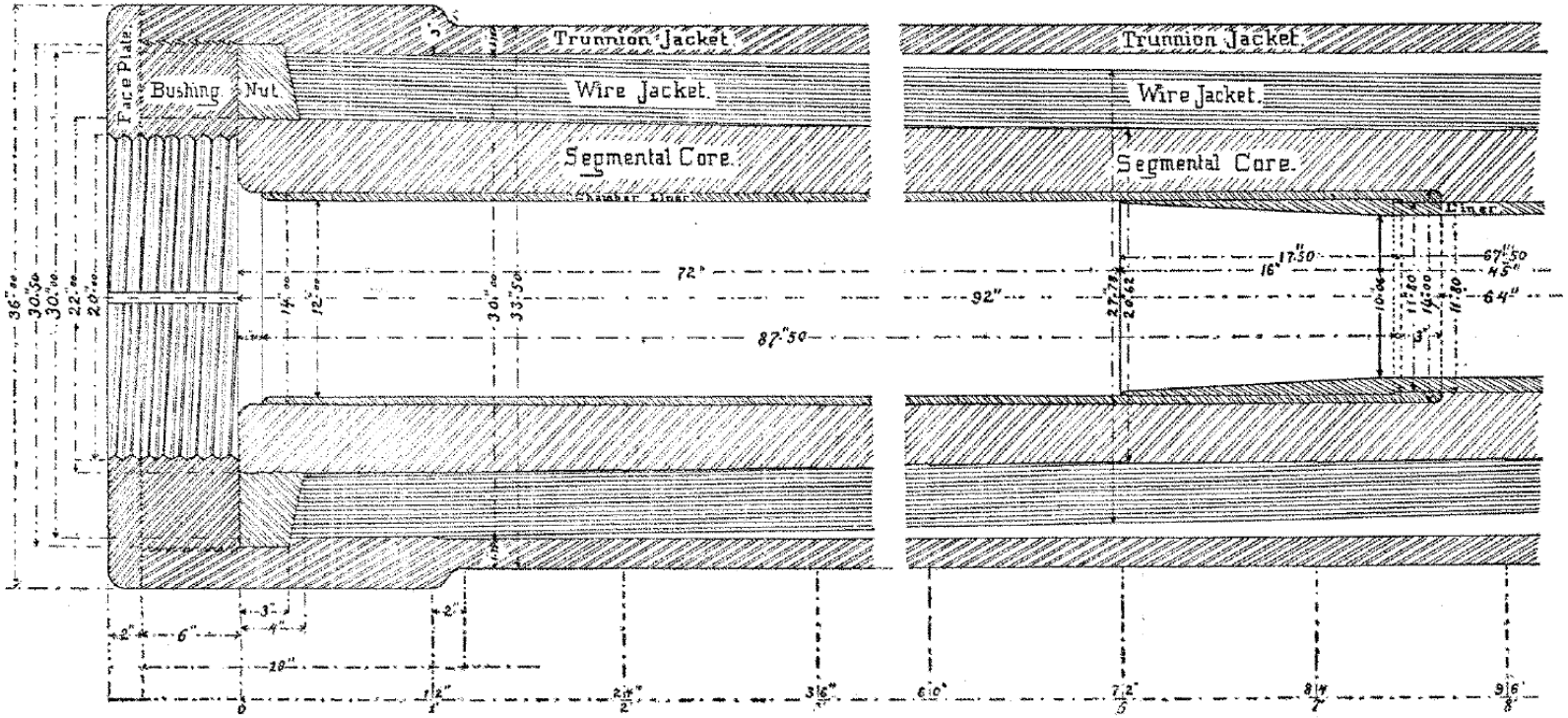
- The key development in this program was understanding and applying the heat shrink to create a substantial pre-stress in the gun – allowing a much higher charge pressure to be used.



# 16” M1895 Seacoast Cannon (USA)



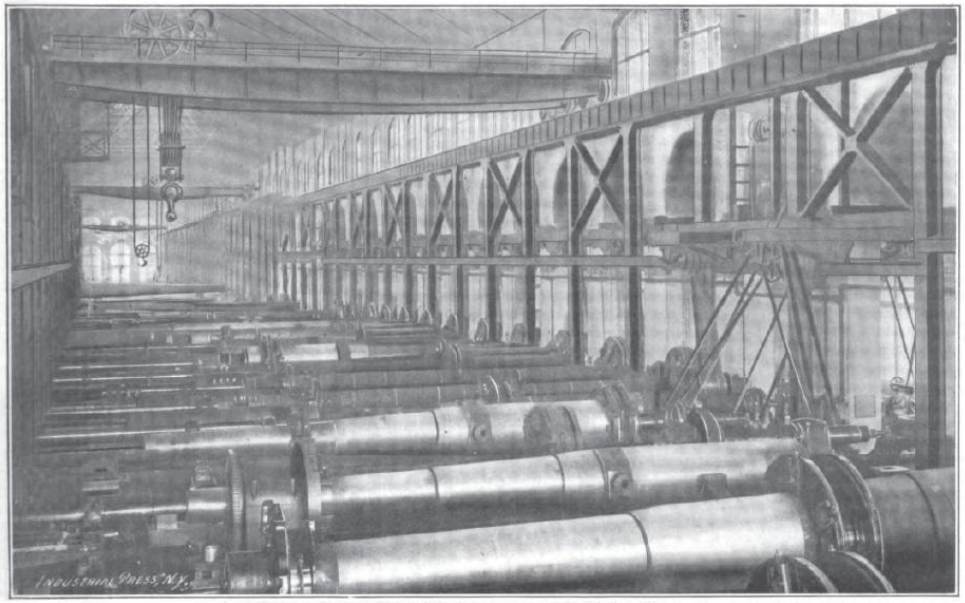
- Additionally, this new design generation of guns introduced a replaceable liner as a design feature. Until chromium plating appeared after WW1, the expected wear life of these cannons was between 250 – 500 rounds.
- The successor to the M1895 – the M1919 utilized wire winding to develop the pre-stress

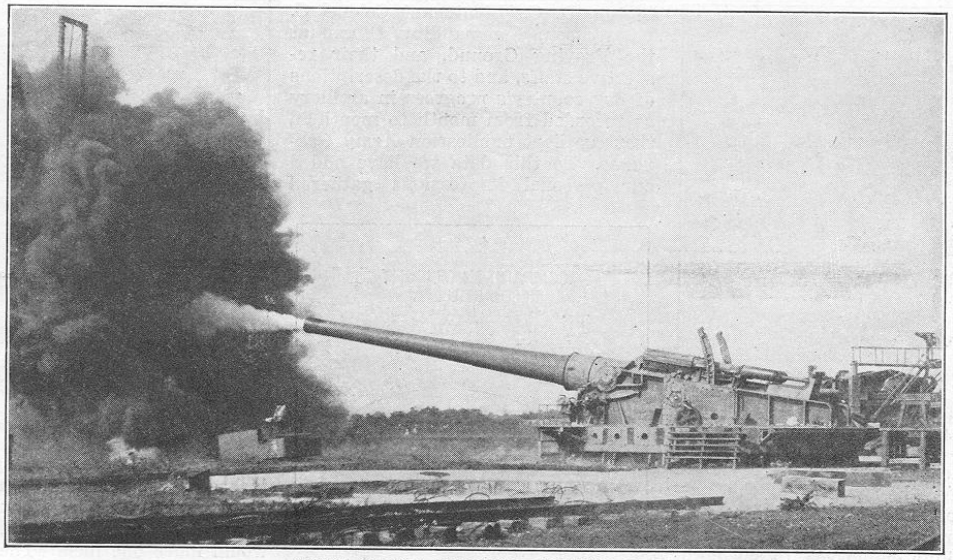


# 16” M1895 Seacoast Cannon (USA)



- Data (M1895):
  - Bore: 16” (406 mm)
  - Length: 826.8” (50 caliber)
    - Projectile Travel: 705.6”
  - Outer Diameter: 60” (breech)
    28” (muzzle)
  - Rifling: 144 lands and grooves
    1-32 constant twist
  - Weight: 385,847 pounds
  - Chamber: 40,000 cu in
  - Range: 54,000 yards (49 km)
  - Projectile Weight: 2,340 lbs
  - Muzzle Velocity: 2,700 fps
  - Max Pressure (Chamber):
    - 38,000 psi



