



**Destruction in Richmond Virginia 1865**

**Gallego Flour Mill is Beyond the Bridge. Virginia was the fifth largest flour producing state before the war.**

## **The Industrial Resources of the Confederacy:**

**Their Extent in 1861, Their Expansion, Their Use, and Their Destruction.**

**Prepared By Charles E. Knight**

**This is the narrative report that accompanied an oral report first presented to the Sterling Price Camp #145 of the Sons of Confederate Veterans on February 10<sup>th</sup> 2015.**

**(Last Revised January 18, 2020)**



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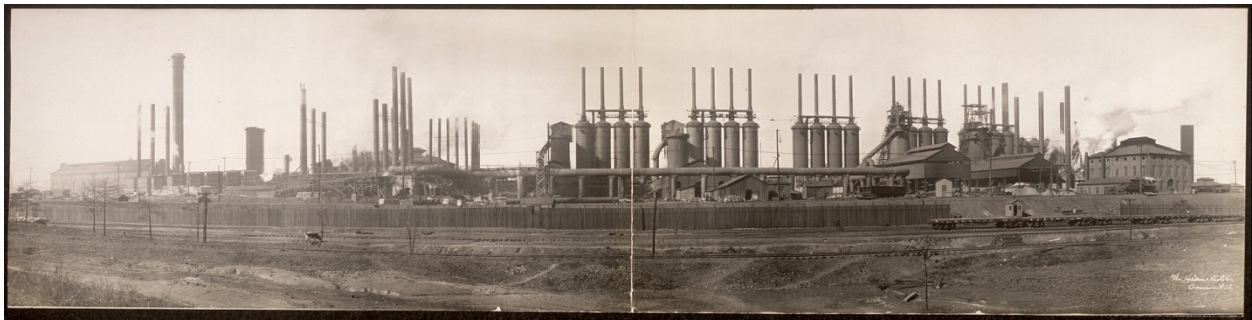
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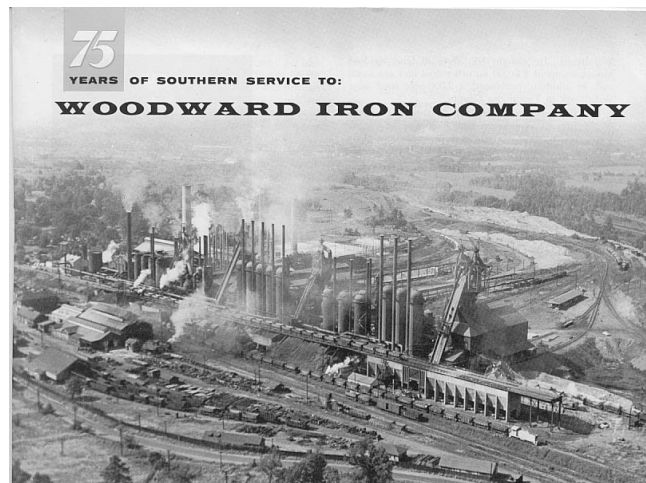
## **I. Introduction:**

### **IA. Author's Background and the reason for the report:**

**I grew up in Bessemer, Alabama in the Birmingham District and well acquainted with heavy industry in contrast with my parents and grandparents who grew up mostly on southern farms. The photographs below, and many others like them, were everyday scenes when I grew up there:**



**Ensley Steel Works - Birmingham District. The district made 40,000,000 tons of pig iron and 4,000,000 tons of steel each year. Everything needed for doing that was mined, transported, and processed there. And, it was all turned into finished products in the local vicinity.**



**Both of these pictured industrial complexes are just fading memories today. Ghost tours are conducted at the abandoned Ensley Works and the place where Woodward stood is a subdivision.**

**One of the places I visited as a small child was the old Confederate Iron Works at Tannehill near McCalla and Bucksville a few miles south of Bessemer. When my parents and I first picnicked there in the 1940's it was a ruin back in the woods. I asked many questions about the ironworks. I was told that iron from these furnaces was used to complete the outfitting of the commerce raider CSS Florida in Mobile Bay and to make huge naval cannon. From then on I wanted to know more about Confederate industry and the sea raiders.**



**The ruin of the Tannehill Furnace built by Moses Stroup in 1830. (Photo in 1936)**

**Some years later the McAdory family and many others (who allowed us as friends to picnic there) passed the site to the state. It became a state park. Some blast furnaces are restored now and an Iron and Steel Museum was added to the property. Over the years our family held annual reunions there until my parent's generation passed away. When John Harris, then program coordinator for the Sterling Price Camp, asked me about giving a presentation I thought: "This is my chance to learn more about Confederate Industry and report on the extent of it to the Camp." What I learned about the extent of Confederate Industry led me to question how it was used.**

**The picture below shows what two reconstructed Tannehill furnaces look like today.**



**Tannehill Iron works was destroyed by the same Iowa Cavalry that bedeviled Sterling Price.**

**As a young boy I often heard statements that portrayed the “Old South” as an “agrarian society” of aristocratic planters proud of being “moral country people” who were later overwhelmed and crushed by the industrial power and burgeoning “mud sill” immigrant population of the northern states. If you grew up in the southern states you probably heard something similar. Descriptions like the one above are loved by the descendants of the aristocrats who controlled southern politics. They show nostalgia for a real past in their case. For most white southerners it is an imagined or legendary past. All such descriptions contain anger driven vitriol about Yankee conduct during the conflict. Descriptions like this do tell what happened to all Southerners. Still, they are a vast oversimplification of life in the Antebellum South and demean our Northern foes. Only a small percentage of white southerners were slave owners and fewer still were aristocratic planters. My Confederate Soldier ancestors were mostly yeoman farmers. They lived in areas unsuited to plantation agriculture. They fought as their grandfather’s had in the American Revolution to defend their homes from foreign invaders and as the only means of removing both the export taxes placed on the cash**



**crops they depended on and the import taxes placed on the inexpensive imported industrial goods they needed to keep their farming operations solvent. Their taxes were being used to support northern industrial interests and, since the United States Legislature and the Presidency were controlled by those interests they felt they had no redress short of secession.**



**The Ruins of Elm Grove Plantation House**

**There are least thirteen such crumbling mansions scattered across Alabama's black belt prairie region.**

## **IB. Southern Industrialists in 1861**

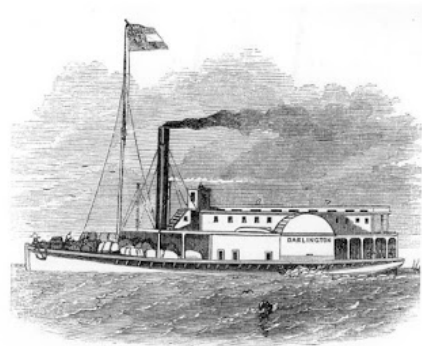
**It is true that the planter aristocrats that lived such homes did not like the northern manufacturers. They didn't like the southern ones either and the feeling was mutual. Most southern industrialists did not favor or support secession. Like their northern counterparts they too wanted the protection of tariffs to shield them from foreign competition, a stable currency so that they could predict their future transactions, developmental loans, access to raw materials and to a large national market. These in turn called for roads, railroads, developed water transportation and a good telegraph communications network with suppliers of tools and raw materials and with**

customers. The only difference was that many southern manufacturers used both free and slave labor. In most such instances the free laborers were the journeymen and foremen who supervised the work of largely unskilled slaves hired out by their owners.

## **II. What Was The Extent of Confederate Industry in 1861?**

How much industry did the South have in 1861? Harold S. Wilson in the introduction to his book, “Confederate Industry: manufacturers and quartermasters in the Civil War” made this statement:

**“On the eve of the Civil War the slave states ranked among the industrial nations of the world in miles of railroads, numbers of steamboats, annual production of pig iron and coal, and the extent of telegraph connections. Tanneries, foundries, slaughterhouses and flour mills added greatly to the material capacity of the nascent Confederacy. Only England, France, two other European Powers and the North possessed more cotton and woolen spindles than the slave states, which had several hundred cotton and woolen mills. While the Confederacy mobilized these resources the Union systematically endeavored to destroy them.”**



No. 671.—REBEL STEAMER DARLINGTON, CAPTURED IN FERNANDINA HARBOR.

**CSS Darlington on the St. Johns River in Florida in 1861.**

**Wilson’s statement implies that the southern states, taken separately from the northern states, were probably the sixth ranking industrial nation in the world at that time.**

**Thinking about this implication, and not believing what I was reading, I made an attempt to independently confirm what Wilson said about the iron and textile industries in the Antebellum South. I grew up in a steel town and was**

**an industrial engineer in a woolen mill just out of college. Later, I picked up an MA in economics and I finished my working life as an Associate Professor of Computer Aided Drafting and Manufacturing at a community college.**



**An 1840s Virginia Grist and Flour Mill. Industries were steam or water driven.**

**A sampling of Wilson's facts about the South: The state of Virginia was the fifth largest producer of wheat and milled flour in the U.S. before the war and Georgia was more industrialized at the war's beginning than Ohio. Georgia was called the South's "Empire State". I confirmed that there were sixty-three textile mills in the Carolinas, 33 prewar textile mills in Georgia, and 100 textile mills in Tennessee along with 489 grist/flour mills and 543 lumber mills in that state alone.**



**Fries Cotton and Woolen Mills in Salem, North Carolina in 1860**

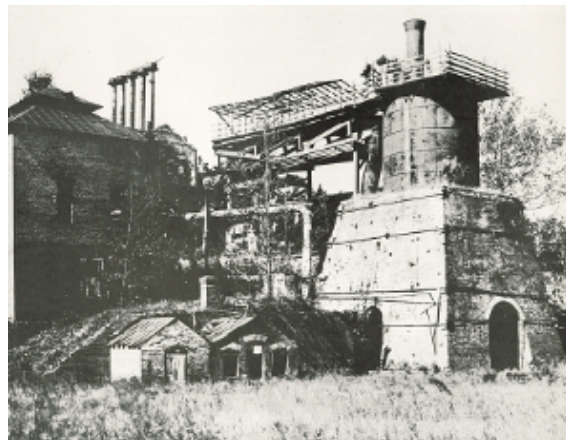




**War Eagle Grist and Flour Mill in Rodgers, Arkansas was burned by Confederates and has been restored several times since then. Today it is a restaurant that serves War Between the States period recipes using its' stone ground products.**

**In his book Harold Wilson compiled many facts that filled several chapters about southern industrial assets. Citing another instance: "There were more than 100 iron smelting (cold blast) furnaces in the slave states." I knew from my past studies that most iron furnaces were concentrated in the Appalachians from northern Alabama northward to Maryland. They ranged in size from those like the Brierfield furnaces in Bibb County, Alabama which produced about 200 tons of iron each day to smaller furnaces that produced around 10 to 20 tons each like the three at Tannehill.**

**The first of the Brierfield Iron Furnaces in 1861 (below). The four partners that owned Brierfield Iron Works and Rolling Mill refused to sell iron to the Confederacy because it would ruin their present customers and therefore their business as well at the war's end. They were forced to sell the works to the State of Alabama to avoid seizure.**



**Brierfield was destroyed by the 10th Missouri Volunteer Cavalry.**

**In aggregate I have estimated that 100 furnaces were capable of contributing about 365,000 tons of iron to the southern economy each year. (100 Blast furnaces in the “slave states” times about 10 tons per furnace equals 1,000 tons per day. This figure times 365 days per year is 365,000 tons per year.) Some furnaces made far more than 10 tons so my estimate could be too low.**

