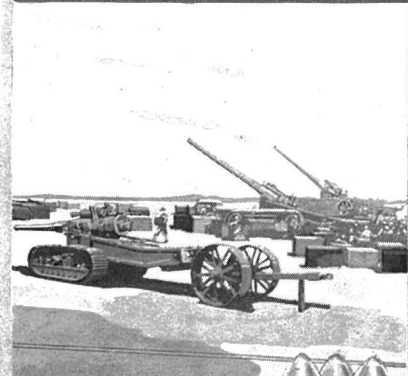
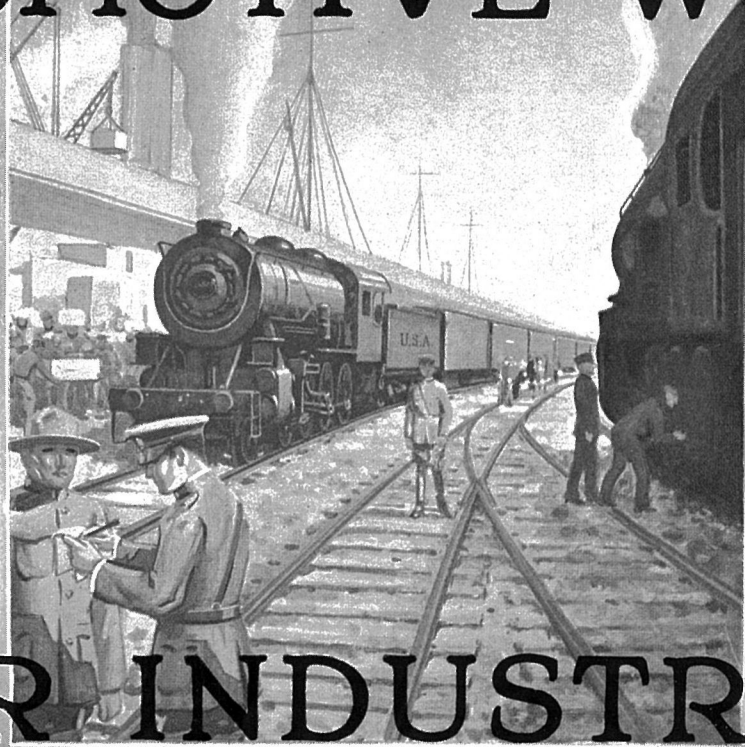
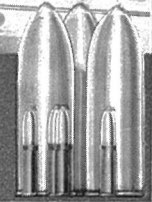


*L. Wiener*

# THE BALDWIN LOCOMOTIVE WORKS



# WAR INDUSTRIES



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RECORD NO. 93

101 L. Wiener

1926

THE BALDWIN LOCOMOTIVE WORKS  
PHILADELPHIA, PA., U.S.A.

War Industries

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1919

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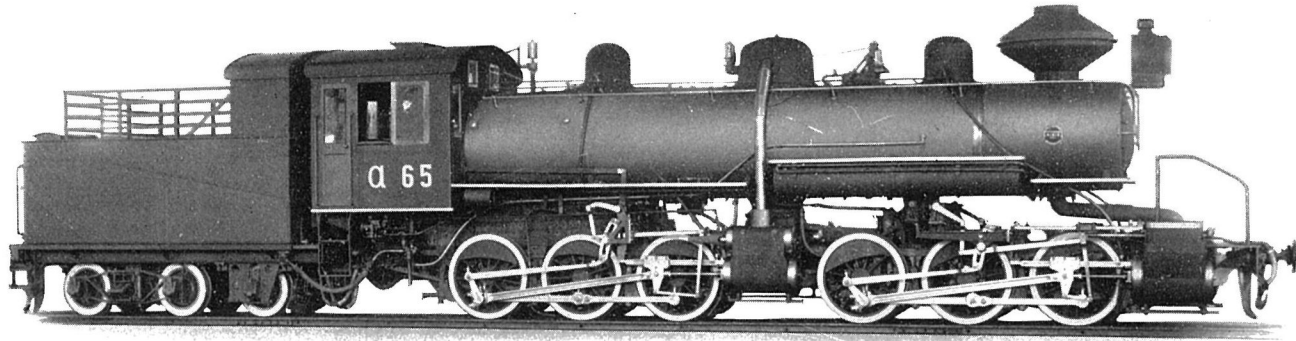
# War Activities of The Baldwin Locomotive Works