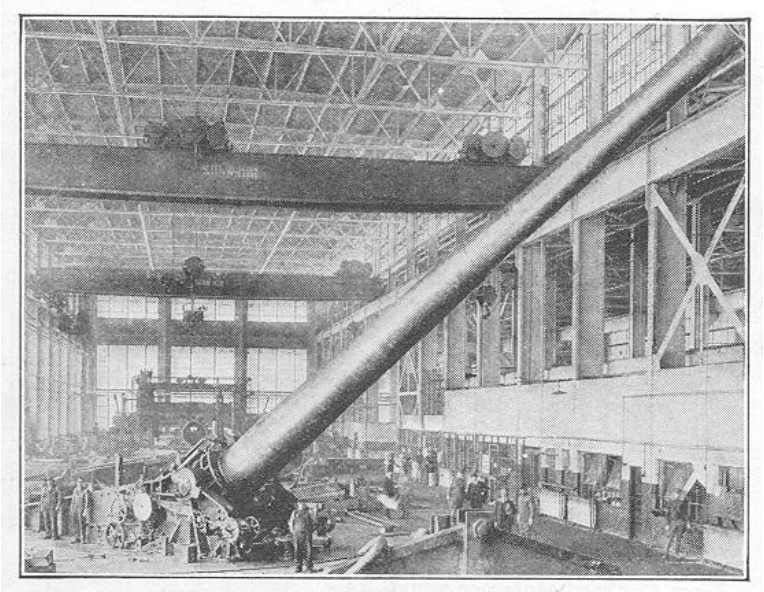


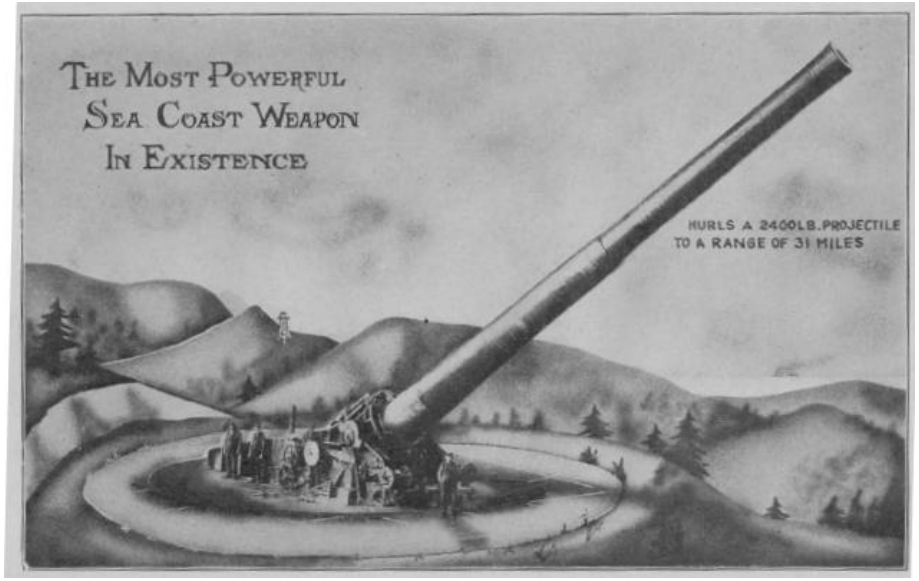
ARMY COAST-DEFENSE 16-INCH GUN

# 16” M1895 Seacoast Cannon (USA) Actual Firing



- Proofed: 1902 – Sandy Hook Proving Grounds, NJ
- Installed in fortifications in Puerto Rico – overhauled at Watervliet and re-lined in 1917
- It was eventually mounted on a disappearing carriage in Fort Grant, Panama Canal Zone, where it served until scrapped in 1943.





# 16” M1895 Seacoast Cannon (USA) Objective - Impact



- Objective: To strengthen seacoast defenses, to increase range and armor penetration capability, to firmly establish claims to territorial waters of the US shorelines

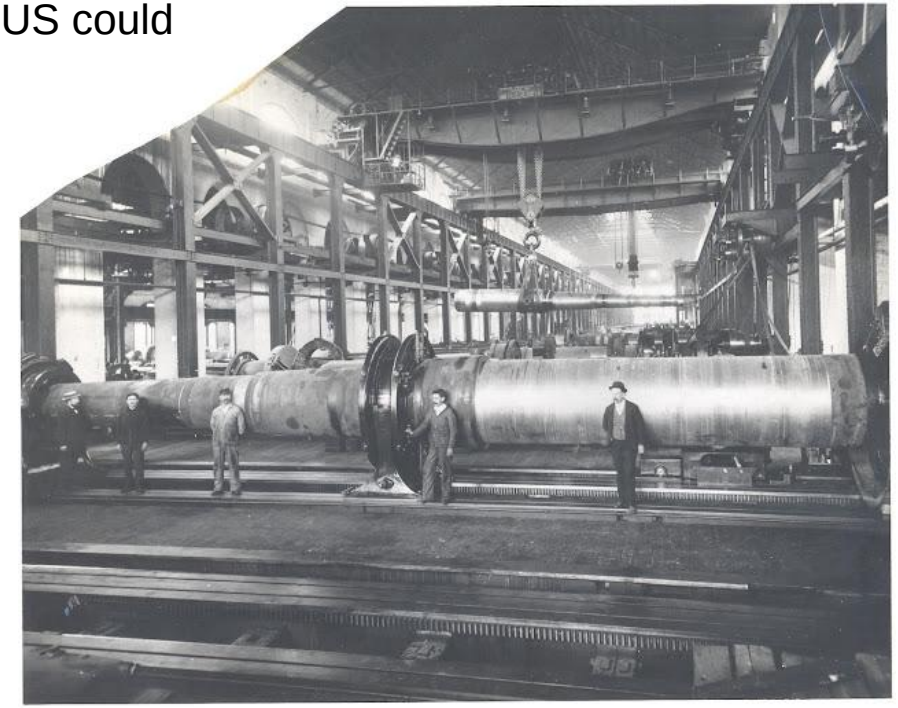
- Impact (was objective met): YES
  - With the widely publicized capability, With the relatively easy victory of the Spanish American war, and the capabilities of the new 12” guns, the need for further 16” guns went away until World War 1 -
  - A new model M1919 16” gun was developed (greater range) and increasing numbers these guns for seacoast defense were acquired
  - The M1895/M1919 gun itself firmly established a claim to the territorial waters of the US, however, it is difficult to assess the deterrence factor

# 16” M1895 Seacoast Cannon (USA) Technical Significance



- Leap ahead technology(s)
  - prestress technologies (shrink fit and wire winding)
  - replaceable liner –
- Size and range capability in seacoast defense
  - showed the European powers that US could match their expertise
  - Deterence factor
- Spin off technologies spurred growth in other industries:
  - steam turbines
  - hydroelectric turbines

16 in M1895 Seacoast Cannon on new lathe Watervliet Arsenal, NY New York Times, 1898



# 16” M1895 Seacoast Cannon (USA) Technical Significance

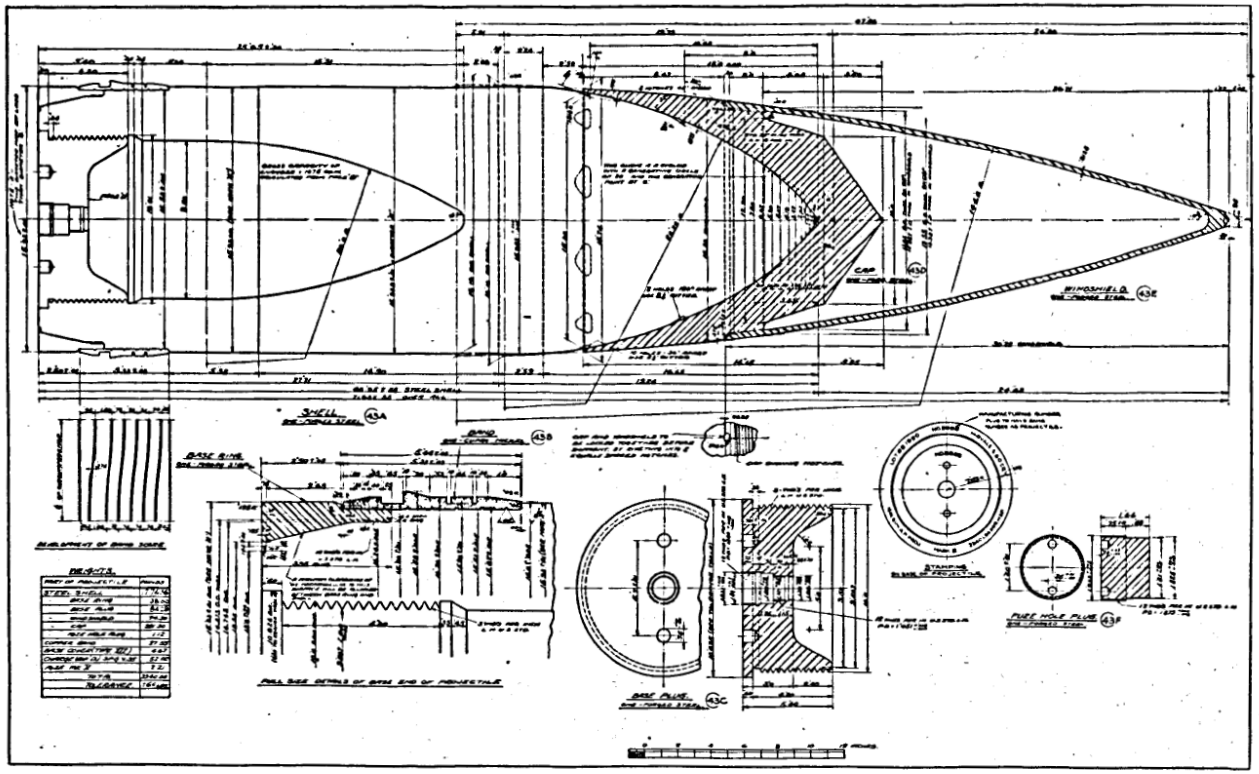


- New manufacturing processes and plant prepared the US for the coming conflicts.
- Machinery and Processes of the M1895 16” system led to 3rd generation of 16” guns for shipboard use that was capable of dominating the future World War 2 naval battles.

16 in Naval Guns 1944

- Another key development was a new type of shell specifically designed for armor penetration – with a hardened shaped nose – protected by a windscreen.

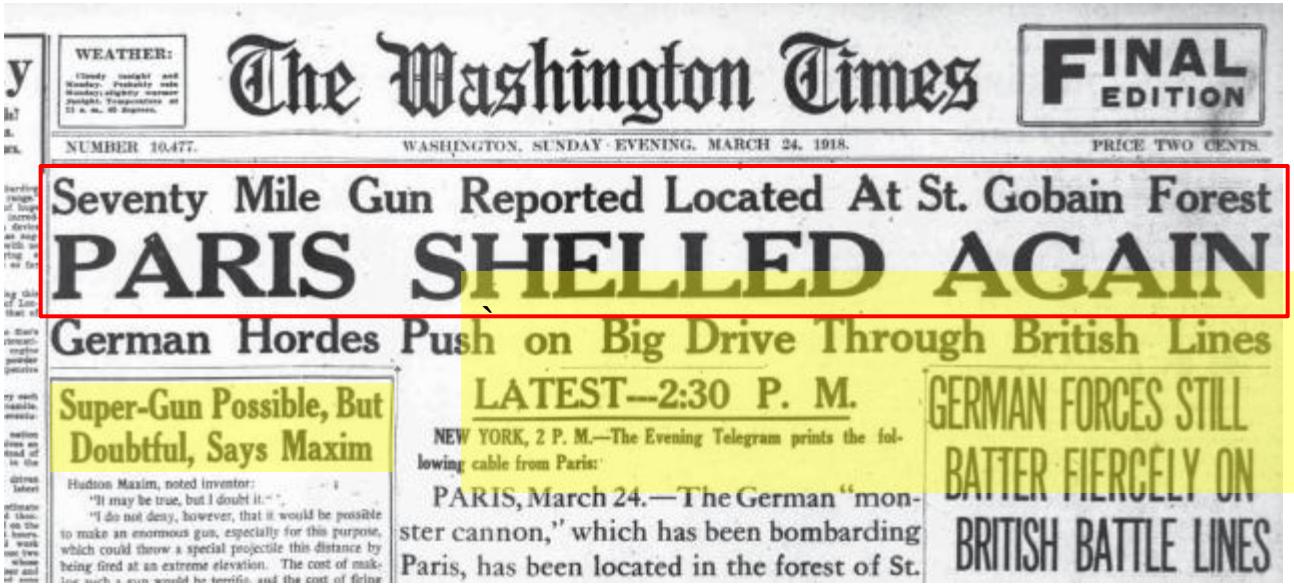
Ordnance Drawing – New Armor Piercing Projectile circa 1896



MODERN ARMOR-PIERCING PROJECTILE FOR 16-INCH 50-CALIBER GUN.