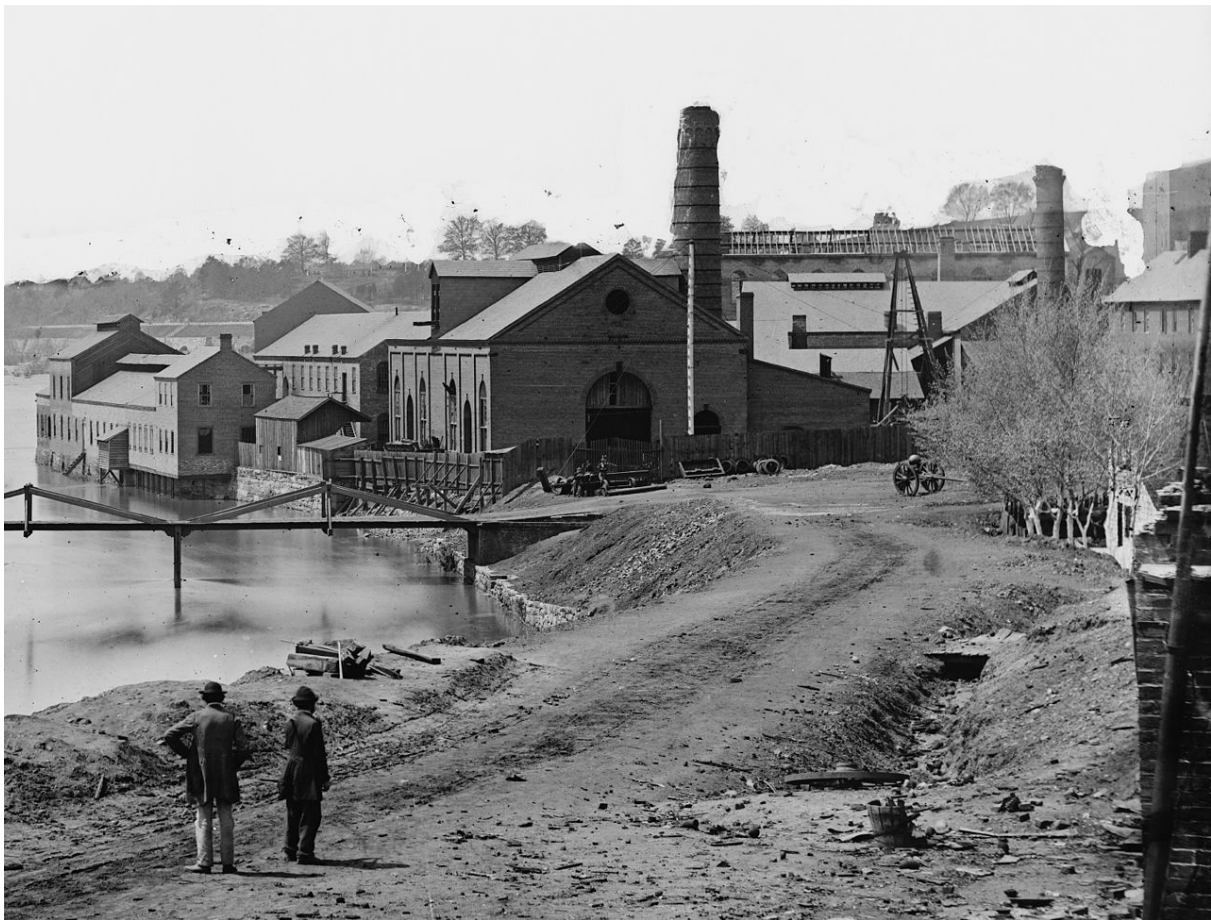
**Wilson used the term “slave states”. I want to note here that the iron furnaces in Missouri, Western Maryland, Eastern Kentucky and what became West Virginia while in “slave states” were not contributing any iron to the Confederacy. Similar statements can be made about their railroads and steamboats.**



**Meramec Iron Works Furnace in Missouri built in 1863 supplied iron for Union Monitors built in St. Louis. States under Union control doubled their industrial capacity between 1861 and 1865 and most northern railroads were converted to standard gauge.**

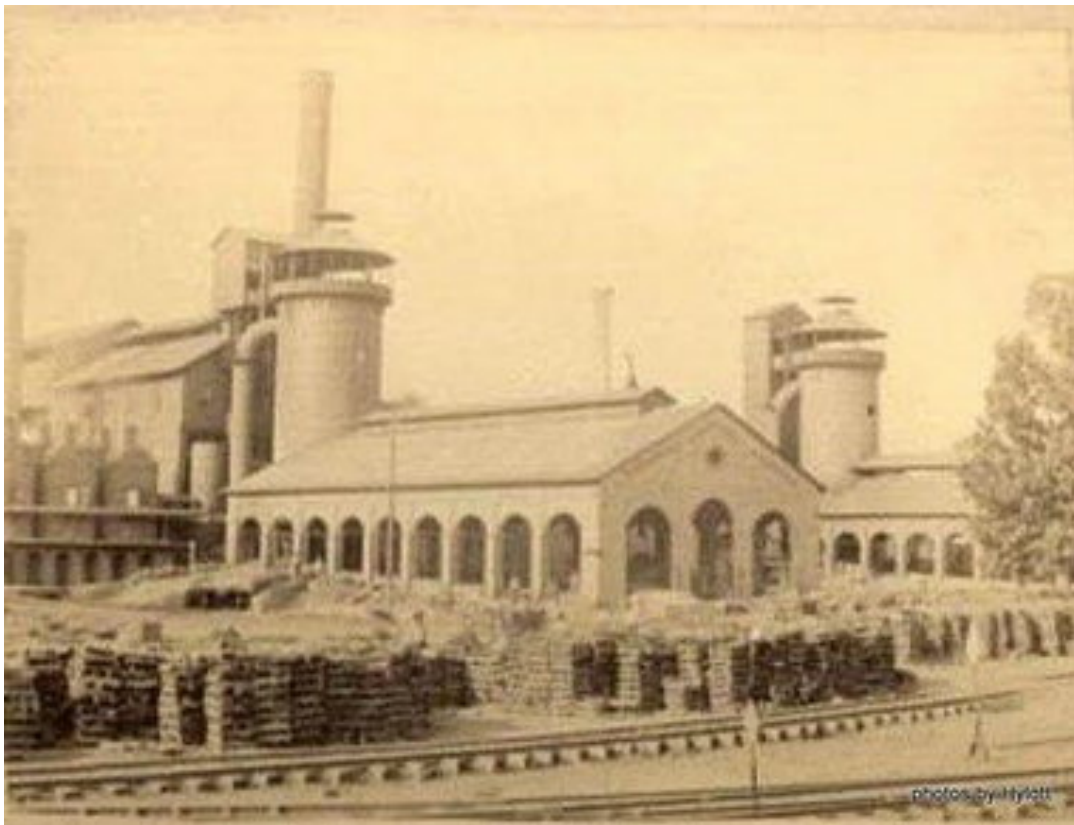
**In the states under Confederate control I confirmed 18 furnaces in Alabama and 20 small ones in Middle Tennessee plus three large ones in Eastern Tennessee around Chattanooga, 10 in Northwestern South Carolina, and perhaps 5 in Northern Georgia (Precise information on Georgia is not easily available.), 5 in Western North Carolina, 18 in Southwestern Virginia, 1 in Texas and 2 in Mississippi. This would indicate 250,000 tons (or slightly more) of variable quality iron was available to the Confederacy yearly.**

**Part of Tredegar Iron Works, Richmond 1861. This is the South's only industrial asset most people know about. Yet, there were over fifty iron foundries in the prewar South.**





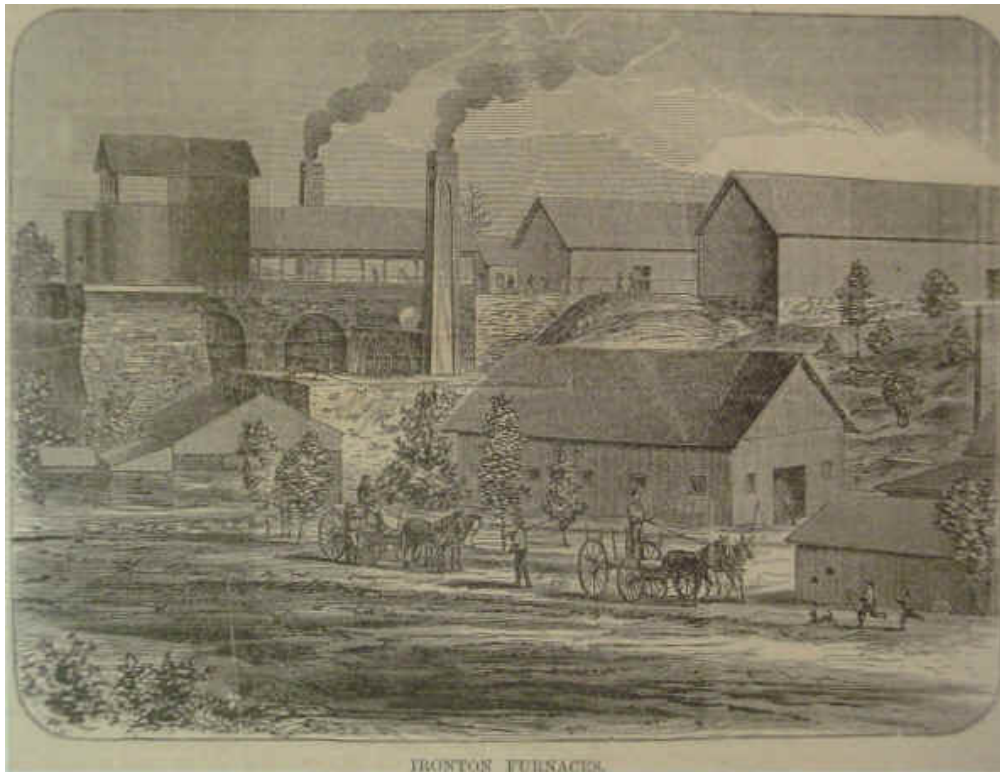
**A portion of Bellona Iron Works in Virginia is shown above (One gutted workshop of the former Federal arsenal's original eight.). I had never heard of this 47 acre complex until I began researching this report.**



**Shelby Iron Furnaces (above) sent high quality iron to England prewar. The English made it into cutlery and swords. This industrial complex was also seized by the Confederate Government.**



**Daniel Pratt the owner of Oxmoor (Later Ironton) Furnaces and industrial complex (pictured below) accepted payment from the Confederacy and had the money deposited in England. After the conflict he used that money to rebuild and reopen his operations.**



**Oxmoor (Later Ironton) Furnaces and industrial complex**

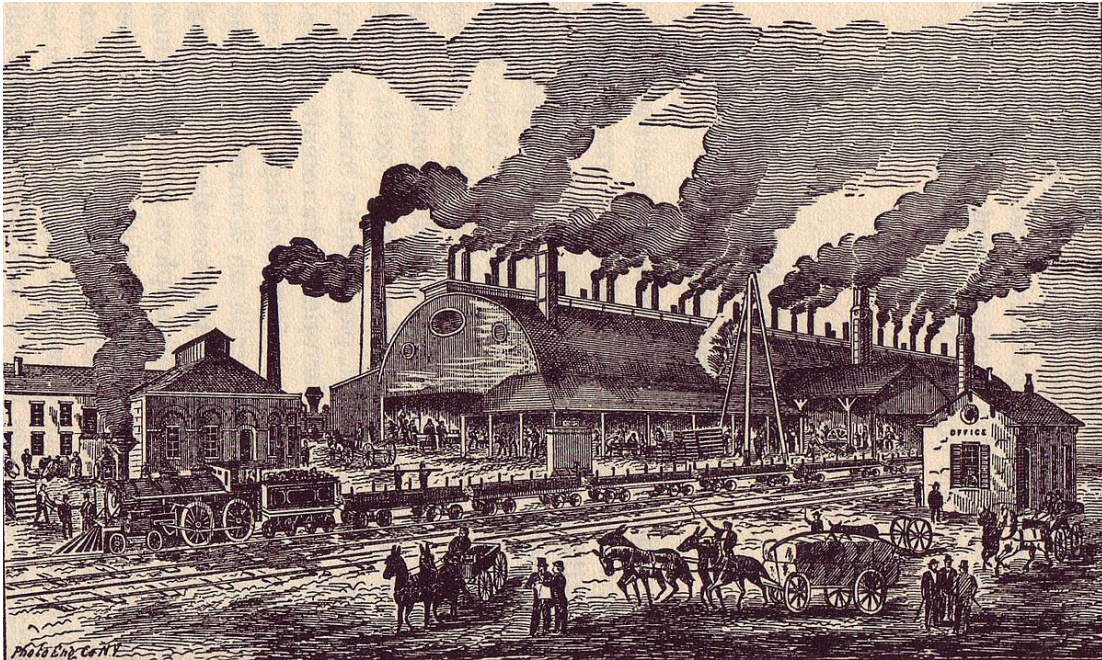
**SOME EXAMPLES OF BAD INFORMATION: The original Oxmoor furnace in Jefferson County, Alabama made 57 tons of iron in nine hours when it was first brought on blast. That is about 56,000 tons per year from this one furnace alone. (Actually, the two made only 8 tons each per day.)**