**A**FTER winning one of the greatest battles of the war, General Joffre is reported to have said:— “This is a railway war. The battle of the Marne was won by the railways of France.” And while this statement may, at first sight, appear to be extreme, it is literally true; for success or defeat, in a present day battle, depends chiefly upon the rapidity with which large masses of men can be moved and the guns served with ammunition; and this must be accomplished by the railways, aided by motor trucks. The amount of ammunition expended during a period of intensive fighting has been almost beyond comprehension. In the attack and defense of Verdun, for example, approximately 60,000,000 shells, representing 3,000,000 tons of steel, were expended in thirty weeks; and the railways moved the greater part of this material to the firing line.

When the conflict broke out in August, 1914, its significance was at once realized by The Baldwin Locomotive Works; and steps were immediately taken to place the manufacturing facilities of the Company at the disposal of the Allied Governments. This could readily be done, because domestic business was at a comparatively low ebb, and the Baldwin plants were working at but a fraction of their capacity.

The pressing needs for ordnance, ammunition and other supplies by France and Great Britain, in order to meet the superior preparations of Germany, were such that all efforts in these early days of the war were directed towards the development of armament and munitions. In Russia, however, greater distances and a desperate shortage of motive power and equipment necessitated the purchase of locomotives. Mr. S. M.

THE BALDWIN LOCOMOTIVE WORKS



**Mallet Articulated Compound Locomotive for the Vologda-Archangel Ry., Russia**  
Gauge, 3'-6"; Cylinders, 13" and 18" x 22"; Driving-wheels, diam., 44"; Weight, total Engine, 105,800 pounds

Vauclain, who was then Senior Vice President of The Baldwin Locomotive Works, visited Russia in the fall of 1914 and also early in 1915, and was instrumental in securing a large part of this business.

The first order for locomotives resulting from his visit was placed in November, 1914, and called for thirty Mallet locomotives of the 0-6-6-0 type as illustrated above. These were of a gauge of three feet, six inches, and were successfully and rapidly completed and shipped. They were used on the Vologda-Archangel Ry., connecting the broad-gauge railways of Russia with the port of

Archangel on the White Sea; the only water outlet in the West after the closing of the Black Sea. This order was followed by others, placed later by the Russian Government, and covering large numbers of heavy Decapod locomotives of a gauge of five feet, gasoline locomotives of a gauge of seventy-five centimetres (2' 5½"), gasoline trucks and gasoline tractors. The Decapod locomotives are illustrated on page 5 and the gasoline locomotives on page 6. As it was impossible, owing to the Bolshevik revolution, to deliver all of the Decapod locomotives to Russia, one hundred of them were purchased by the

THE BALDWIN LOCOMOTIVE WORKS



**Decapod Type Locomotive for the Russian State Rys.**

Gauge, 5'-0"; Cylinders, 25" x 28"; Driving-wheels, diam., 52"; Weight, total Engine, 200,000 pounds

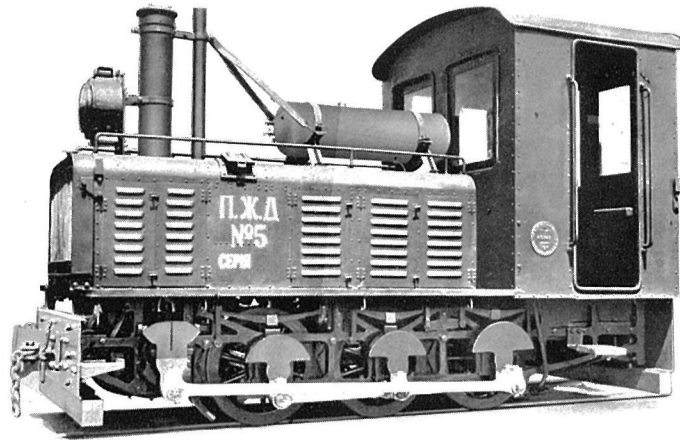
United States Government and were modified so that they could be used temporarily on the railways of the United States.