# Paris Kanone (aka Paris Gun) Background

- Background: In March 1918, Germany began a bombardment of Paris with a new weapon.
- Modern world - first real war experience with a super gun.
- At first – no one believed that this was gunfire



WEATHER:

The Washington Times

FINAL EDITION

NUMBER 10,477. WASHINGTON, SUNDAY EVENING, MARCH 24, 1918. PRICE TWO CENTS.

Seventy Mile Gun Reported Located At St. Gobain Forest

PARIS SHELLED AGAIN

German Hordes Push on Big Drive Through British Lines

Super-Gun Possible, But Doubtful, Says Maxim

Hudson Maxim, noted inventor:

"It may be true, but I doubt it."

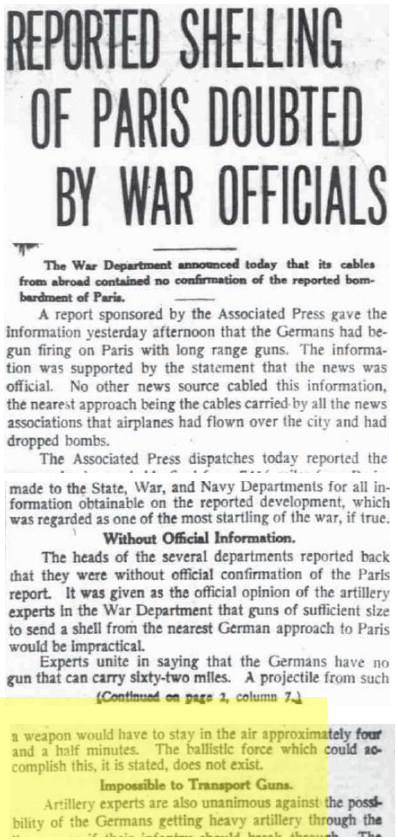
"I do not deny, however, that it would be possible to make an enormous gun, especially for this purpose, which could throw a special projectile this distance by being fired at an extreme elevation. The cost of mak-

LATEST—2:30 P. M.

NEW YORK, 2 P. M.—The Evening Telegram prints the following cable from Paris:

PARIS, March 24.—The German "monster cannon," which has been bombarding Paris, has been located in the forest of St.

GERMAN FORCES STILL BATTER FIERCELY ON BRITISH BATTLE LINES



REPORTED SHELLING OF PARIS DOUBTED BY WAR OFFICIALS

The War Department announced today that its cables from abroad contained no confirmation of the reported bombardment of Paris.

A report sponsored by the Associated Press gave the information yesterday afternoon that the Germans had begun firing on Paris with long range guns. The information was supported by the statement that the news was official. No other news source cabled this information, the nearest approach being the cables carried by all the news associations that airplanes had flown over the city and had dropped bombs.

The Associated Press dispatches today reported the

made to the State, War, and Navy Departments for all information obtainable on the reported development, which was regarded as one of the most startling of the war, if true.

Without Official Information.

The heads of the several departments reported back that they were without official confirmation of the Paris report. It was given as the official opinion of the artillery experts in the War Department that guns of sufficient size to send a shell from the nearest German approach to Paris would be impractical.

Experts unite in saying that the Germans have no gun that can carry sixty-two miles. A projectile from such

(Continued on page 2, column 7.)

a weapon would have to stay in the air approximately four and a half minutes. The ballistic force which could accomplish this, it is stated, does not exist.

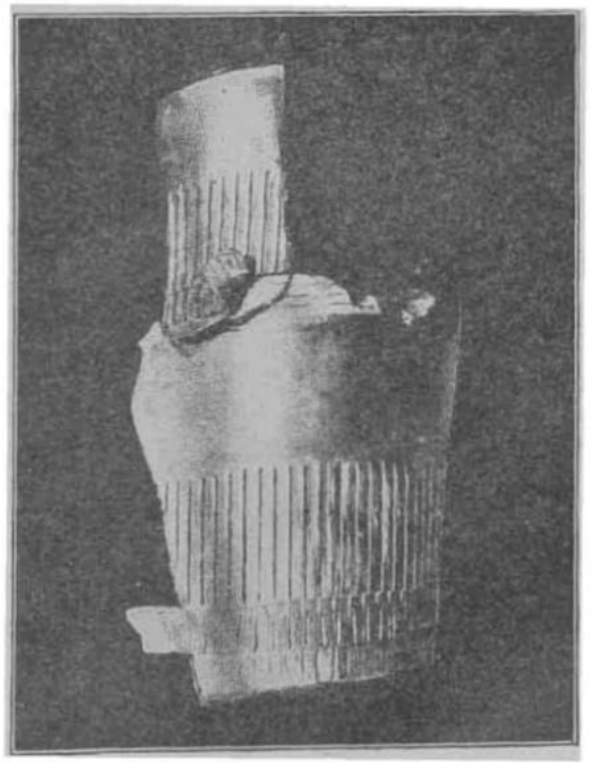
Impossible to Transport Guns.

Artillery experts are also unanimous against the possibility of the Germans getting heavy artillery through the

# Paris Kanone (aka Paris Gun) Background

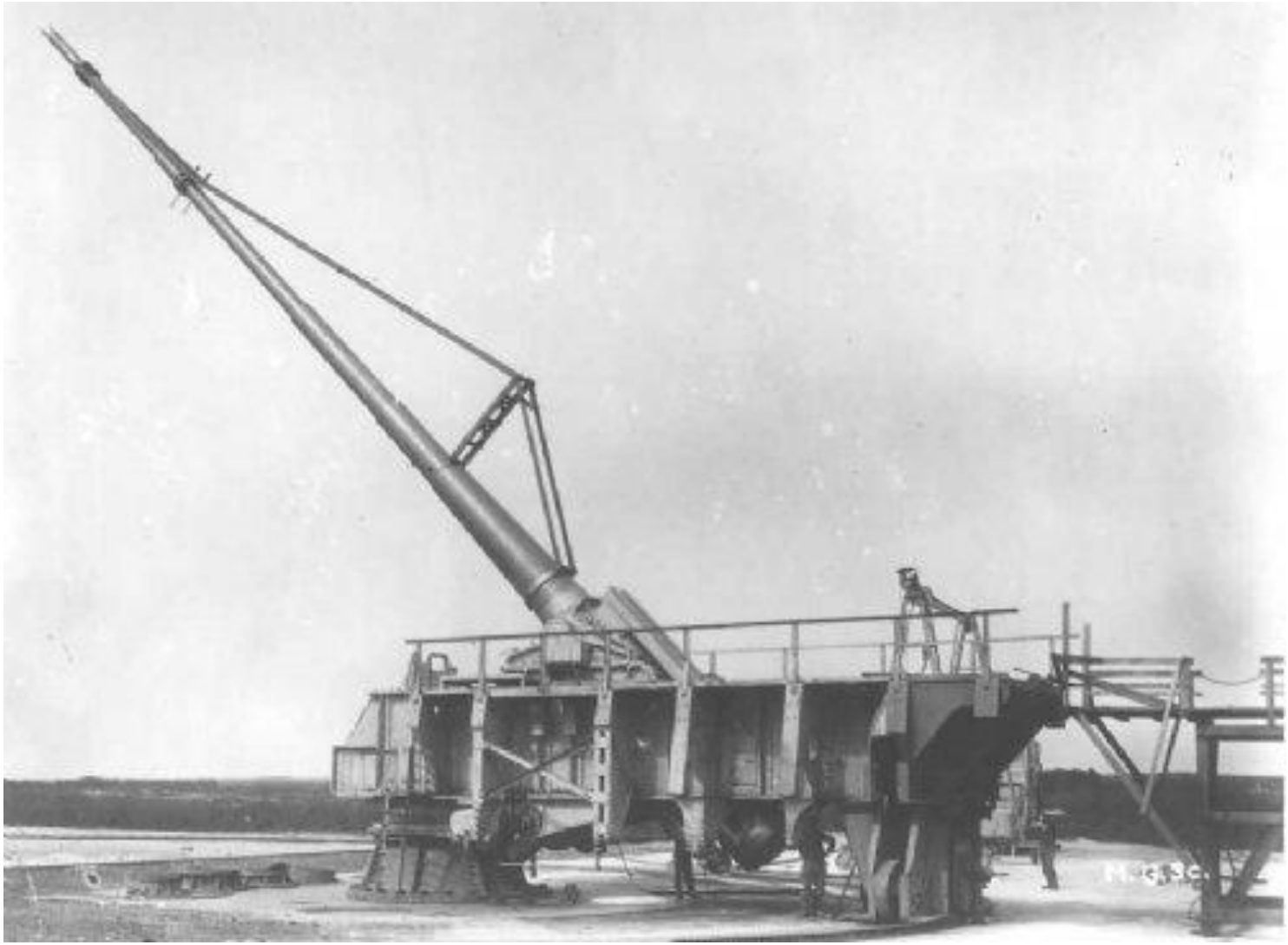


- Citizens were encouraged to recover shell fragments  for authorities
- Objective:  With the exit of Russia from the war -  German authorities believed that the panic in the French population would hasten peace talks and give it more favorable terms
- Gun was officially named the Kaiser Wilhelm Geschütz