**FROM WIKIPEDIA: Economy of the Confederate States of America, Iron Industry, “The Tredegar Iron works in Richmond was the third largest iron manufacturer in the U. S.” (They were the third largest iron foundry; they did not make iron at all.) and...**

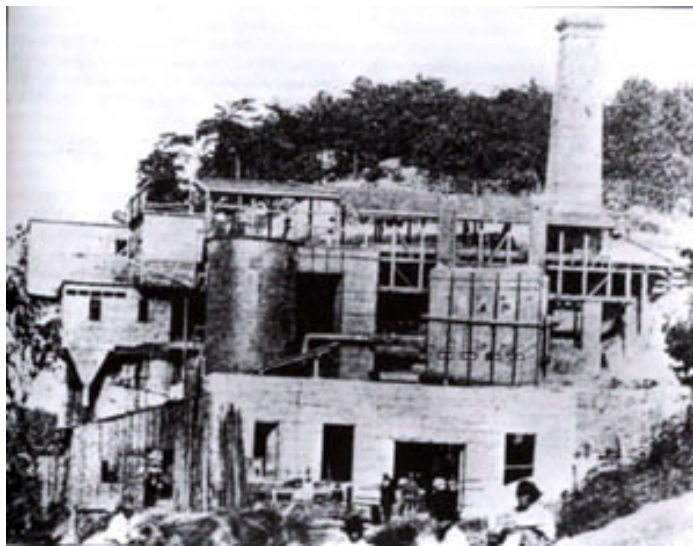
**Still same Wikipedia article: Birmingham, Alabama did not produce iron until 1864. Production from this region was minor throughout the war. Actually, Birmingham itself did not exist until 1871 but, the 18 iron furnaces in that area made about 25% of the Confederacy’s iron.**



**In the war these and other Deep South iron works sent their iron to Selma, Macon and Atlanta. Their rolling mills made plate for the CSS Virginia and the Ram Tennessee. The Alabama works were destroyed by Wilson's Cavalry.**



**Schofield's Atlanta Rolling Mill in 1861 made iron railroad rails.**

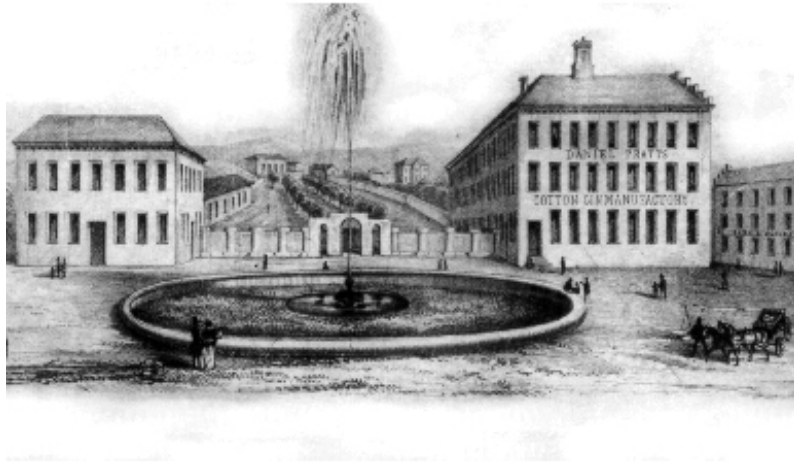


Most furnaces in the 1860s used hardwood charcoal for fuel. This up to date Chattanooga Iron Furnace used industrial coke for fuel. Its' iron was used to make railroad cars. It was destroyed during the Federal occupation of the city and never rebuilt.



**The tracks leading out of the Atlanta Depot and Rail yard in 1860**

**Daniel Pratt's Cotton Gin Company was founded in 1831 in Georgia. The Prattville, Alabama plant was started in 1833 and shipped cotton gins all over the world even as far as Tsarist Russia. (The depiction below is from an 1856 Ad.) This entire complex depended on water power. The building at the extreme right and the fountain in this drawing still exist.**



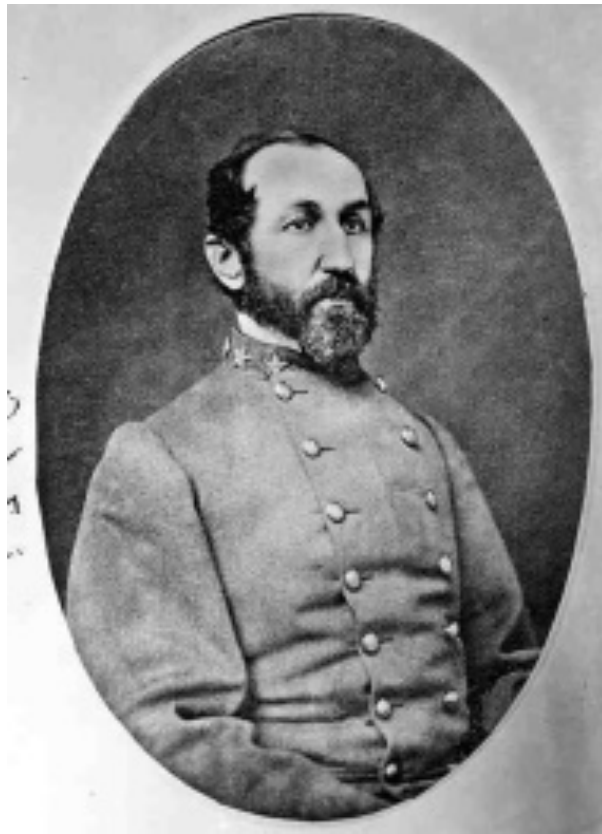
### **The eastern side of that building today**

**My initial research dealt with existing iron and textile industries. These are intermediate industrial goods. Over 50 existing southern companies made finished goods- rifles, carbines, pistols and cannon for the Confederacy. (See: "List of Confederate arms manufacturers." on the net.)**



### **III. How the Industrial Base was expanded**

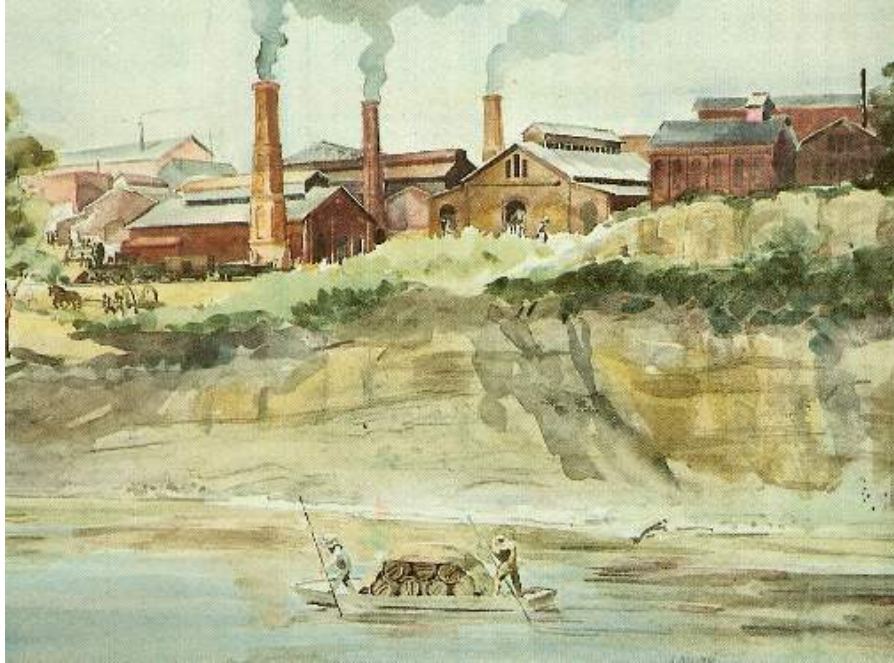
**As the war progressed many southern states used forced purchases of whole factories or seizures under eminent domain to obtain needed war material. Then they expanded the industries that were seized. For instance, additional iron furnaces were built at Brierfield and Tannehill and two closed Mississippi furnaces were reopened. Texas built a completely new ironworks. States also built port facilities, canals, and trunk rail lines to facilitate the movement of raw materials and finished war goods.**



**Brig. Gen. Josiah Gorgas**

**Confederate States Chief of Ordnance**

**Under the direction of Josiah Gorgas the Ordnance Bureau of the War Department had over twenty arsenals, powder works and laboratories built (See Appendix A). “This constituted a form of badly needed state socialism.” (Wilson)**



**One example of the Ordnance Bureau's work is Selma Arsenal & Naval Foundry in Alabama (above) it was completed in just under two years. It employed from 6,000 men in 1863 to 10,000 men by 1865. It was the second largest industrial asset in the South after the Tredegar Works in Richmond, Virginia. Selma arsenal made everything from swords, to Confederate buttons, to naval cannon.**



**This Selma Cannon Lathe now sits outside Samford Hall at Auburn University.**





**This is a 7" Brooke rifle in a naval gun mount of the type used on ironclads. This large gun, and 70 like it, were manufactured in Selma. It was recovered from the CSS Jackson in 1962. It was last fired at the Columbus, GA. Civil War Naval Museum\* in 1999. The barrel alone weighs 15,000 pounds and could accurately hurl a 118 pound projectile five miles and penetrate 5" of cast iron armor. (\*Formerly Confederate Naval Museum)**



**Cartridges and Bullets were made at all arsenals.**

**The plan was to have at least one arsenal in each State.**

**(These came from Augusta, GA)**



**A Part of Richmond Arsenal (1865)**



**Charleston, SC Arsenal**



**Architects Drawing of Macon Arsenal in Georgia. Macon was a typical southern industrial town. Macon's unfinished arsenal, the Confederate Ordinance Laboratory, the Findlay Iron Works (its' products included locomotive and steamship boilers), Schofield's Iron Works (field artillery-sugar mills prewar) and the Powder Mill at Augusta were all "bypassed" during Sherman's march through Georgia. After a failed attempt at taking Macon and a feint at Augusta he simply destroyed the railroads so nothing could be shipped.**



**Pistol Factory and Pistol made in Griswoldville, Georgia  
(Factory Destroyed by Sherman)**



**The Confederate Powder Works in Augusta and the canal to the Savannah River. Excellent powder was made here.**

**Southern states also seized former Federal Arsenal.**



**Tower Building Little Rock Arsenal**



**Harper's Ferry Musket Factory 1860 was dismantled and sent to Richmond, VA and Fayetteville, NC.**

#### **IV. The Use of Confederate Industry:**



**Weighing the facts about the expansion of the industrial base and having confirmed other well documented facts presented by Wilson about the extent of southern industry in 1861 raised a new and bigger question for me.**

**IVA- A New and Bigger Question: With the resources the Confederacy had, why did many soldiers go into battle ragged, hungry and some even without arms? I changed the focus of this report to try and answer that question. I found only partial answers.**