The gasoline locomotives, when properly handled, emit practically no smoke. For this reason they are well fitted for trench service, as they are less conspicuous, especially during the day-time, than steam locomotives.

The French Government, late in the summer of 1914, sent a mission to the United States to make certain purchases. Early in November, 1914, the mission re-

ceived cable instructions from France to purchase twenty tank locomotives of a gauge of sixty centimetres (1' 11 $\frac{3}{8}$ "'), which were to be built to American designs and shipped as promptly as possible. The Baldwin Locomotive Works took this order on November 3rd, and the twenty locomotives, boxed and ready for shipment overseas, left the Works on November 21st. One of these locomotives is illustrated on page 6. Following this came a number of important orders from the French Government for locomotives to be used in military

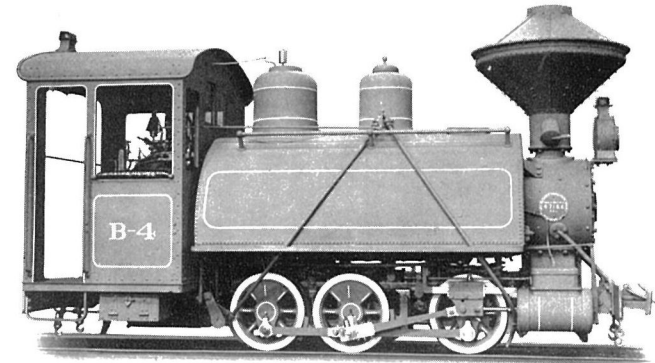
THE BALDWIN LOCOMOTIVE WORKS



**Gasoline Locomotive for the Russian Government**  
Gauge, 2'-5½"; Weight, 15,000 pounds

service. With the advent of trench warfare, during the winter of 1914-1915, it became necessary to develop a vast system of narrow-gauge railways on the West Front in order to handle troops and supplies. The French built these lines to a gauge of sixty centimetres (1' 11⅝") and this gauge was subsequently adopted by the British and American armies. The track was so built that it could be quickly laid or shifted to suit requirements. For

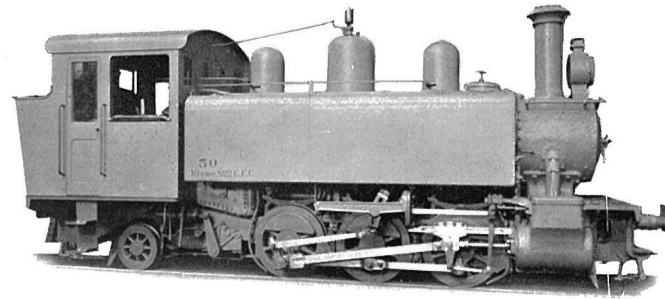
operation over these railways in the advanced areas, the French Government purchased, from The Baldwin Locomotive Works, 280 locomotives of a special type, known as the Pechot, which were of French design and were built to the metric system. These locomotives, as illustrated on page 7, are carried on two steam driven trucks or bogies, giving them unusual flexibility and excellent track riding qualities. Notwithstanding the complexity of the design, every requirement of the French Government as to delivery was promptly met.



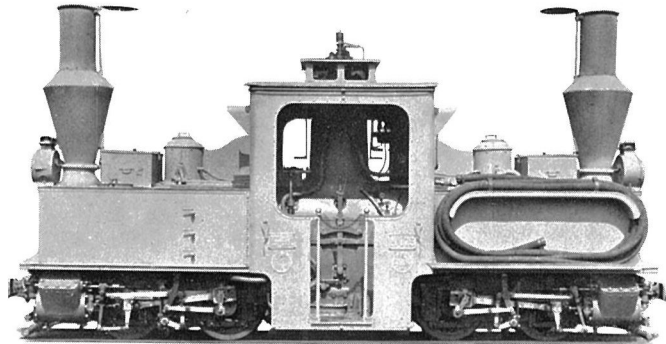
**Six-Coupled Tank Locomotive for the French Government**  
Gauge, 1'-11⅝"; Cylinders, 9" x 12"; Driving-wheels, diam., 26"; Weight, total, 29,000 pounds