# Paris Gun
## What set this weapon apart:

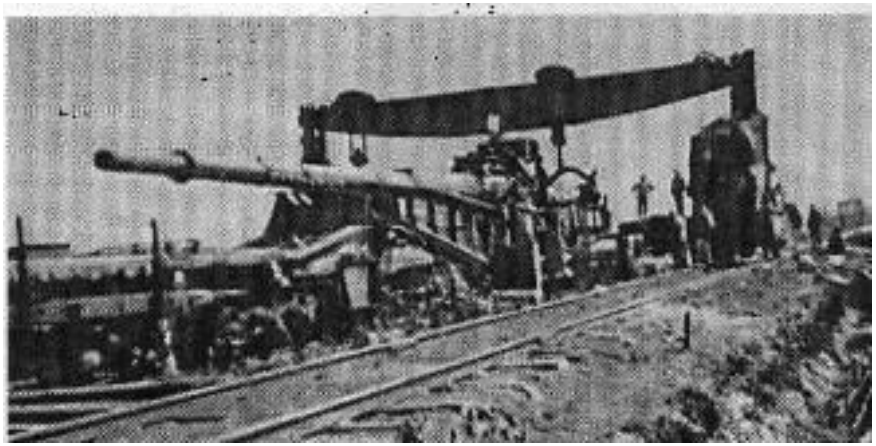


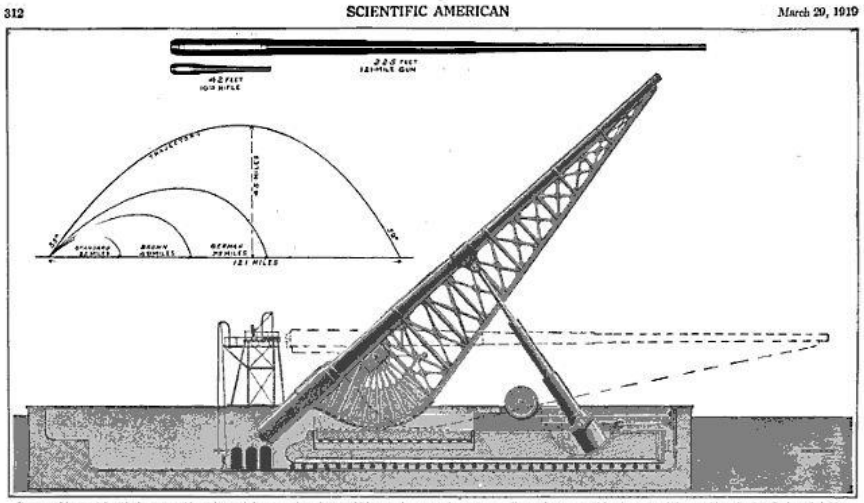


# Paris Gun Fabrication/Construction



- Gun:
  - Outer ‘sleeve’ 38 cm (15”) L45 bored out
  - Two (2) section inner tube 210 mm (bore) tube
    - chamber 3m
    - rifling 18m (total about 98’ long) -
    - heat shrunk into sleeve.



- 

312 SCIENTIFIC AMERICAN March 29, 1919

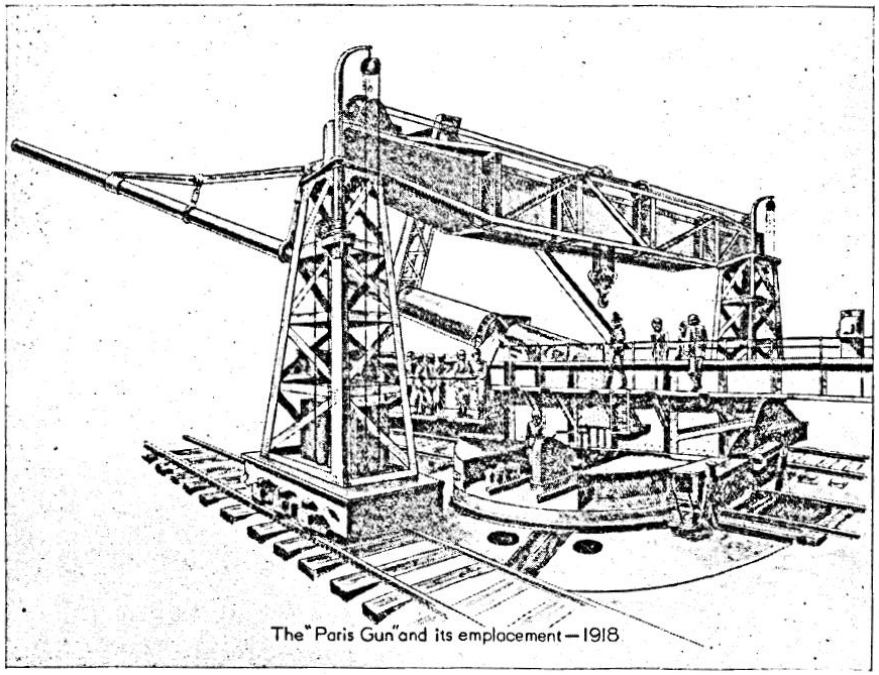
Because of its great length the gun could not be carried on trunnions, but would have to be mounted on a truss. Gun and truss would be elevated and depressed by adopting the bascule-bridge principle. Length of gun, 226 ft., weight 224 tons. Weight of shell, 600 pounds. Weight of powder, 1,440 pounds. Muzzle velocity, 8,500 foot-seconds. Brown gun was designed but never built.

Theoretical study of a 10-inch gun with a range of 121.3 miles

## A 121-Mile Gun

Ordnance Officers of the United States Army Demonstrate Futility of Super-Range Guns

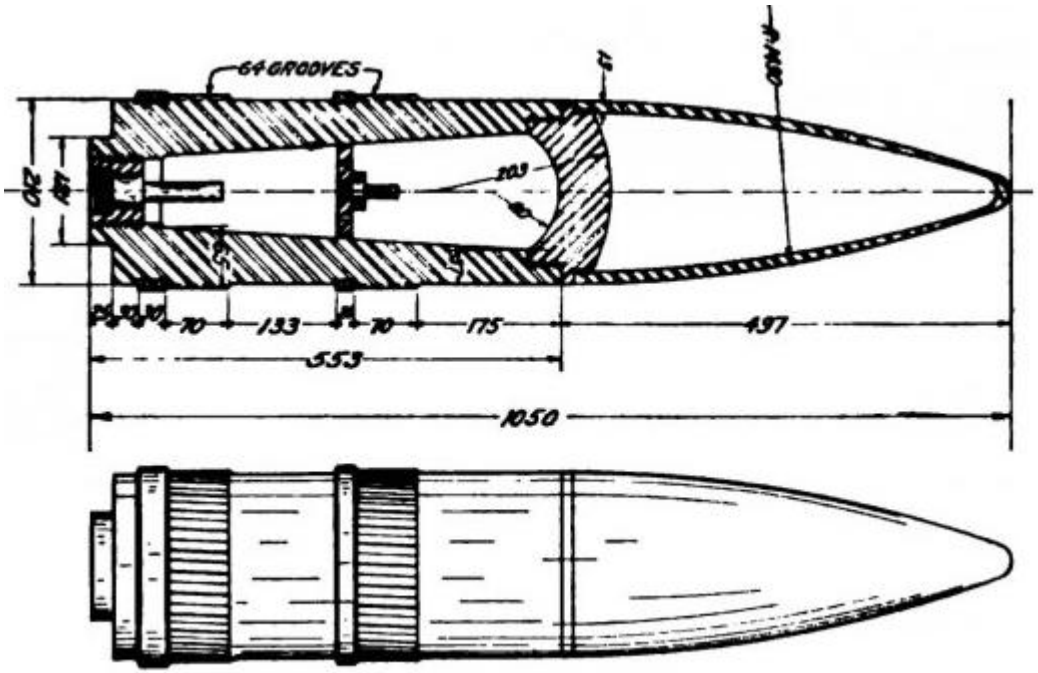
By J. Bernard Walker



The "Paris Gun" and its emplacement—1918

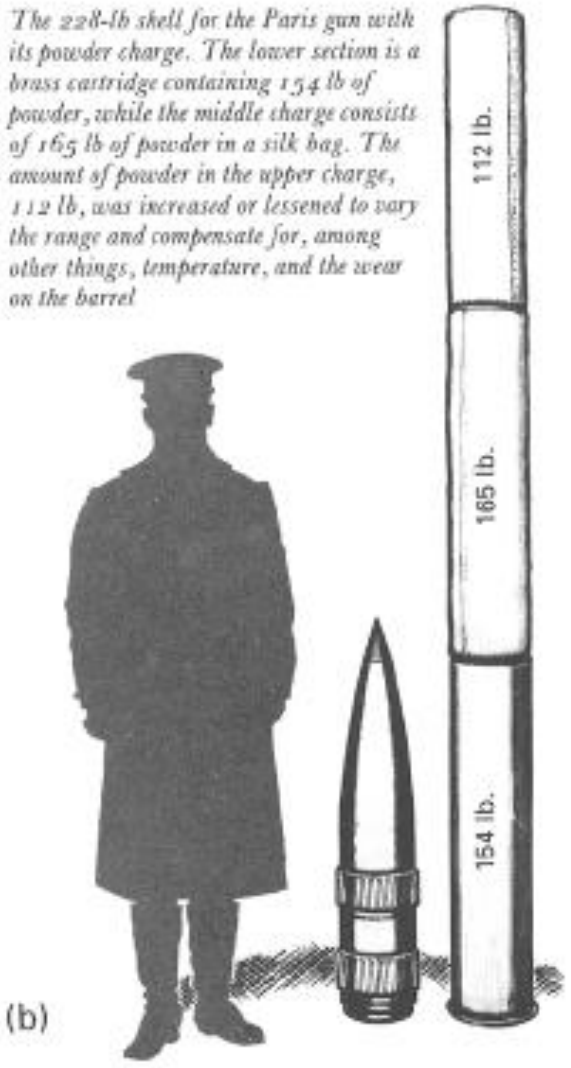
# Paris Gun
## What set this weapon apart

- Projectiles used were also a feat of engineering.
  - 40 in long  projectile was supplied with dual copper alloy rotating bands – total weight about 250 lbs
  - Chamber/bore wear measured for each round and powder weight  adjusted




DESIGN OF THE GERMAN LONG-RANGE PROJECTILE.