**A poorly equipped Confederate**

## **IVB The Use of Confederate Industry: An Analysis by Using Form, Place and Time Utility**

**To aid me in understanding the use of Confederate Industry I took this from my economics background: for any item to be useful to a society it must possess form, place and time utility.**

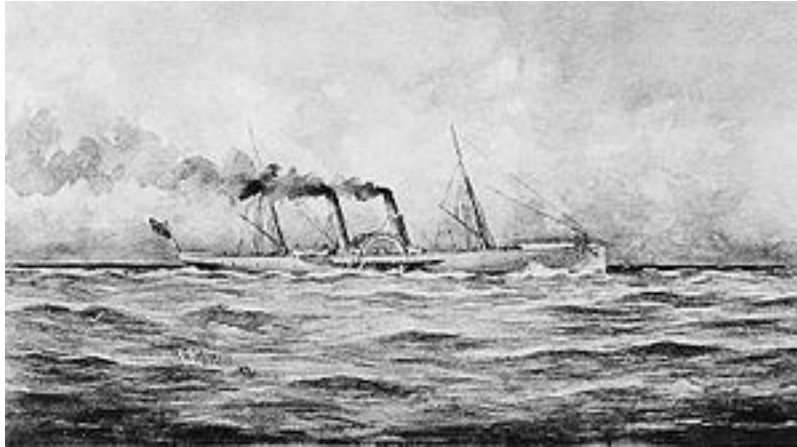


**Reproduction boots from a suttler's advertisement.**

**Put simply: Cowhides are not in the form of and will not substitute for finished boots. If I am a barefoot soldier in the snows of Tennessee only boots will do. Likewise, boots sitting in a factory warehouse in New Orleans (One existed that made 250,000 pairs per year.) are not in the right place to shoe my freezing feet in Tennessee. They lack place utility; they need to be in Tennessee and, they need to be there at the time my need arises for new boots and not two weeks after I have marched away barefoot. Having said this, seeing that our soldiers had the material resources they needed in the right form, in the right place and at the right time to survive, fight and hopefully win the war was one of the massive jobs of the Confederate States War Department. Factories and imported items provided form utility. Railroads, steamboats and wagons provided place utility, but only planning and coordination on the part of the Confederate War Department could provide time utility.**

#### **IVBa. Form Utility**

**Our recruits brought arms from home. Some of the South's war material resources were imported; some came from captured Union items but, most had to be fabricated domestically. Early in the war when goods and money were still available many troops were generously equipped by individual citizens. When N. B. Forrest enlisted he helped equip the unit with his own money.**



**SS Banshee a fast blockade runner made seven runs before being captured.**

**In the war's early years imports helped immensely. The South fought the battle of Shiloh with mostly imported arms. Many agents of the Southern War Department were in Great Britain and Europe. Ironically, they bought blankets, tents, rope, clothing and absolutely massive amounts of arms of every description. What they didn't purchase much of were the machine tools and replacement parts for southern mills. These parts could have made the South independent of the need for much that was imported. Exporting agricultural products, principally cotton, but also tobacco, sugar, rice, lumber and naval stores and then importing finished manufactured goods was business as usual for southern planters. Harold S. Wilson said: "Cotton was king, and king cotton was going to turn Europe into the South's arsenal."**



**Living on a Big Cotton Plantation was not a typical lifestyle for the Southern White Population.**

**The Planter Aristocrats in control of the Confederate Government that owned plantations were essentially well to do farmers who didn't at first understand the relationship between industrial resources and modern war. For them to become aware of what manufacturing capacity was already available at home and use it wisely was a slow process. Some ordnance machinery was bought but stopped by the blockade. We all know that the Union blockade eventually became pretty effective and imports nearly ceased.**



**A huge percentage of southern whites were yeoman farmers who were mostly barred from voting by property ownership and literacy requirements. 75% of white family's owned no slaves at all and less than 3% owned more than 20. (From the Teacher's Guide, PBS Special "Africans in America", Ken Burns)**

**As Northern troops occupied various parts of the South the industries and resources there were either taken over by the North or destroyed. The Gosport (Norfolk) Navy Yard, the Pensacola Navy Yard, the iron works of Middle Tennessee, and the wheat fields and flour mills of the Shenandoah Valley are all cases in point.**



### **The burned ruins of Gosport (Norfolk) Navy Yard**

**Sometimes portable machinery was moved out of harm's way to escape the invaders and thus continue producing for the South. This happened to the former Federal Arsenal at Harper's Ferry, Virginia and Mt. Vernon, (near Mobile), Alabama. The arsenal at Mount Vernon, Alabama was built to supply ordnance for the Mexican War. It was relocated to Selma.**

**The southern industrialists never wanted secession or war. They felt that the planter class that controlled the political process, and looked down their noses at them, had dragged them into a war that was not at all in their best interests. Worse yet, they were being accused of both profiteering when they asked for payment for goods rendered and even treason when they objected to outright seizure of goods produced in the form of "we take 40% of your production" type taxes.**

**Cotton planting aristocrats were deemed "essential to the war effort" and given deferments that few took advantage of. However, initially there were no deferments for key industrial personnel because they were needed in the factories. Key industrial staffs volunteered or were conscripted. "One North**



**Carolina cotton mill at Cedar Falls (See below) lost 800 men in one day after a recruiting session.”**

**When that regiment of “Randolph’s Hornets” marched away there were sixty old men and boys along with one thousand women left to run the local textile mill.” (Wilson)**



**We should thank our Southern Ladies for their hard work! Perhaps “Rosie the riveter” is not a modern thing.**



**The planter class that controlled politics in the South, and the prosperous yeoman farmers as well, believed that Northern industrialization, and the high taxes and tariffs the North imposed on their exported agricultural products and imported tools to pay for it, had caused America to lose the**

**elite republic we had inherited from Jefferson and Washington. They wanted to return to a time when their central government was controlled by an elite educated class and voting was restricted to the landed gentry and prosperous yeomen. Therefore the Confederate Congress put two clauses (Article VIII-1 & 3) in the Constitution of 1861 that called for “no encouragement to domestic industry or commerce.”**

1. To lay and collect taxes, duties, imposts, and excises for revenue, necessary to pay the debts, provide for the common defense, and carry on the Government of the Confederate States; **but no bounties shall be granted from the Treasury; nor shall any duties or taxes on importations from foreign nations be laid to promote or foster any branch of industry;** and all duties, imposts, and excises shall be uniform throughout the Confederate States.

3. To regulate commerce with foreign nations, and among the several States, and with the Indian tribes; **but neither this, nor any other clause contained in the Constitution, shall ever be construed to delegate the power to Congress to appropriate money for any internal improvement intended to facilitate commerce;** except for the purpose of furnishing lights, beacons, and buoys, and other aids to navigation upon the coasts, and the improvement of harbors and the removing of obstructions in river navigation; in all which cases such duties shall be laid on the navigation facilitated thereby as may be necessary to pay the costs and expenses thereof.

**These clauses, and the sentiment behind them, hamstrung any early effort at cooperation between the War Department and industrialists. Under this rule there was no organized effort to gain the support of the industrialists who were vital to winning the war. No southern quartermaster wanted to be accused of fostering domestic industry. That was unconstitutional.**

**For the first two years of the war soldiers were given an allowance or “commutation” to buy uniforms. Early in the war there was no standard issuance of clothing or nearly anything else. Twice a year company commanders were given the use of this allowance based on headcounts and tried to purchase clothing for their troops in a market where there was little to purchase.**

**Soon after the South seceded southern industrial activity collapsed into a deep depression. There was no national bank and the southern commercial banks suspended specie payments (gold or silver coins like the 1860 Gold “Double Eagle” (below). Without specie payments southern industrialists could not pay for imported tools.**



**Gold Coins (Specie)**



**Fiat Paper Money**

**Confederate paper money was worthless in Europe and the northern states. Businesses had to use fiat paper money for internal transactions and ultimately fell back to using the barter system. Before the war nearly all the tools and factory machine parts needed to keep the Southern factories running had come from the North. Likewise, about half of what had been produced was exported north and trade with the North was now forbidden. Many went bankrupt.**

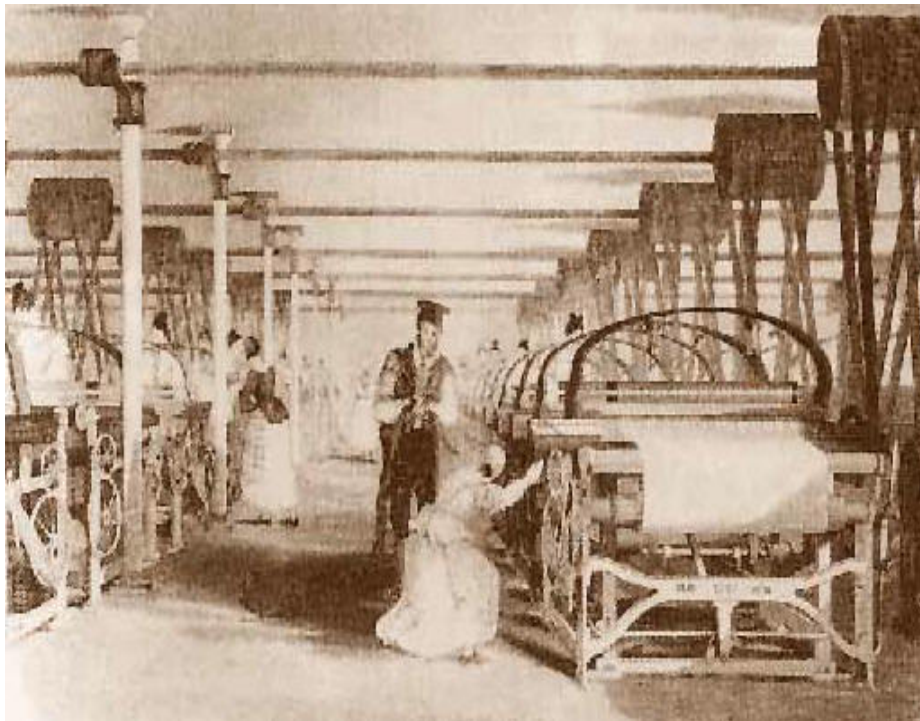
**The few industrialists that fared best foresaw the shortage of industrial tools and stockpiled those tools before the war. All southern industries looked for new markets for their products. They actively cultivated markets in the South. Markets were available in Europe and machine parts too but the attitude of the War Department and the tightening blockade prevented this from being a highly viable alternative.**

**Southern industrialists held meetings, shared available machine parts, diversified product lines, began to tool up to produce what was needed for the war effort and they began with innovation and improvisation to make some of the tools needed by their fellow industrialists. The textile mill that made warp frames in North Carolina expanded its production. Experimental**

**wooden cones and heddles were fabricated for weave sheds. Pine pitch “turpentine” lanterns were invented and produced.**



**Factories in states like Arkansas that were in danger of being overrun were dismantled and sold to industrialists further south. Most of the cotton mill machinery in Arkansas wound up in Texas where the state government, largely because of the isolation of the Trans Mississippi, worked for self-sufficiency. Throughout the war industrialists pushed for the importation of machine tools and equipment through the blockade but only a trickle came in.**



**A Nineteenth Century English Textile Mill.**

**Weave sheds in our southern textile mills resembled this English mill.**



The largely female labor force in the southern textile mills who had worked five 10.5 hour days before the conflict were by 1863 putting in over 77 hours per week. Factories were being operated around the clock seven days a week using pine pitch lanterns (no whale oil was available). This was not only brutal on the workers it was also rapidly chewing up the useful life of existing machinery. The War Department however had higher priorities than machine imports. Nearly all available capacity was devoted to the war effort and little was left for consumers. Only in the Trans Mississippi where machine tools could be imported across the Rio Grande was the maintenance and expansion of production by the importation of machinery possible on any meaningful scale. After the fall of Vicksburg in July of 1863 the southern states east of the Mississippi were cut off from this possible source of machine tools and from the meat and wool of Texas and Arizona Territory.