THE BALDWIN LOCOMOTIVE WORKS

In addition to the locomotives just referred to, the French Government ordered a large number of gasoline locomotives from The Baldwin Locomotive Works, and also a number of fireless steam-storage locomotives, both of which are shown on page 8. In the latter type the boiler is replaced by a cylindrical reservoir, which is charged with hot water and steam at high pressure from a stationary plant. The pressure of the steam is reduced before it is used in the cylinders; and as the steam is drawn off, the water in the reservoir grad-



**Six-Coupled Tank Locomotive for the French Government**  
Gauge, 3'-3 $\frac{3}{8}$ "; Cylinders, 13" x 16"; Driving-wheels, diam., 34"; Weight, total, 55,500 pounds



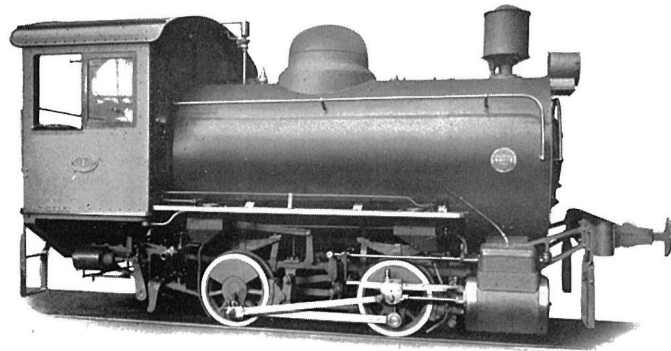
**Pechot Type Locomotive for the French Government**  
Gauge, 1'-11 $\frac{5}{8}$ "; Cylinders, 6.89" x 9.45"; Driving-wheels, diam., 25.59"  
Weight, total, 28,200 pounds

ually evaporates, until the storage pressure is lowered to a point where recharging becomes necessary. Locomotives of this type are specially fitted for work about explosive plants, or in other localities where fire risks must be absolutely eliminated.

In addition to the locomotives for the French Government, The Baldwin Locomotive Works built a large number of heavy freight locomotives of the Mikado (2-8-2) type for the Paris, Lyons & Mediterranean Railway and the Nord Railway. These locomotives have balanced compound cylinders; they were designed in accordance with French practice, and were built throughout to the



THE BALDWIN LOCOMOTIVE WORKS



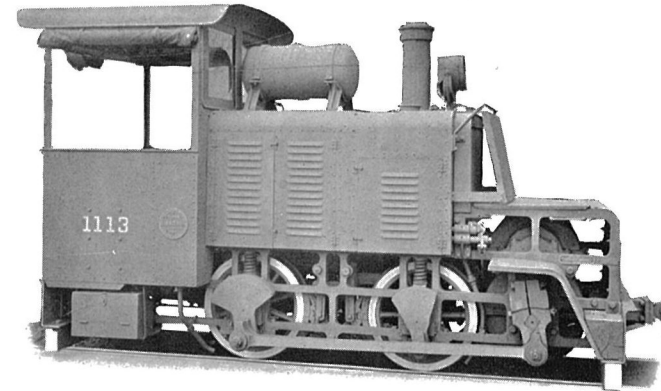
**Four-Coupled Fireless Locomotive for the French Government**  
Gauge, 4'-8½"; Cylinders, 15" x 16"; Driving-wheels, diam., 30"; Weight,  
total, 42,750 pounds

metric system of measurement. One of them is illustrated on page 9.