*The 228-lb shell for the Paris gun with its powder charge. The lower section is a brass cartridge containing 154 lb of powder, while the middle charge consists of 165 lb of powder in a silk bag. The amount of powder in the upper charge, 112 lb, was increased or lessened to vary the range and compensate for, among other things, temperature, and the wear on the barrel*



# Paris Gun
## What set this weapon apart:

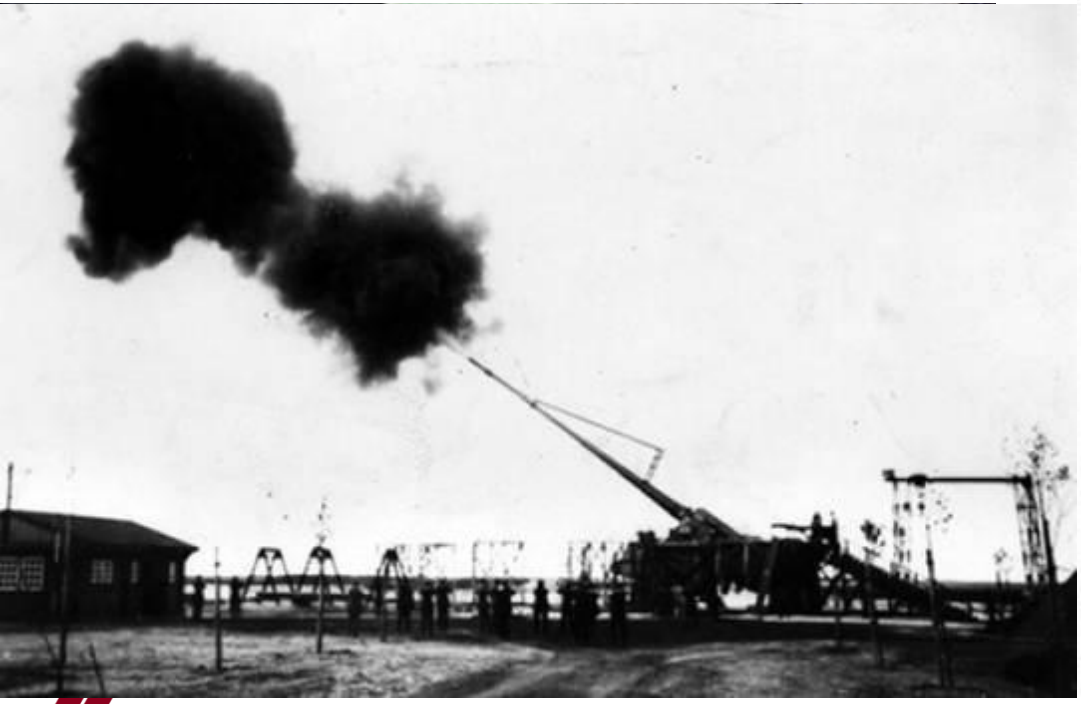


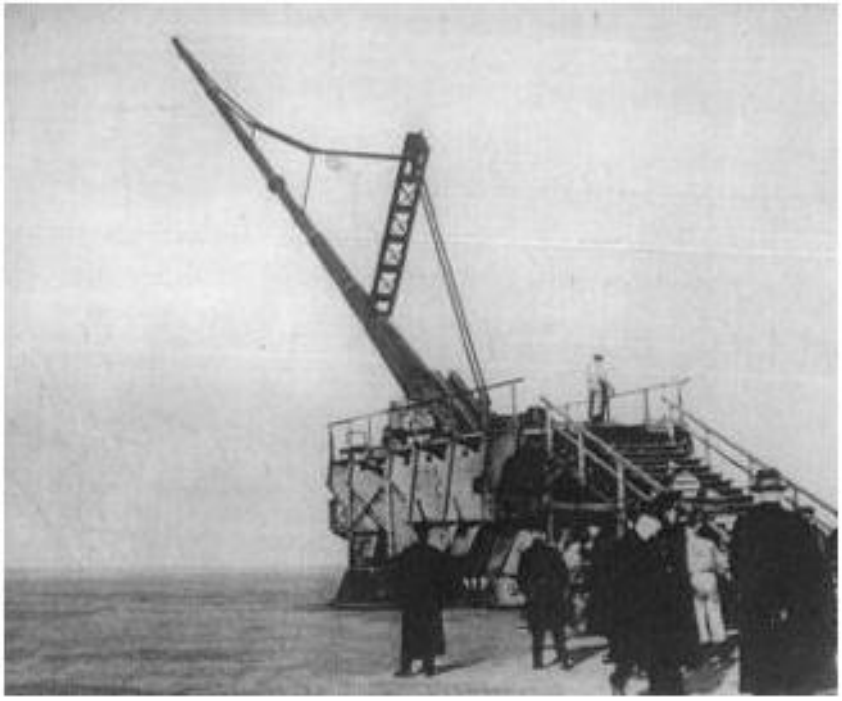
- Data:
  - Bore: 21 cm
  - Length:
    - 30 m (rifled) + 6 m (smooth)
  - Outer Diameter:
  - Rifling: 210 mm (8.27”)
  - Weight: Gun + Carriage 400mts
  - Chamber: varied by wear
  - Range: 112 km (67 – 72 mi)
  - Projectile Weight: 103 kg (228 lb)
  - Muzzle Velocity: 1600 m/s (5,260 fps)
  - Max Pressure (Chamber): 53,000 psi

# Paris Kanone
# Actual Firing



- 7 cannons and 2 carriages were built
- Fired on Paris from March to August 1918
- 1 gun exploded killing crew
- Extremely manpower intensive – hydraulic hoists and special ammo carriages required.

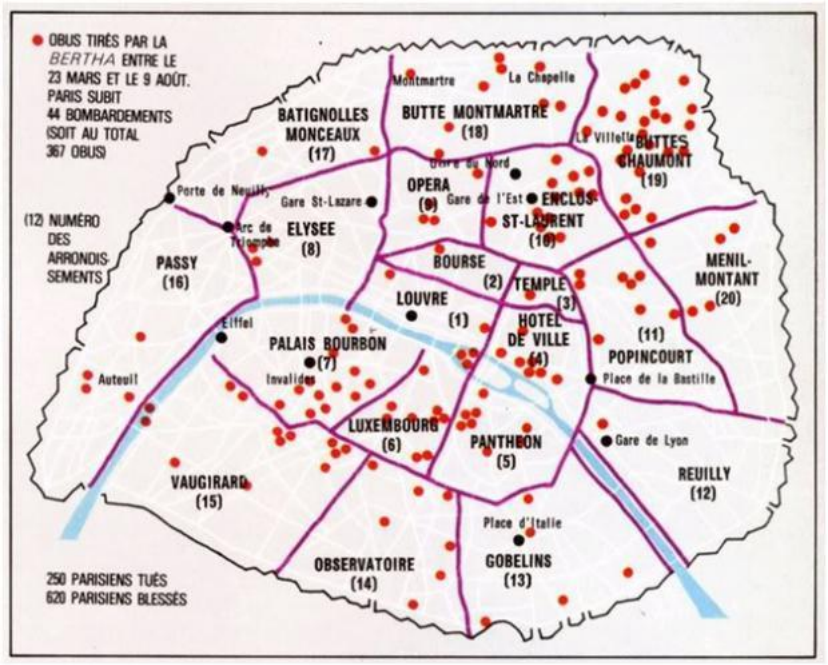


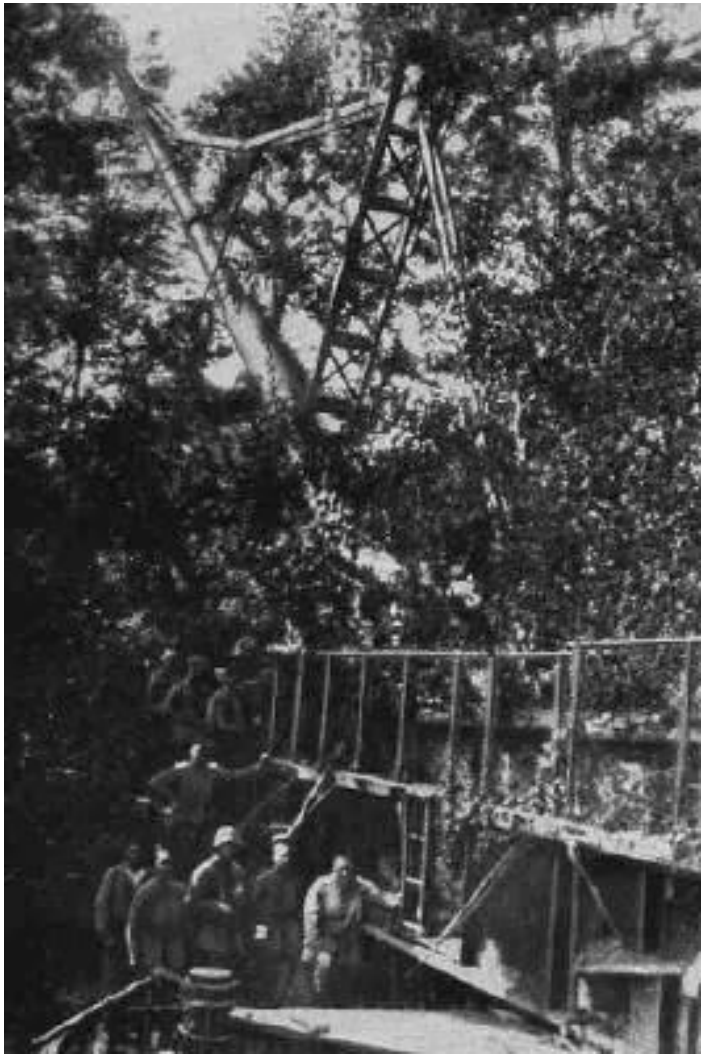


# Paris Gun
## Objective - Impact



- Objective: to terrorize the French and prompt the peace talks
- Impact (was objective met): NO
  - Once the inaccuracy was well known – the French population as a whole ignored it – couldn't create a widespread panic