8922 Ch. fd. May 22, 1865

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A WEEKLY JOURNAL OF POLITICS, LITERATURE, AND NEWS.

Vol. I.—No. 1.] LONDON—THURSDAY EVENING, MAY 1, 1862. [PRICE 6D.]

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The determination of the Washington Govern-ment to gag the press of Europe, is very particu-larly evinced by refusing to allow Mr. Russell to proceed to join the army before Yorktown, and the the English public is convinced that no reliance is to be placed on Northern intelligence. The Times had a brilliant leader yesterday upon the Northern News Manufactury. Our contemporary wants to know the use of loans and levies, when a salute of 100 guns, a thanksgiving, and a fiction, can be substituted for a victory; and further suggests that the Pittsburg Landing story "is only the first of many great campaigns yet to be accomplished in this tempting region of fiction." The Times also comments on the obstinacy of the Confederates in pretending to be alive after they have been killed by Mr. Stan-ton's pen.—"For ourselves, we are perfectly pre-pared to admit that Beauregard is dead. The press of Federal America is now the voice of the War department; the press 'obstinately persists' that Beauregard first had his arm shot off and then was killed. News from America is now an official matter, and this is the news. Beauregard may ex-claim as much as he pleases, but for all newspaper purposes he is dead, and there ought to be an end of that we did not conquer those colonies. It was because we found that when we had been successful in the field we were no nearer our object than before. It is not the question—when you are endeavouring to conquer a country—whether you can break up its embattled armies and drive them off the plain where they contended with you in fight. The question is this, and this alone—whether the heart of that country is set upon separation?" We direct especial attention to our Paris cor-respondent's letter. We cannot venture to specu-late on the effect of the Emperor's last ap-pel to the British Government; but we know that the influential classes in England would deeply regret the French taking precedence in the recognition of the Confederate States of America. Nor do we imagine that our Government can be uninfluenced by the condition of Lancashire. The memorable declaration of Earl Russell in reference to the accounts of the English army in the Crimea, that "they were horrible and heartrending," is truly applicable to the reports of the sufferings of our citizens in the north. It was stated on Monday that in Blackburn and the district of four miles around it is computed that there are 154 mills and

**A Typical Weekly Newspaper of the Period (This was a pro-south London Paper.)**

In the winter of 1862 there was a so called "woolen famine". The Confederate troops had been in the field for over a year and had no winter woolen uniforms. The newspapers raised a hue and cry across the South.

**The government in Richmond was being lampooned for incompetence. The South had everything from the sheep to the woolen mills needed to make the uniforms but nothing was happening.**

**Southern legislators now began to take notice. Laws were now passed exempting some key industrial personnel from the draft and releasing some from front line duty but this action came coupled with price and profit controls. These controls were almost impossible to live with because Richmond, lacking the power to raise much money through taxation, decided to finance the war by borrowing (Confederate Bond Below.) and was allowing the printing of paper currency to monetize the debt.**



**Shortages caused by the blockade also affected prices. Shortages and the monetary inflation rate caused prices to double every six months resulting in a 400% yearly inflation. The newspapers and the public blamed the manufacturers for rising prices and accused them of turning into profiteering Yankees, damned extortionists and worse.**

**The 1862 woolen famine was solved when woolen manufacturers made a deal with the shepherds to take their wool on consignment. The finished cloth was sent to supply depots where cutters and seamstresses made woolen uniforms.**

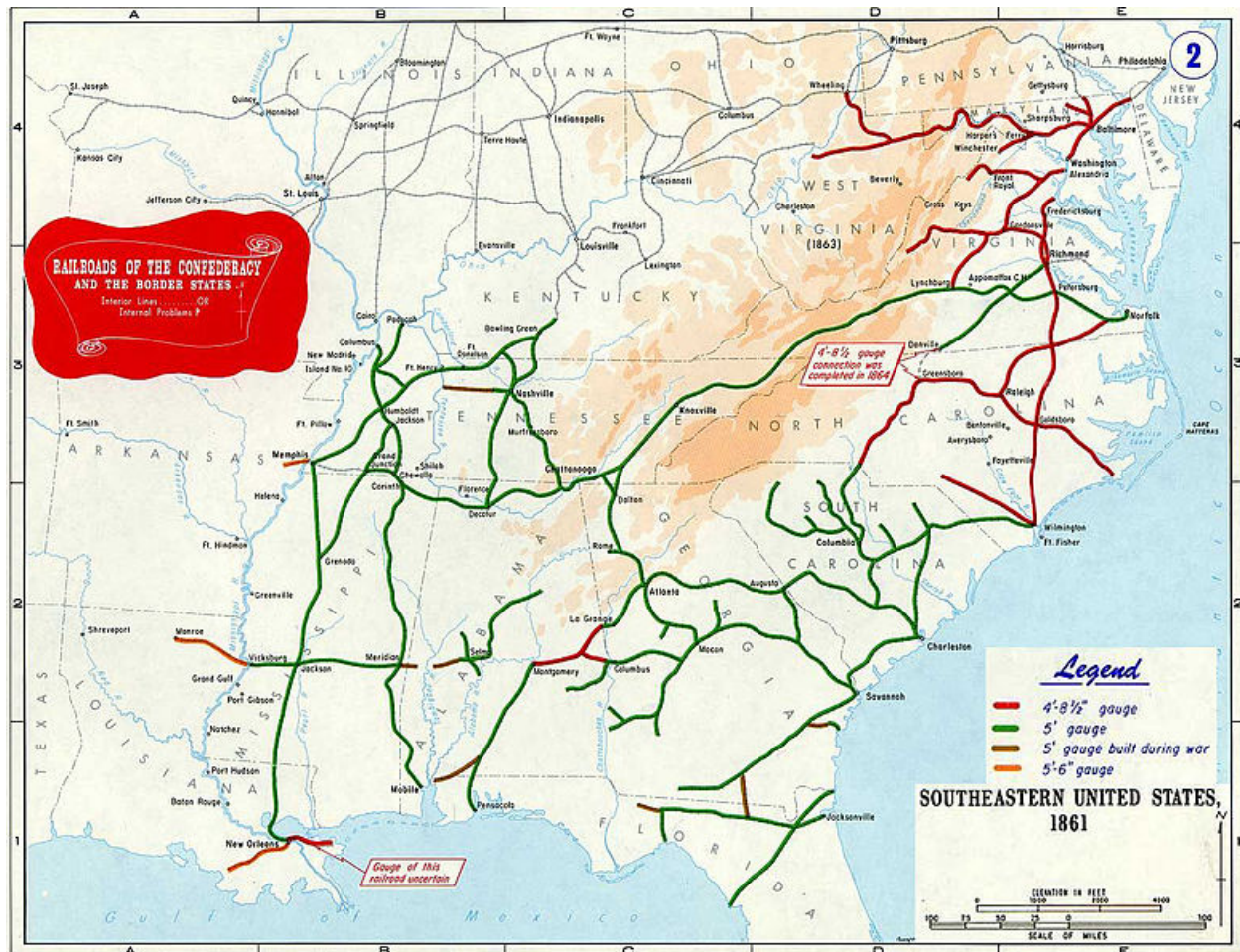
### **Woolen Mill in Charlottesville, Virginia**



### **Glendale Woolen and Cotton Mill in 1840 (Spartanburg, SC)**



## IV B b. Place Utility



**Railroads of the Confederacy**

**Don't be fooled by this map. This was not a network. These railroads were only rarely interconnected. For example: In 1860 railroads from six directions entered the Richmond/Petersburg area. All terminated there. If you wanted to continue your travel beyond the city you had to disembark from your arriving train and get transportation across town to board your departing train after examining schedules and buying tickets, etc. all over again. Goods and soldiers being transported faced the same tasks.**

**Notwithstanding the drawbacks just stated, the southern railroads in the WBTS were the primary movers of war materials and personnel. Thus, they were the primary creators of place utility. Speaking logistically a single 15 car train could deliver far more goods in far less time and with less cost than any other mode available. Southern Railroads had 9500 miles of track and**



**three gauge widths in 1861. The rails were 4'-8.5", 5'-0" and 5'-6" apart. Not only were the gauge widths different the rails themselves differed greatly in design; one set even looked like a hollow inverted "U" with flanges like the Greek letter omega. Older lines used flat iron bars on wooden sleepers for rails. No rail was larger than 60 pounds per yard. Modern "T" shaped rails weigh a standard 120 pounds per yard.**

**The quote below was taken from this source:**

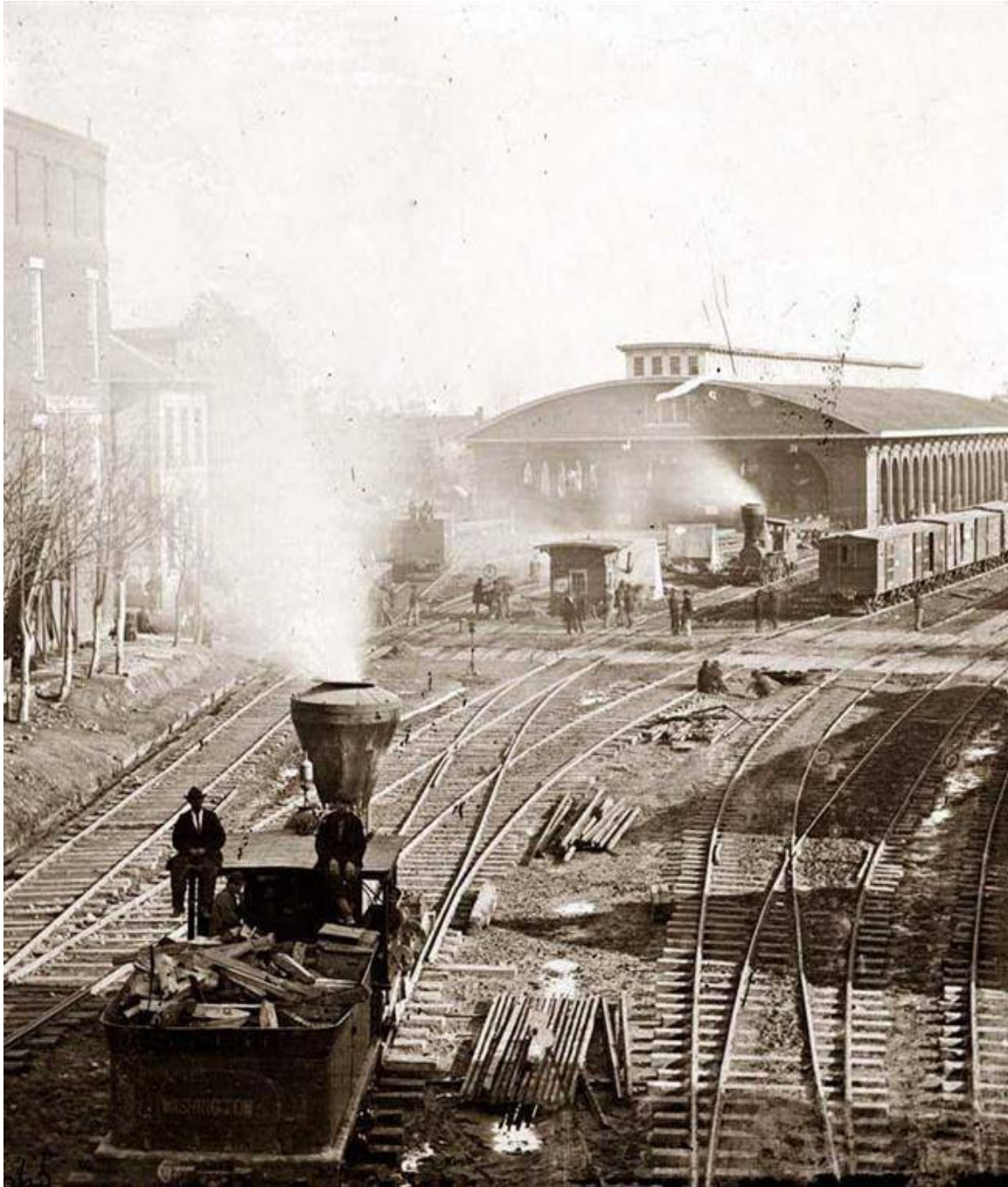
**Rails to Oblivion: The Battle of Confederate Railroads in the Civil War. Dr. Christopher R. Gabel, U. S. Army Command and General Staff College Press, 2002.**