At the outbreak of the war the British Government, in addition to using French equipment, ferried across the Channel several hundred locomotives taken from service on the British railways. As the operations of the British armies in France increased, however, Great Britain became a heavy purchaser of locomotives in the United States, the great majority of the orders being placed with The Baldwin Locomotive Works. The total number

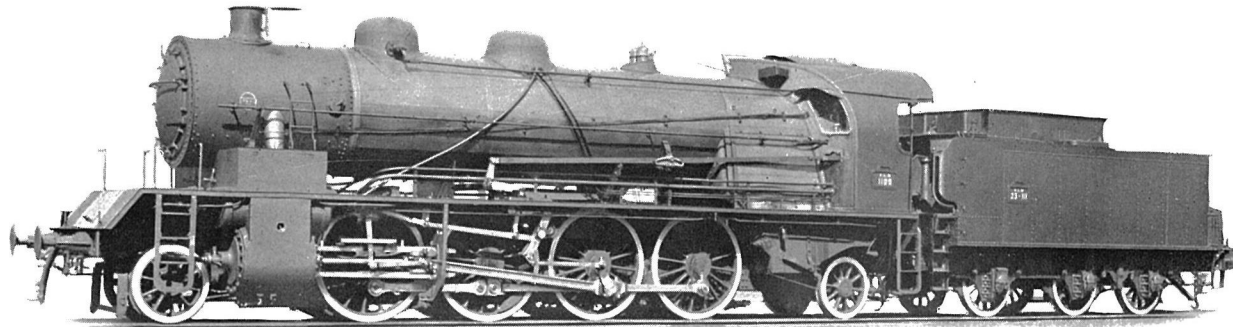
of locomotives thus ordered during the years 1915-1917 was 960. Of these, 495 were of a gauge of sixty centimetres (1' 11⅝"), all of them being of the 4-6-0 type as shown on page 16; while the remainder were of standard gauge, and represented several types.

Every effort was made during this period, to meet the war demands of the Allied Nations, and their orders were given preference. Many serious difficulties had to be overcome in order to complete these orders promptly,



**Gasoline Locomotive for the French Government**  
Gauge, 1'-11⅝"; Weight, 15,000 pounds

THE BALDWIN LOCOMOTIVE WORKS



**Mikado Type Locomotive for the Paris, Lyons and Mediterranean Ry.**

Gauge, 4'-9"; Cylinders, 20.08" x 25.59" and 28.35" x 27.56"; Driving-wheels, diam., 65.36"; Weight, total Engine, 194,900 pounds

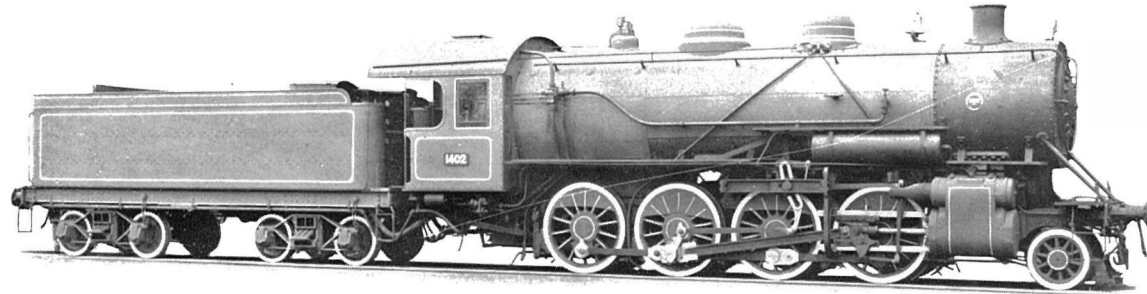
but the requirements were successfully met. One of the Baldwin officials had the satisfaction, while in London, of being told by Sir Guy Granet, then in control of railways for the War Department of Great Britain, that if it had not been for the prompt and efficient deliveries of Baldwin locomotives, some of the accomplishments of the British Army would not have been possible.