# Paris Kanone
# Technical Significance

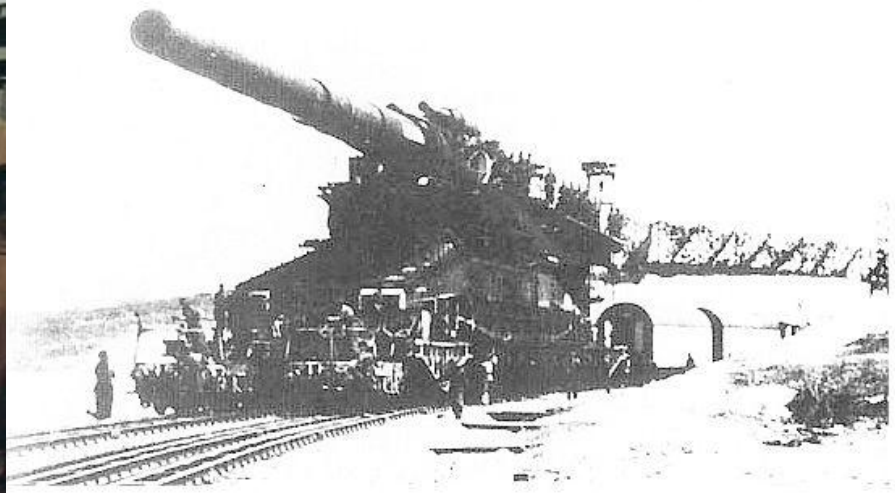


- Engineering:
  - First weapon to account for Coriolis effect (spin of the earth)
  - Firing solution calculated the drag reduction in the upper atmosphere
  - Earth's curvature also entered the calculations
- Experience with this gun gave Germany the knowledge to create a new generation of extended range armaments starting in 1934.
  - German 28 cm K5 (E)
  - 42 cm railway gun, (Anzio Annie) (shown here)
  - 80 cm railway gun (Dora)
  - precursor to the 88 mm anti-aircraft gun (most successful weapon of WW2)

# Schwerer Gustav (Dora) Background



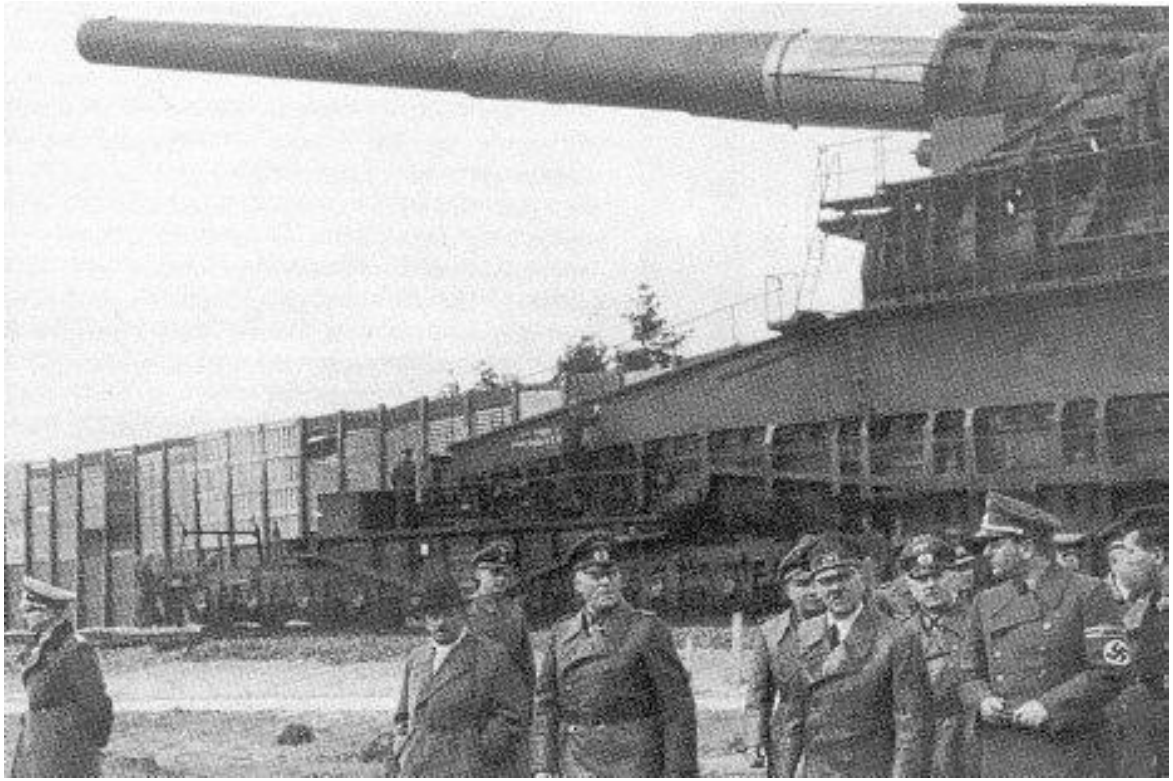
- Development started in 1934 by Krupp without a contract
- Purpose - destroying heavy fortifications, specifically those in the French Maginot Line.
- German Government let contract in 1939
  - D1 Schwerer Gustav (Heavy Gustav):
  - D2 Schwerer Langer Gustav (Heavy Long Gustav)
  - D3 Langer Gustav (Long Gustav)



# Schwerer Gustav (Dora) Background



- Not ready for action when the Wehrmacht outflanked the Maginot line during the Battle of France.
- Gustav was used in the Soviet Union at the siege of Sevastopol during Operation Barbarossa



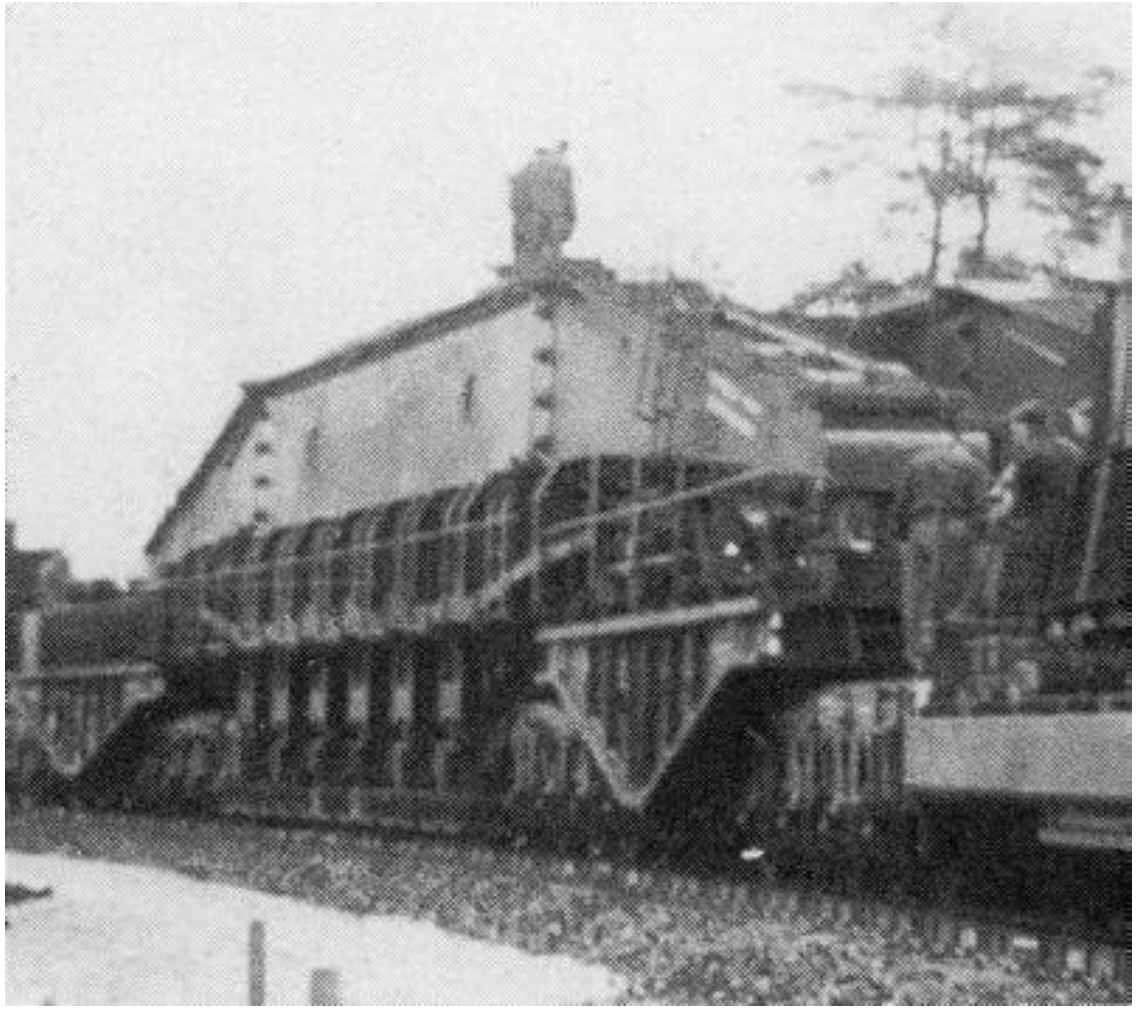
# Schwerer Gustav (Dora)
## What set this weapon apart