**"Statistics show that the Confederacy possessed only one-third of the miles of track found in the United States at the time of secession\*, one-third of the freight cars, one-fifth of the locomotives, one-fifth of the railroad workers, one-eighth of rail production, one-tenth of the telegraph stations, and one-twenty-fourth of total American locomotive production. Did this disparity constitute a crippling disadvantage for the South? On the contrary-Southern railroads were in fact sufficient for the Confederacy to win the war..." (Dr. C. R. Gabel)**

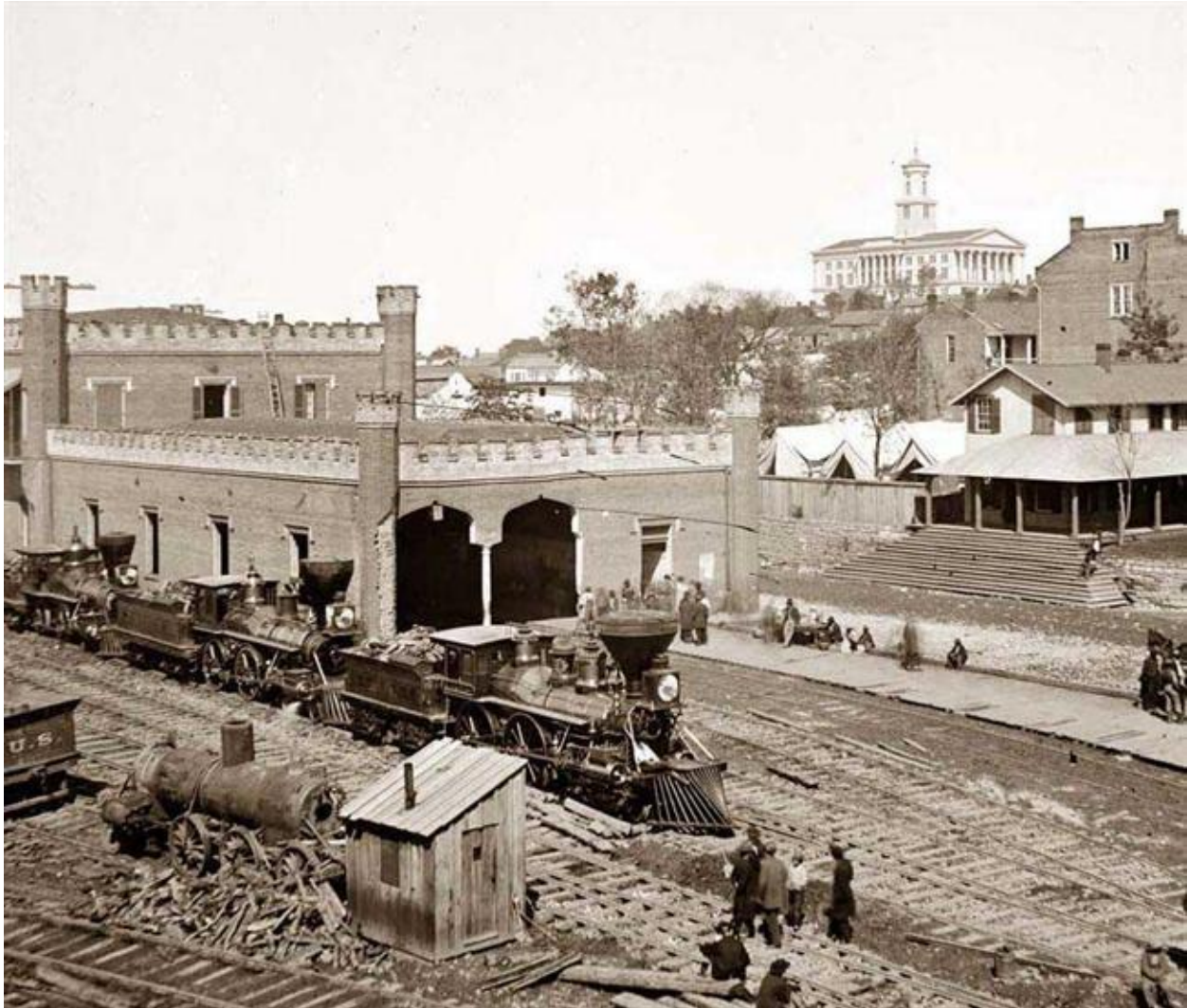


**WBTS-Typical Flatcar and "Housecar" (Boxcar)**

**\*The miles of track in The South were in proportion to the South's population; it only had 1/3 of the nation's people as well.**



**Atlanta's Railroad Yards in early 1864 – Still in Confederate Hands**



**Nashville Railroad Yard and Depot was in Yankee Hands in 1864. The locomotives shown here were the property of the U.S. Military Railroad and were dedicated to supplying the Union troops of Grant, Sherman, Rosecrans and Thomas. Union military trains had priority use of the railroads over all others. There was no Southern counterpart to supply Southern soldiers.**

**“Southern Railroads were suffering the same woes as industry.” (Wilson) The great rail centers of the south were Chattanooga, Atlanta and Richmond. Little track existed west of the Mississippi. Early in the war the Confederate Government acted as if railroads existed only to transport cotton to tidewater for export. Since the 100 railroad companies were privately owned domestic industries they neither received help from Richmond nor were they thought important enough to be regulated. By 1863 over 25% of the rolling stock needed repair. The crews that cut and stacked the wood that fueled**

**the locomotives, the roundhouse crews that repaired them and the track repair gangs had volunteered, left for the American West or had been conscripted. Engineers, firemen, brakemen and conductors had to stop every few miles and cut wood. Accidents were rife. The average speed of southern trains had dropped from over 25mph in 1861 to under 10mph by 1863. Track and bridges destroyed by Yankee raids had to be repaired by the railroad companies themselves until late 1863. Companies could only petition Richmond for reimbursement. By 1864 the railroads were incapable of hauling enough to supply the South's armies.**



**The steamboat fleet, that had been the South's prime mover of goods and people pre-war, was greatly bottled up by the Union's "Anaconda Policy"**



**which eventually closed the major rivers and southern ports, and like the railroads, the steamboat fleet was either destroyed or fell into disrepair.**



**A prewar steamboat.**

**A great number of the South's steamboats were lost when used as ironclads and cotton-clads (when iron was in short supply) for the purpose of defending the South's rivers as an improvised brown water navy.**

## **IVBc. Time Utility- The Confederate War Department**

**Over the period of the conflict Jefferson Davis had five Secretaries of War and six Quartermaster Generals. There was always turmoil in the upper executive branch. Davis, a former officer in the Mexican War, vehemently disagreed with and blamed his Military staff for all the South's supply shortcomings.**

**The Confederate War Department was the virtual dictator of everything associated with supplying southern troops. It had ten key personnel overseeing twelve Bureaus. It was the largest department in the government. Some key personnel included an adjutant and inspector general, one key person each for commissary, imports, ordnance, conscription, niter and mining, and the quartermaster general plus others.**



**The South's second appointed Quartermaster General, Brig. Gen. Alexander R. Lawton, (Above) in 1863 was allowed to take a survey of all southern war resources and began to organize what was at hand. The South was losing far more soldiers to disease and exposure than to war wounds. Even so, Southern supply efforts didn't get well organized until after the Battle of Gettysburg.**

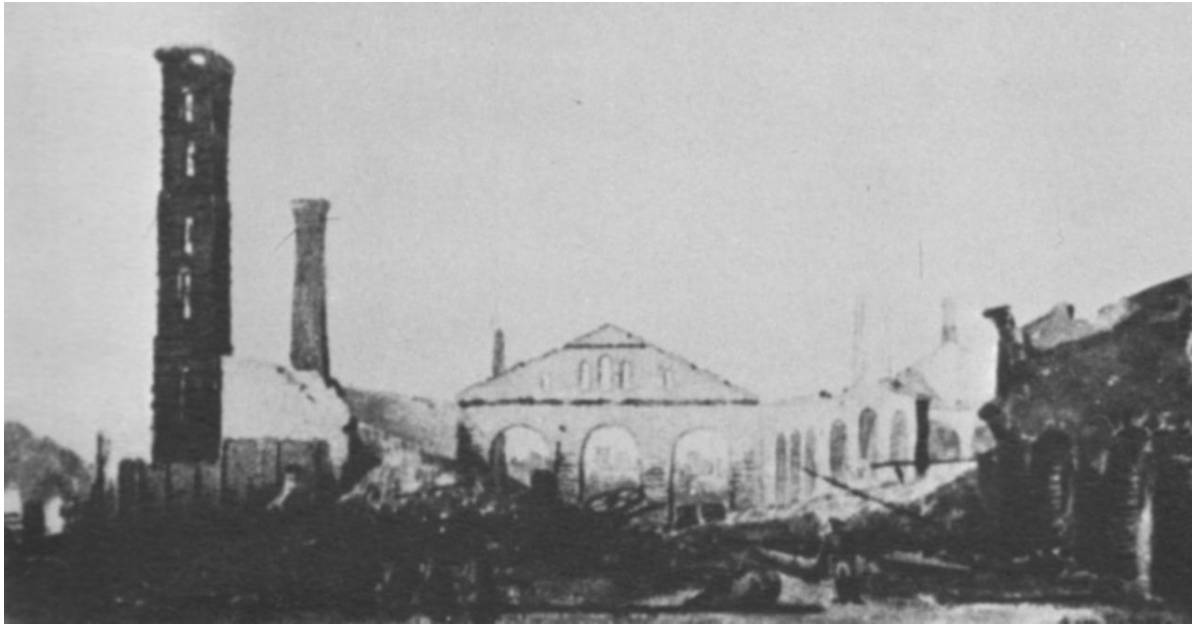


**Confederate Cavalry Soldier (From 4<sup>th</sup> Alabama Cavalry images)**

**The soldiers that fought for the South were largely state troop's not national troops. For example, the Fourth Alabama really was the Fourth Alabama. They had to requisition supplies and war materials through state channels to local quartermaster depots. These depots then attempted to purchase the items using a bid system if possible. Failing that, the depot had to somehow get the raw materials needed and fabricate finished goods on the spot. With the delay from requisition to completed finished war goods, and with the southern railroad transportation system suffering the same woes as southern industry, getting the finished goods to the fighting troops took great effort and weeks if not months. The bill for all this was then sent on to Richmond. And while this was happening, the Confederate Congress, which itself had to request funds from the "sovereign states", was forced to cut appropriations for the quartermaster corps (From 128 million to 29 million in 1862).**

**"Notwithstanding all this, the quartermaster corps' biggest failure was the complete lack of planning for, and the anticipation of, the needs of the fighting units." (Wilson) The system could only react to requests. The long requisition chain caused delays and many other problems. As states like Maryland, Missouri, Kentucky, and later Arkansas, and Tennessee fell under Union control those state troops were "orphans" who initially had to "beg" from other units for basic needs. By 1863 all requisitions were being processed through Richmond.**

## **V. The Destruction of Confederate Industry:**



**The burned Ruins of Selma Naval Foundry.**

**Note: Gen. Forrest with his African American Bodyguards, Ben McCullough's Missouri Regiment, Roddy's Alabama units and others including civilian "volunteers" (less than 4,000 men total) mounted a desperate defense of the arsenal. Union Gen. Wilson's cavalry with 9,000 men at the site destroyed Selma in four days along with 11 additional foundries and a powder works. (The Industry was never rebuilt.)**