During this period the Baldwin products, which were being supplied to the Allied Governments, were not confined to locomotives, as orders were taken for the machining of a large number of shells, varying in calibre

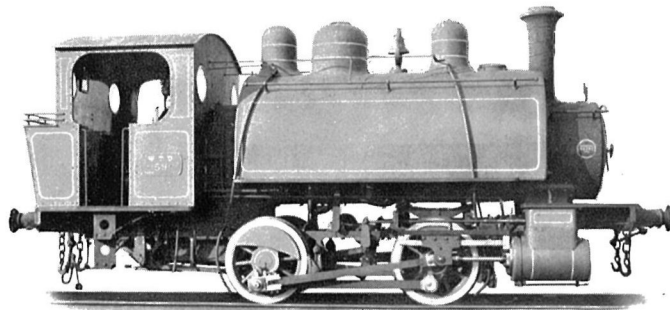
from four and seven-tenths inches to twelve inches. These shells were furnished to the British and French Governments. They were manufactured in such of the locomotive shops as were available for the purpose, and also in new shops, specially built and equipped for this kind of work.

In connection with the manufacture of shells, mention should be made of the construction, in 1915, of two large plants on the Eddystone property of The Baldwin Locomotive Works. One of these plants was leased to the Remington Arms Company of Delaware, afterwards acquired by the Midvale Steel and Ordnance Company

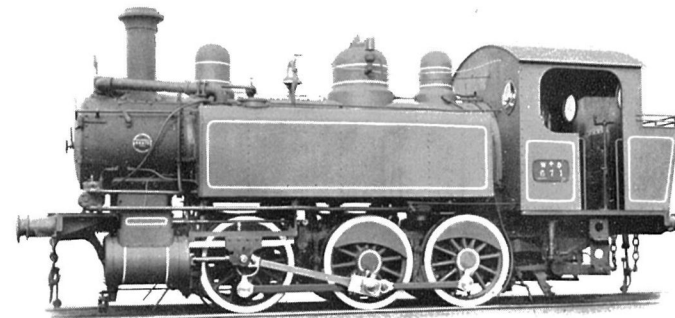
THE BALDWIN LOCOMOTIVE WORKS



**Consolidation Type Locomotive for the British Government**  
Gauge, 4'-8½"; Cylinders, 21" x 28"; Driving-wheels, diam., 56"; Weight, total Engine, 162,510 pounds

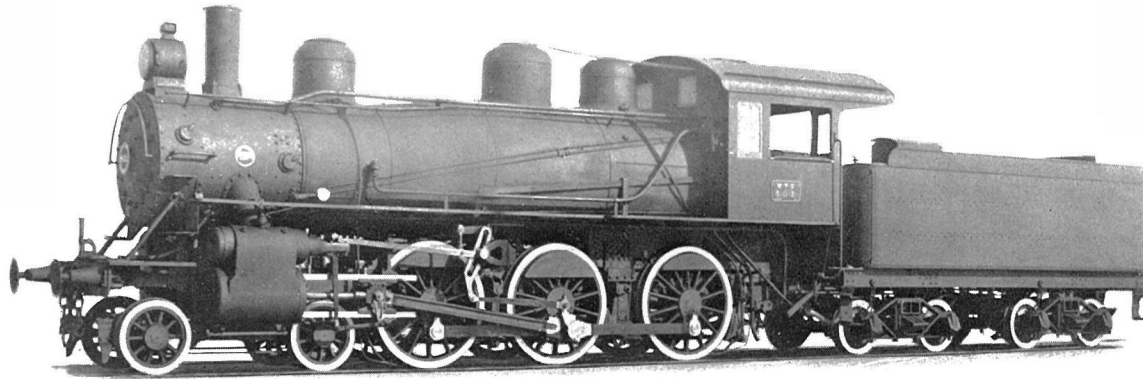


**Four-Coupled Tank Locomotive for the British Government**  
Gauge, 4'-8½"; Cylinders, 14" x 22"; Driving-wheels, diam., 42"; Weight, total, 78,100 pounds