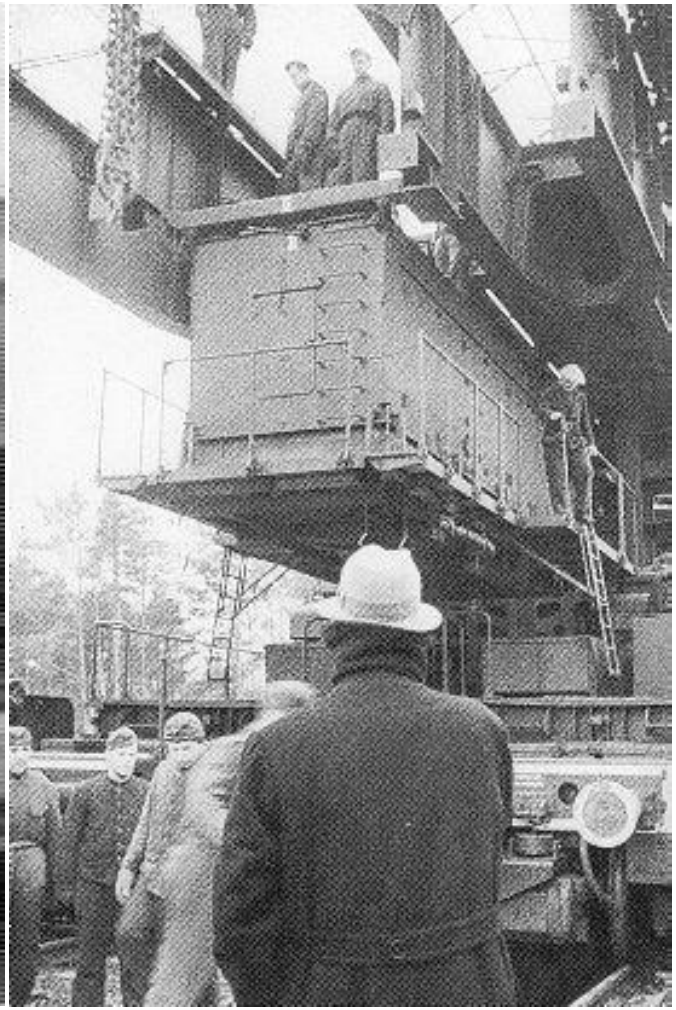


- Sheer size –
  - Largest bore
  - Most powerful
- Cost - 7 million Reichsmark

# Schwerer Gustav (Dora) Fabrication/Construction

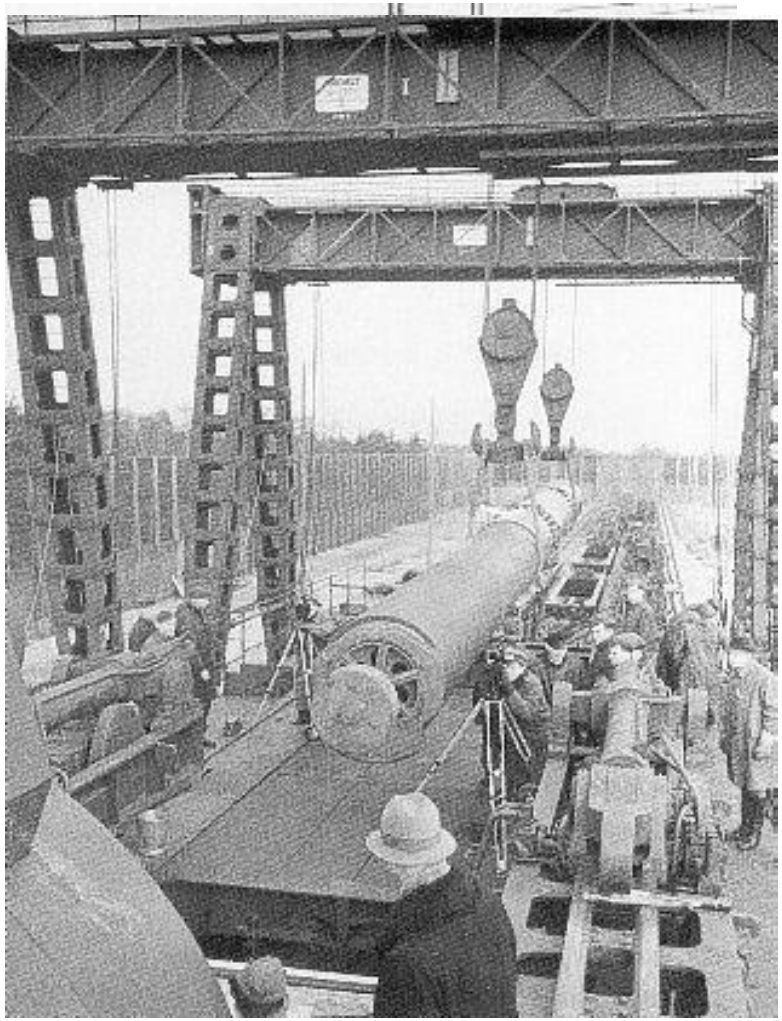


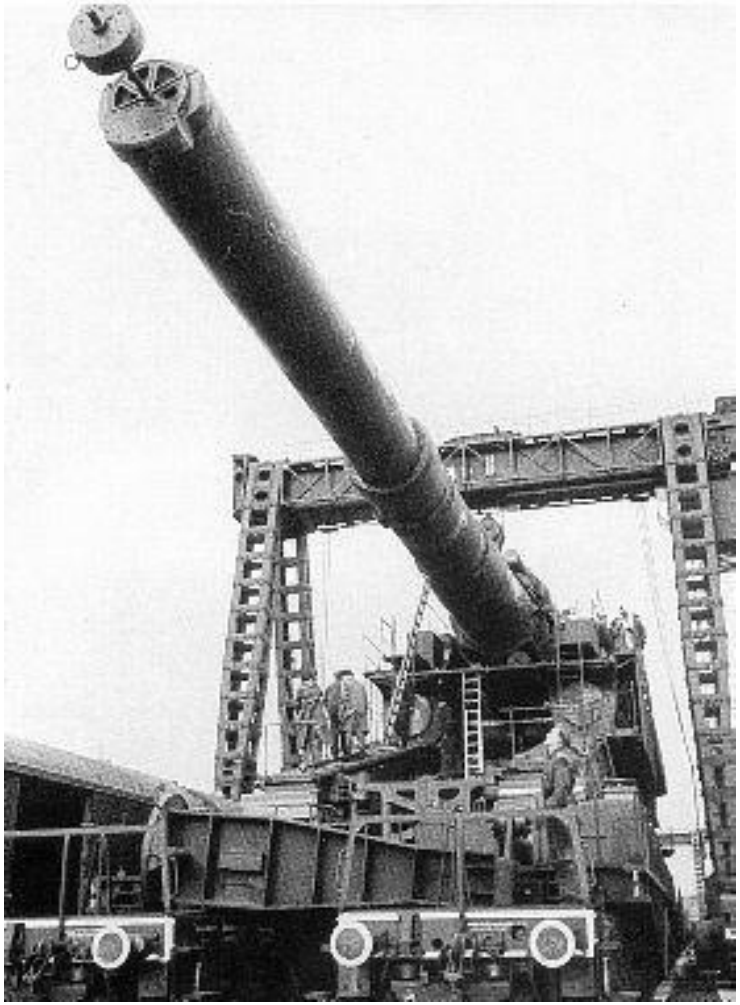




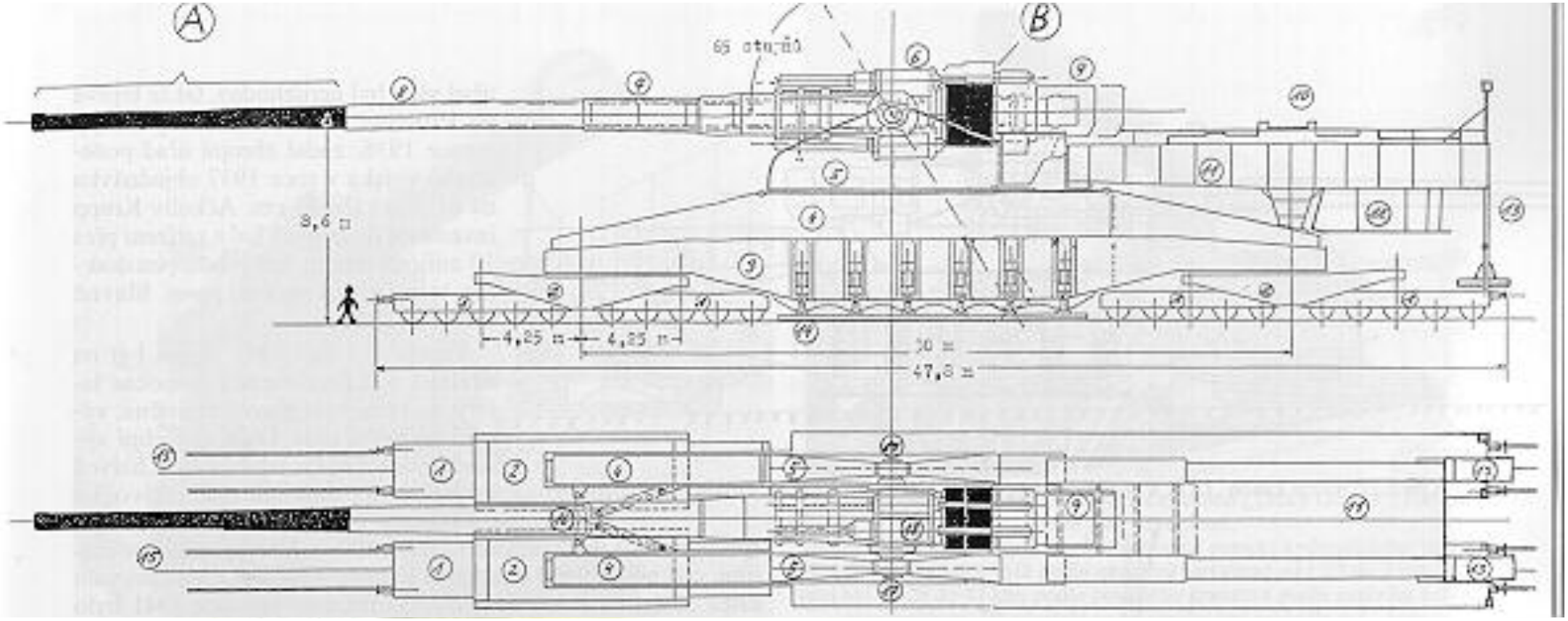
# Schwerer Gustav (Dora) Fabrication/Construction