**Only the Chimney of the Augusta Powder Works survives today**



**The brick in the ruins of Brierfield's Rolling mill (below) were used in reconstructing residences in Bibb County, Alabama. (Rebuild begins Nov., 1866)**



**What remains of one of Brierfield's original furnaces is preserved in a state park.**





**A Damaged Locomotive in Richmond. (1865)**



**Burned Roundhouse, Atlanta, December 1864. It was already under reconstruction by the U.S. Military Railroad using “Contraband” workers.**



**Ruins of Schofield's Rolling Mill and Hood's Rail Cars in Atlanta 1864-65**



**Schofield's Iron Works in Macon, Georgia Survived the War.**



**Knight Iron Furnace, the cotton mill and the old sugar mill foundry In Calhoun and Talladega Counties in Alabama are just ruins in the wilderness of Talladega National Forest today.**

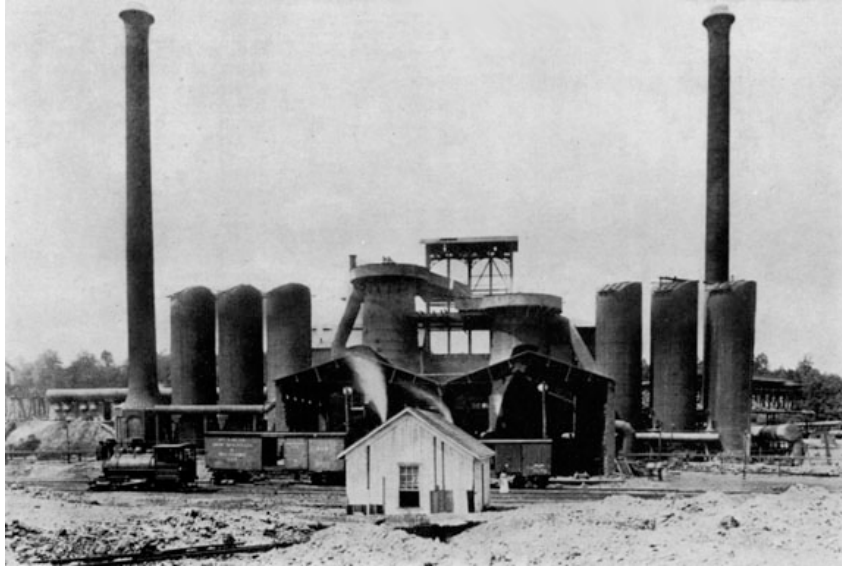


**Tredegar Iron Works was partially destroyed by Confederate arsonists in 1865.**

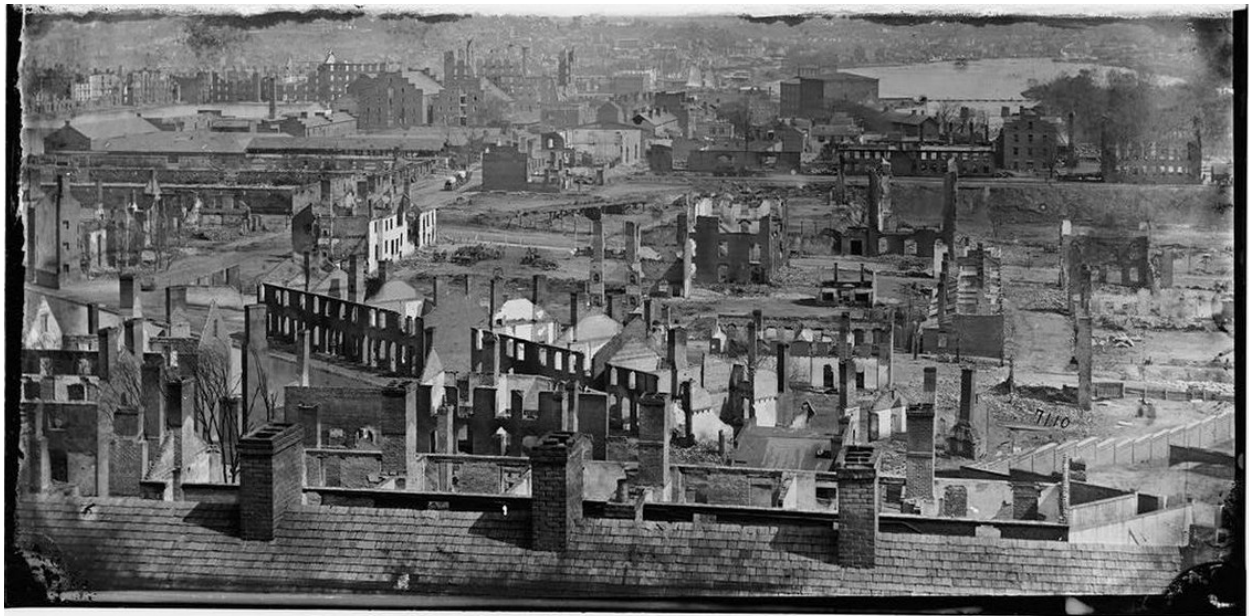




**Above: Part of the Ruins of the 5 Story New Manchester Textile Mill in Georgia (Destroyed by Sherman). What happened to the young girls who worked here was probably a war crime.**



**Oxmoor Furnaces were rebuilt as hot blast furnaces by Daniel Pratt.  
(Photo 1885)**



**Reconstruction Era 1865-1877**

## **VI. Afterthoughts and Acknowledgements**



**This report focused on physical industrial resources; the human cost of this war is beyond my ability to estimate.**

**Losing our War for Southern Independence not only brought an end to legal slavery and ruined the planter aristocracy. The North's application of the principles of total war also systematically destroyed almost the entire antebellum industrial renaissance that was in full swing before 1861. It also left the South's yeoman farmers in dire poverty with markets for their products partially taken over by foreign producers and the infrastructure needed to distribute the products destroyed.**

**Jefferson Davis was right when he said: "The South died of an idea." Unfortunately, the fatal idea was probably "states' rights".**

**Why were many of our Southern troops ragged, hungry and ill equipped?**

**There was certainly no lack of effort, courage or gallantry on the part of our troops. It was perhaps a combination of many, many things: In the war's beginning, disdain for and ignorance of what southern industry was available, ignoring the needs of railroads, failure to plan due to expectations of a short defensive war, depending on imports in spite of the blockade, a weak central government hampered by insistence on state's rights, (all these delayed getting industry organized until too late), Yankee destruction, a supply system that did not anticipate the needs of our troops and perhaps greatest of all just too little manpower for all the tasks at hand resulting in the drafting of key industrial and railroad personnel greatly aggravated by the emancipation of a huge part of the labor force.... ???**

## **VII. Personal thoughts and other Conclusions**

### **First- Comments by previous listeners:**

**Many listeners have hated my criticisms and said that I should be marveling at how an agrarian society was able to build the industrial resources it needed in short order and under extreme duress. Please read Appendix A, it supports that point of view.**

**Others, like John Harris, have remarked that the South would have perished in a year or so without the industry I documented.**

**Still others have said that the myth of a totally agrarian South was first used by those explaining why we lost and has been enlarged over the years.**

### **Second- My Conclusions, Musings and Opinions**

**The South really was crushed by the size of the North's industry and population but, we certainly were not all planter aristocrats any more than the Yankees were all "mudsill" immigrants.**

**Please forgive me for choosing to present facts and not legend as I was tempted to do. Wise persons say "Only print the legend when the facts don't agree with it".**

**Information I found while researching this report caused me to reexamine and then discard some cherished notions I held about the South's civilian leadership. In perspective, they were all too human.**

**I was also forced to vastly scale up my ideas about the size of our industrial base in our lost War for Independence. I am now pretty certain the following statement I read in a National Military Park brochure many years ago is untrue. Southern soldiers certainly were not "wearing homespun butternut gray because few factories existed in the South".**

**I had a great uncle who had a grain farm in Central Virginia. He was a kind, generous and hospitable man. He once remarked that "The Tredegar Iron Works in Richmond was the only factory in the south and tried to supply the whole Confederate Army singlehandedly." He was quoting bad and inflated information. Sadly he also remarked that, "The troops from Northern Virginia fought the whole war while others from "little bitty" places like Alabama "hope out some". I suspect this misinformation came from the same mold. He was a sadly misinformed man who was a victim of what I call "The Only**



**Virginia Syndrome”. Someone had to tell him these misrepresentations of the true facts.**

**Third- Harold S. Wilson, the author whose highly detailed and documented information I have freely used in this report continued his treatment of southern industry through reconstruction and up to WWI. If you grew in some southern industrial town his book could make interesting reading.**

**Fourth- I am grateful to Dr. Gabel for his detailed information on the railroads of the Confederacy.**

**Fifth- For what secession did to Northern Industry at the War’s beginning I suggest you read, “Northern Economic Annihilation- The true Cause of the War Between the States” by Gene Kizer, Jr.**

## **VIII. Questions/Comments, perhaps answers.**

## **IX. Some Selected Resources Used in this report:**

### **Some General Industrial References:**

**Confederate Industry: manufacturers and quartermasters in the Civil War, by Professor Harold S. Wilson of Mississippi State University, cc 1935, 2002.**

**Ruin Nation: Destruction and the American Civil War, by Megan Kate Nelson, cc 2012**

**Encyclopedia of Alabama – History – 1838 to 1874 – Civil War and Reconstruction – Many Articles concerning antebellum industry**

**New Georgia Encyclopedia – Civil War Industry and Manufacturing**

**Historic Context Evaluation for Mills in Tennessee, page 127, (for TN DOT 2002), J.N. Lovett, PhD, Museum Director**

**North Carolina Business History- Textiles, etc.**

**The Ordnance of the Confederacy, Lt. Col Mallett CSA, and Capt. Hunt USA**

**Some Iron Industry References:**

**Alabama Ironworks Sourcebook**

**NCpedia, Iron and Steel Industry- Bigore Bank (North Carolina)**

**Early Ironworks in Northwestern South Carolina**

**Visits to the Iron and Steel Museum at Tannehill State Park.**

**“Geology and History of the Civil War Iron Industry in the New River – Cripple Creek District of Southwestern Virginia”, Virginia Minerals, Vol. 44, No. 4, 1998**

**The Antebellum Iron Industry in Northern Georgia: Etowah and Alatoona**

**The Tennessee Encyclopedia of History and Culture – Iron Industry**

**Some Railroad References**

**Railroads of the Confederacy, Civil War Trust**

**Rails to Oblivion: The battle of Confederate Railroads in the Civil War, Dr. Christopher R. Gabel, U. S. Army Command and General Staff College Press, 2002.**

**Rails to Oblivion: The Decline of Confederate Railroads in the Civil War, Dr. Christopher R. Gabel, U. S. Army Command and General Staff College Press, 2002.**

## **Appendix A**

**The Ordnance of the Confederacy**

**By**

J. W. MALLET, Lieutenant-Colonel, Confederate States Army,  
and Superintendent of the Ordnance Laboratories of the Confederate States  
and  
O. E. Hunt, Captain, United States Army

At the beginning of the Civil War the Confederate States had very few improved small arms, no powder-mills of any importance, very few modern cannon, and only the small arsenals that had been captured from the Federal Government. These were at Charleston, Augusta, Mount Vernon (Alabama), Baton Rouge, and Apalachicola. The machinery that was taken from Harper's Ferry Armory after its abandonment by the Federals was removed to Richmond, Virginia, and Fayetteville, North Carolina, where it was set up and operated. There were some State armories containing a few small arms and a few old pieces of heavy ordnance. There was scarcely any gunpowder except about sixty thousand pounds of old cannon-powder at Norfolk. There was almost an entire lack of other ordnance stores--no saddles and bridles, no artillery harness, no accouterments, and very few of the minor articles required for the equipment of an army. There was a considerable number of heavy sea-coast guns at the fortified seaports, and others were seized on board men-of-war at Norfolk and among the stores of the Norfolk Navy-Yard. The supply of field-pieces amounted to almost nothing. The States owned a few modern guns, but the most of those on hand were old iron guns, used in the war of 1812-15.