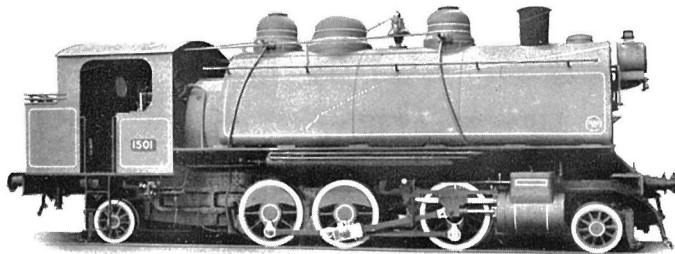
**Six-Coupled Tank Locomotive for the British Government**  
Gauge, 4'-8½"; Cylinders, 16" x 24"; Driving-wheels, diam., 48"; Weight, total, 102,800 pounds

THE BALDWIN LOCOMOTIVE WORKS



**Ten-Wheeled Locomotive for the British Government**

Gauge, 4'-8½" Cylinders, 19" x 26"; Driving-wheels, diam., 62"; Weight, total Engine, 141,200 pounds

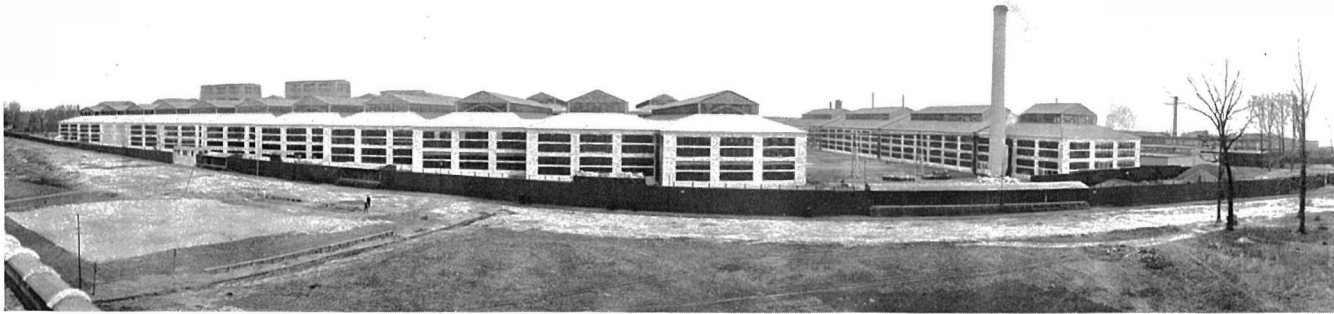


**Six-Coupled Double-Ender Tank Locomotive for the British Government**

Gauge, 4'-8½"; Cylinders, 17" x 24"; Driving-wheels, diam., 44"; Weight, total, 150,900 pounds

(Eddystone Rifle Plant), and was first used for the production of Enfield rifles, model of 1914, for the British Government. Subsequently, the plant manufactured rifles for the United States Government, .300-calibre, U. S. model 1917. The capacity finally reached more than 6000 rifles per day, and the plant supplied nearly two-thirds of all the rifles used in combat by the American Army in France. This was a notable achievement; and the capacity of the Eddystone Plant, at the termination of hostilities, exceeded that of any other rifle plant then in operation.

THE BALDWIN LOCOMOTIVE WORKS

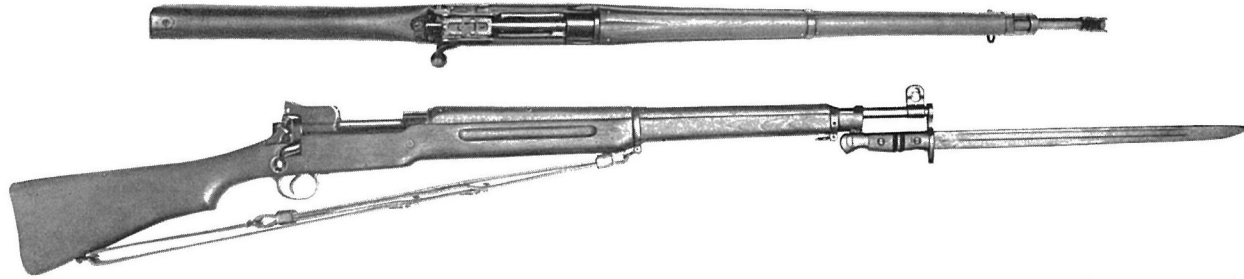


Eddystone Rifle Plant, Midvale Steel and Ordnance Co.