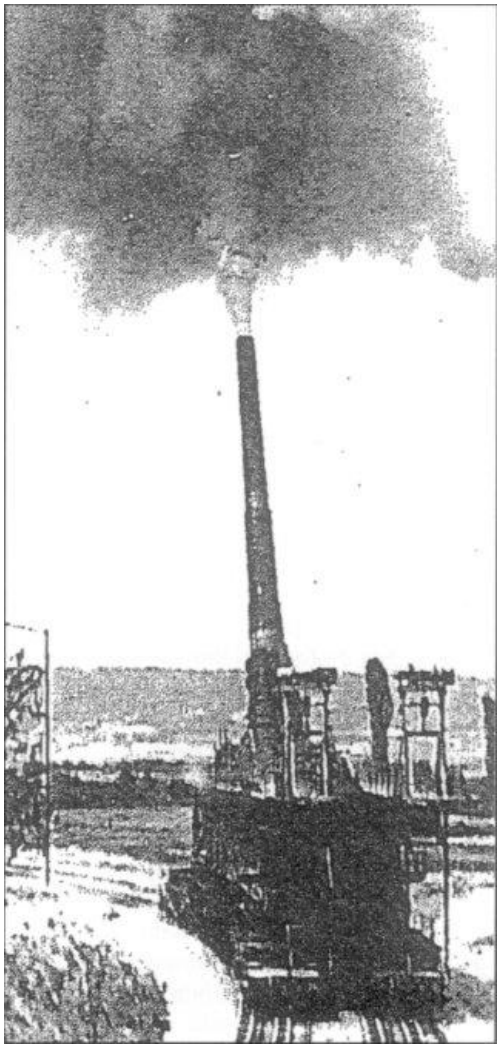
- Crew 250 to assemble the gun in 3 days (54 hours), 2,500 to lay track and dig embankments. 2 Flak battalions to protect the gun from air attack.
- Produced 1941
- Number built 1 (2 cannon tubes)



# Schwerer Gustav (Dora) Data



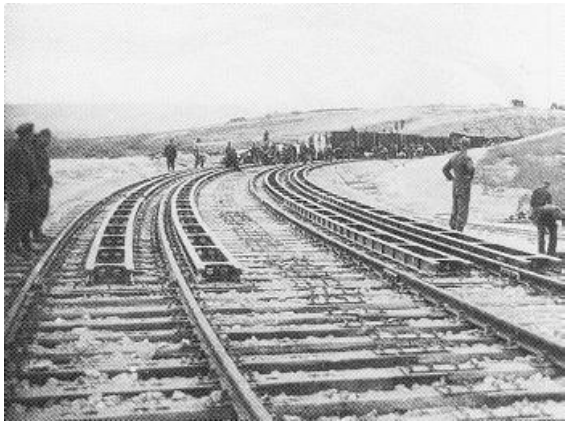
- Data - 80 cm Schwerer Gustav:
  - Bore: 800 mm (31.5”)
  - Length: 32.4 m (40 caliber)
    - Projectile Travel: 24.4 m
  - Rifling: twist unknown 10 mm deep
  - Weight: 2,976,241lbs (1350 mt)
    - Cannon Only 400 mt
  - Chamber: unknown
  - Range: 42,650 yards (39 km)
    48 km (HE); 38 km (AC)
  - Projectile Weight:
    - 4800 kg (HE) (10,500 lbs)
    - 7100 kg (anti concrete)
  - Muzzle Velocity: 820 m/s (HE)
    720 m/s (AC)
  - Max Pressure (Chamber): 38,000

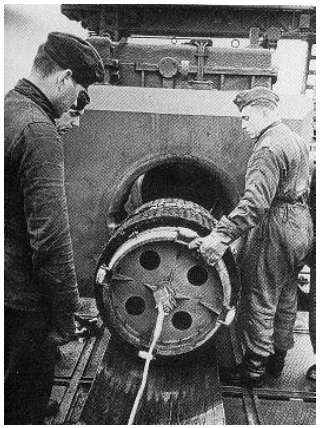


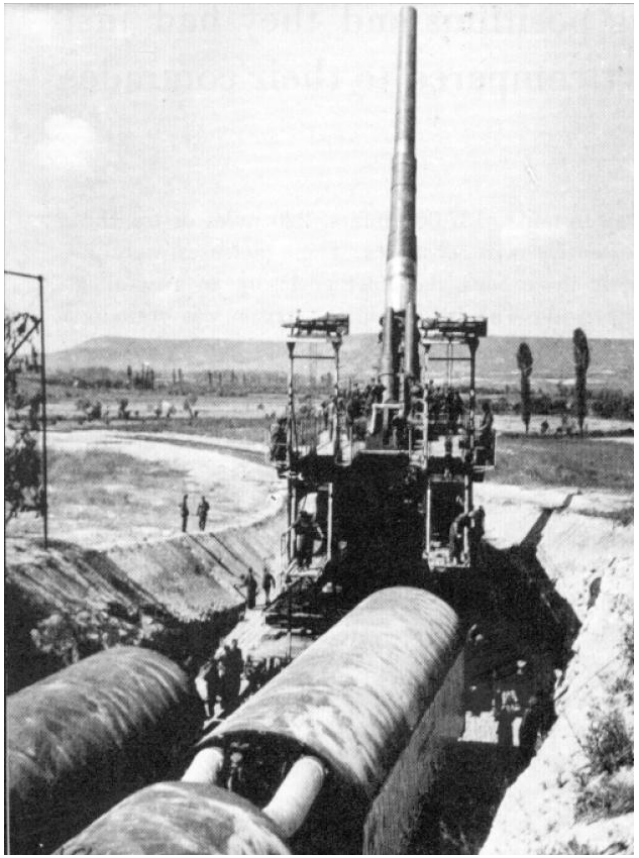
# Schwerer Gustav (Dora) Actual Firing



- February 1942 Heavy Artillery Unit (E) 672 and went on the march to the Crimea.
- Train carrying the gun was 25 cars long, a total length of 1.6 km. The gun reached the Perekop isthmus in early March 1942, where it was held until early April.
- Special railway spur was built to the Simferopol-Sevastopol railway 10 miles (16 km) north of the target, at the end of which four semi-circular tracks where built specially for the Gustav.
- 5 June 1942 the gun was ready to fire.
- Fired 48 rounds until 17 June 1942 – Sevastapol fell

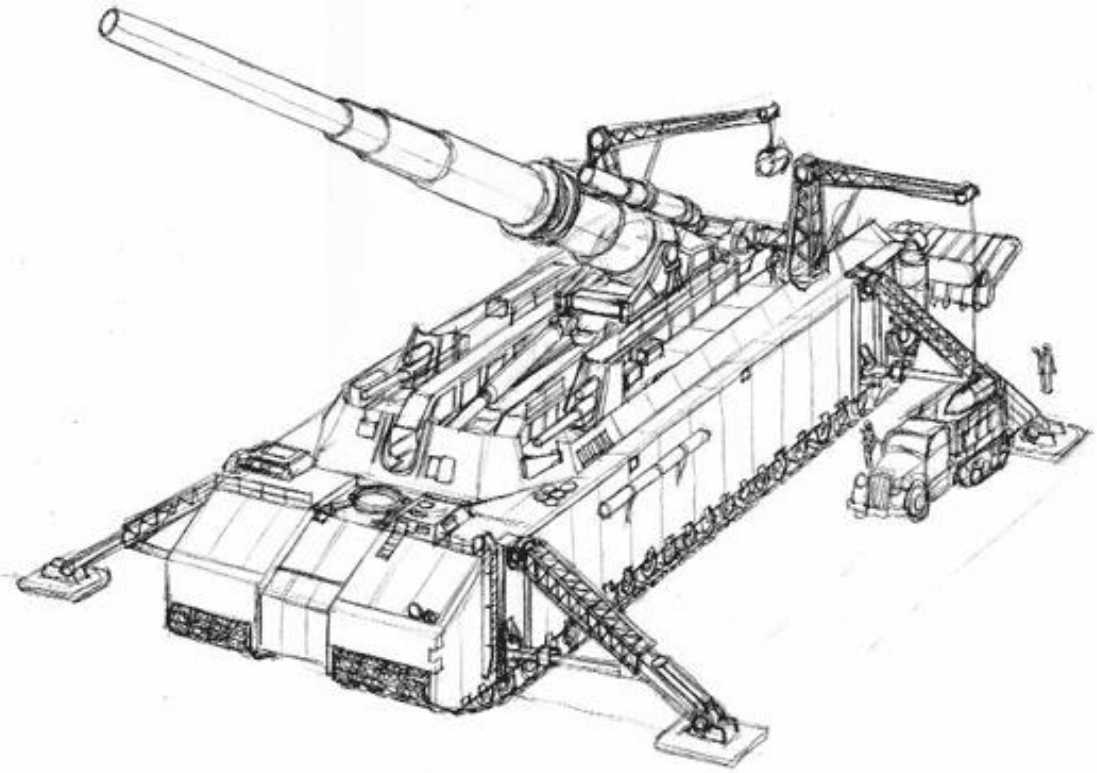






# Schwerer Gustav (Dora)
# Actual Firing





# Schwerer Gustav (Dora) Actual Firing



- D1 Gun Destroyed - Grafenwoehr

# Schwerer Gustav (Dora) Objective - Impact



- Objective: To destroy heavy fortifications & psychological impact
- Impact (was objective met): Yes, but . . .
  - Relative cost and logistics trains involved were far higher than the three (3) smaller K5 railway guns (280 mm) combined.

280 mm K5 Railway Gun (German)

# Summary



- These guns represented a departure from the norms of weapon design, and each had superlatives to it – first (16” Seacoast), longest range (Paris Cannon), heaviest (Schwerer Gustav – that last to this day.
- These guns had only limited or no proven combat effectiveness:
  - 16” Seacoast Gun was never fired at an enemy warship
  - Paris Cannon – not intended for firing at a military target, but at civilians
  - Schwerer Gustav – fired a total of 48 rounds in battle

- Planned for Part 2 – Super Guns
  - V-3 Vergeltungswaffen 1943 Germany
  - M65 Atomic Cannon 1954 USA
  - HARP 1973 USA/Canada

# Questions for Understanding



1. The 16” seacoast cannon used tubular segments built up utilizing a _____ process.
2. T/F  The 16” M1895 cannon was the only 16” gun made.
3. The Paris Kannone accounted for _____ and _____ in ballistic calculations.
4. T/F Paris Kanone was intended to bombard Allied Airfields
5. T/F  Paris Kanone had pin point accuracy
6. T/F The Paris Kanone utilized a cable suspension to counteract tube droop
7. The Schwerer Gustave moved by
   a) Railway
   b) Canal Boat
   c) Tracked Chassis
   d) All of the above
8. In addition to the D1 Schwerer Gustav - _____ additional designs were planned.
9. T/F  Over 10 Schwerer Gustav Guns systems were deployed
10. The Schwere Gustav had a tube life of roughly _____ rounds.