In the arsenals captured from the Federals, there were about one hundred and twenty thousand muskets of old types, and twelve thousand to fifteen thousand rifles. In addition to these, the States had a few muskets, bringing the total available supply of small arms for infantry up to about one hundred and fifty thousand. With this handicap, the States entered the greatest war in American history. President Jefferson Davis said that "it soon became evident to all that the South had gone to war without counting the cost."

At first, all the ordnance and ordnance supplies of the United States in the Southern arsenals and armories were claimed by the States in which they were found. This caused no little delay in the acquisition of necessary ordnance stores by the Confederate Government, due to the necessity for negotiating for their transfer. The first steps toward provision for ordnance needs were taken while the Government was still at Montgomery, Alabama. An Ordnance Department was organized. Colonel Josiah Gorgas, a graduate of the United States Military Academy in the class of 1841, was appointed chief of ordnance about the end of February, 1861. The department immediately sent out purchasing-officers. Of these, Commander Raphael Semmes (afterward Admiral Semmes) was sent to New York, where, for a few weeks, he was able to buy ordnance stores in considerable quantity and ship them to the South; and Colonel Caleb Huse was soon afterward sent to London to act as general purchasing-agent in England and on the European continent. He remained on this duty throughout the war, and did invaluable service to the Confederate cause.

The seat of the Confederate Government having been moved to Richmond, Colonel Gorgas there proceeded to organize the center of activity of the Ordnance Department. There were four main sources of supply: arms on hand at the beginning of the war, those captured from the United States, those manufactured in the Confederacy, and those imported from abroad. The principal dependence at first was necessarily on the importations.

An officer was detailed in special charge of the latter service, and agencies were established at Bermuda, Nassau, and at Havana. A number of swift steamers were bought, and, after the blockade was established, these did valiant service in blockade running. Wilmington and Charleston were the principal ports of entry from which cotton was shipped in exchange for the greatly needed ordnance supplies. This trade was so essential to the existence of the Confederate Government, before the domestic supply of ordnance became approximately adequate, that vigorous efforts were made by all concerned to keep the channel open.

The arms on hand at the beginning of the war came forward chiefly in the organizations of the men who first volunteered. These were equipped, as far as possible, by the States from which the regiments came. In response to a call for private arms, many thousand shotguns and old sporting-rifles were turned in, and served, to some extent, to satisfy the impatience of men eager to take the field until better provision could be made for them, or they provided for themselves on some of the battlefields in the early part of the war.

Of those captured from the United States, the number obtained from arsenals and armories at the opening of the conflict has been noted, and, in addition to these, there were the quantities being constantly turned in from numerous actions in the field. In the summer of 1862, after the Seven Days' Battles around Richmond and the second battle of Manassas, men were detailed to collect arms from the field and turn them in. Thereby, several thousand Springfield rifles were added to the small supply. When General Jackson captured Harper's Ferry, in 1862, the arms of the defending force there were also added. Such increments greatly augmented the number that could be collected from other sources.

The stringency of the blockade rendered it imperative that every effort be made to increase the domestic manufacture of all kinds of ordnance and ordnance stores. In arranging for the manufacture of arms and munitions at home, establishments of two different kinds were placed in operation: those which were intended to be permanent, built and equipped for their special purpose and intended to concentrate work on a large scale, and those of a more temporary character, capable of yielding results in the shortest time, and intended to meet the immediate demands of the war, with such resources as the country then afforded.

The first of the permanent works undertaken was a first-class powder-mill, the erection and equipment of which were placed in charge of Colonel George W. Rains, of North Carolina, a graduate of the United States Military Academy in the class of 1842. The mill was placed at Augusta, Georgia, and its construction was commenced in September, 1861. The plant was ready to begin making powder in April, 1862, and continued in successful operation until the end of the war, furnishing all the gunpowder needed, and of the finest quality. Competent critics say of this mill, that, notwithstanding the difficulties in the way of its erection and maintenance, it was, for its time, one of the most efficient powder-mills in the world.

Another permanent work erected was a central ordnance laboratory for the production of artillery and small-arms ammunition and miscellaneous articles of ordnance stores. This was decided on in September, 1861, placed in charge of Lieutenant-Colonel J. W. Mallet, and located at Macon, Georgia. It was designed to be an elaborate establishment, especially for the fabrication of percussion-caps, friction-primers, and pressed bullets, in addition to heavier ordnance supplies. Special machinery was made in England and shipped, but did not reach its destination in time for use. A large instalment including a most powerful pair of engines, had reached Bermuda when blockade running practically came to an end, near the close of the war.

The third establishment projected to be permanent was a large central armory, equipped with a complete plant of machinery for the fabrication of small arms, and to which the Harper's Ferry machinery, which had been temporarily installed at Richmond and Fayetteville, was to be removed. This was put in charge of Lieutenant-Colonel J. H. Burton, who had gained experience at the factory in Enfield, England. It was determined to locate this armory at Macon, also. The buildings were begun in 1863, but they were not so far advanced toward completion as the laboratory when the end of the war arrested the work.

As a consequence of the necessity for immediate supply of arms and munitions to enable the armies to keep the field, resort was had to temporary arsenals and armories—at least they were designated as "temporary," although they were actually permanent, as far as the purposes of the war which the Confederacy waged was concerned.

The work was scattered among a number of available places throughout the South. Herein entered the problem of transportation by rail. The railroads were not very amply equipped at the outbreak of the war, and were overburdened in operation to such an extent that it would have been impossible to transport material to any single point from great distances, or to secure similar transportation for finished products over long lines. It was, moreover, uncertain how far any one place could be depended upon as secure from molestation by the foe. And there was not time for the removal of the plants from the localities in which they were when the Confederacy took possession of them, and various temporary ordnance works grew up about existing foundries, machine-shops, and railroad repair-shops, and at the various United States arsenals and ordnance depots. The chief localities that were thus utilized were Richmond, Virginia; Fayetteville, North Carolina; Charleston, South Carolina; Augusta, Savannah, and Macon, Georgia; Nashville and Memphis, Tennessee; and Montgomery, Alabama; New Orleans and Baton Rouge, Louisiana; Little Rock, Arkansas, and San Antonio, Texas. The events of the war soon compelled the abandonment of some of these, and from time to time others were added to the list, as, for instance, Columbia, South Carolina; Atlanta and Columbus, Georgia; Selma, Alabama, and Jackson, Mississippi.



Of these, Atlanta and Selma became most important.

Heavy artillery at the beginning of the war was manufactured only at Richmond at the Tredegar Iron Works. Later in the war, excellent heavy artillery was produced at Selma, first in conjunction with the naval officers, and later by them alone.

Field-artillery was made and repaired chiefly at Richmond and at Augusta, small arms at Richmond and Fayetteville, caps and friction-primers at Richmond and Atlanta, accouterments to a great extent at Macon, while cast bullets and small-arms cartridges were prepared at almost all of the works.

After the Federals took possession of the copper mines of Tennessee, there was great anxiety as to the future supply of copper, both for bronze field-guns and for percussion-caps. The casting of bronze guns was immediately stopped, and all the available copper was utilized in the manufacture of caps. It soon became apparent that the supply would be exhausted and the armies rendered powerless unless other sources of supply were discovered. No reliance could be placed on the supply from abroad, for the blockade was stringent, although large orders had been forwarded. Of course, the knowledge of this scarcity of copper was kept from the public as much as possible. In this emergency, it was concluded to render available, if possible, some of the copper turpentine- and apple-brandy-stills which were in North and South Carolina in large numbers. This work was entrusted to Lieutenant-Colonel Leroy Broun, commanding the Richmond Arsenal.

In spite of the difficulties to be overcome and the constantly increasing pressure for immediate results, the Confederate Ordnance Department was able to boast of some useful new experiments and some improvements. One of the most notable of these was the method of steaming the mixed materials for gunpowder just before incorporation in the cylinder mills, which was invented and brought into use by Colonel Rains, and which very greatly increased the capacity of the mills for work, besides improving the quality of the powder. Other examples of improvements in materiel which were more or less notable were the casting of shells with polygonal cavities, introduced by Lieutenant-Colonel Mallet, securing the bursting into a determinate number of pieces, and devices for the ignition of time-fuses for the shells of rifled guns.

Smooth-bore muskets, of which some were in the possession of the Confederate troops, were not very accurate, and their range was insufficient. A plan was proposed at the Richmond Arsenal to overcome these difficulties. An invention had been devised for the shape and composition of the projectile, which undoubtedly would have overcome these defects in a measure, had it been practicable under the circumstances. It is interesting to note that this plan was devised in the early years of the war by the ordnance authorities, but later in the conflict was, in identically the same form, sent to President Davis from Canada as a scientific gift of great value, and by him turned over to the War Department. The idea was to use an elongated projectile made of lead and hard wood or papier-mache. In longitudinal section it appeared, in the lead part, shaped like the head of an Indian arrow, and the rear portion of the bullet was filled out with the wood or papier-mache. This threw the center of gravity well forward, causing the flight of the projectile to be like an arrow rotating on its longer axis.

From the Richmond Arsenal there were issued between July 1, 1861, and January 1, 1865, 341 Columbiads and siege-guns, 1306 field-pieces of all descriptions, 921,441 rounds of artillery ammunition of all classes, 323,231 infantry arms, 34,067 cavalry carbines, 6074 pistols, and nearly 72,500,000 rounds of small-arms ammunition, besides many thousand articles of other ordnance and ordnance stores. The enormous number of pieces of artillery issued were, of course, not all made at the arsenal, but had been obtained by manufacture, by purchase, or by capture. *The Richmond Enquirer, on the day after the evacuation of Richmond, said that, assuming the issues from the Richmond Arsenal to have been half of all the issues to Confederate troops, which was approximately true, and that 100,000 of the Federals had been killed, it would appear that about 150 pounds of lead and 350 pounds of iron were fired for every man killed, and, furthermore, assuming that the proportion of killed to wounded was about one to six, it would appear that one man was wounded for every 200 pounds fired.\** These figures exaggerated the form of the old belief that it took a man's weight in lead to kill him in battle.

Considering the general lack of previous experience in ordnance matters, the personnel of the corps, both at the arsenals and in the field, deserved, great praise for intelligence, zeal, and efficiency. Many names of officers deserve to be remembered. Among the most prominent were Lieutenant-Colonels J. H. Burton, superintendent of armories; T. L. Bayne, in charge of the bureau of foreign supplies; I. M. St. John, at the head of the niter and mining bureau; Lieutenant-Colonel J. W. Mallet, in charge of the Central

Laboratory at Macon, Georgia; Lieutenant-Colonel G. W. Rains, of the Augusta powder-mills and Arsenal; Lieutenant-Colonel Leroy Broun, commanding the Richmond Arsenal; Major M. H. Wright, of the Atlanta Arsenal; Lieutenant-Colonel R. M. Cuyler, of the Macon Arsenal; Major J. A. De Lagnel, of Fayetteville; Major J. T. Trezevant, of Charleston Arsenal; Lieutenant-Colonel J. L. White, of Selma Arsenal; Lieutenant-Colonel B. G. Baldwin, chief of ordnance, Army of Northern Virginia; Lieutenant-Colonel H. Oladowski, chief of ordnance, Army of Tennessee, and Major W. Alien, chief ordnance officer, Second Corps, Army of Northern Virginia.

Source: "The Photographic History of the Civil War, Volume III, Forts and Artillery"

100,000 dead times 150 pounds of lead per man is 15,000,000 pounds of lead or 7,500 tons and, 100,000 dead times 350 pounds of iron is 35,000,000 pounds of iron. 35,000,000 divided by 2,000 pounds per ton is 17,500 tons.