Plant of Eddystone Munitions Co.

THE BALDWIN LOCOMOTIVE WORKS



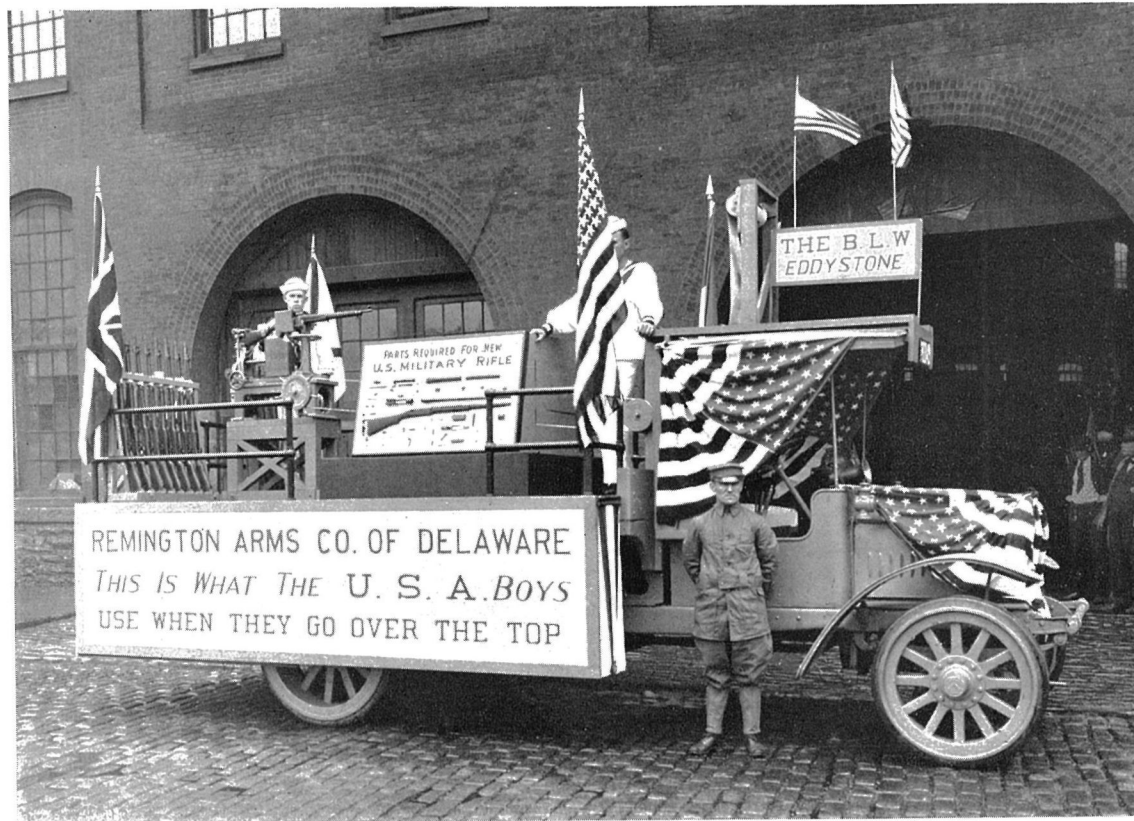
**United States Military Rifle, .300-Calibre, U. S. Model 1917**  
Manufactured by Midvale Steel and Ordnance Co., Eddystone Rifle Plant

The second plant referred to was erected as a result of the receipt of large orders for complete ammunition from the British Government. This ammunition was manufactured by the Eddystone Ammunition Corporation, a Company organized for the purpose by Mr. S. M. Vauclain, and owing its existence to his energy and directive ability. The operations of this Company were satisfactorily terminated in 1917. The United States Government requested, at this time, that the equipment and machinery of the Company be kept fully employed in its service. A new corporation was accordingly organized under the title of Eddystone Munitions Company, and to it was leased the property formerly occupied by the Eddystone Ammunition Corporation. The new Company

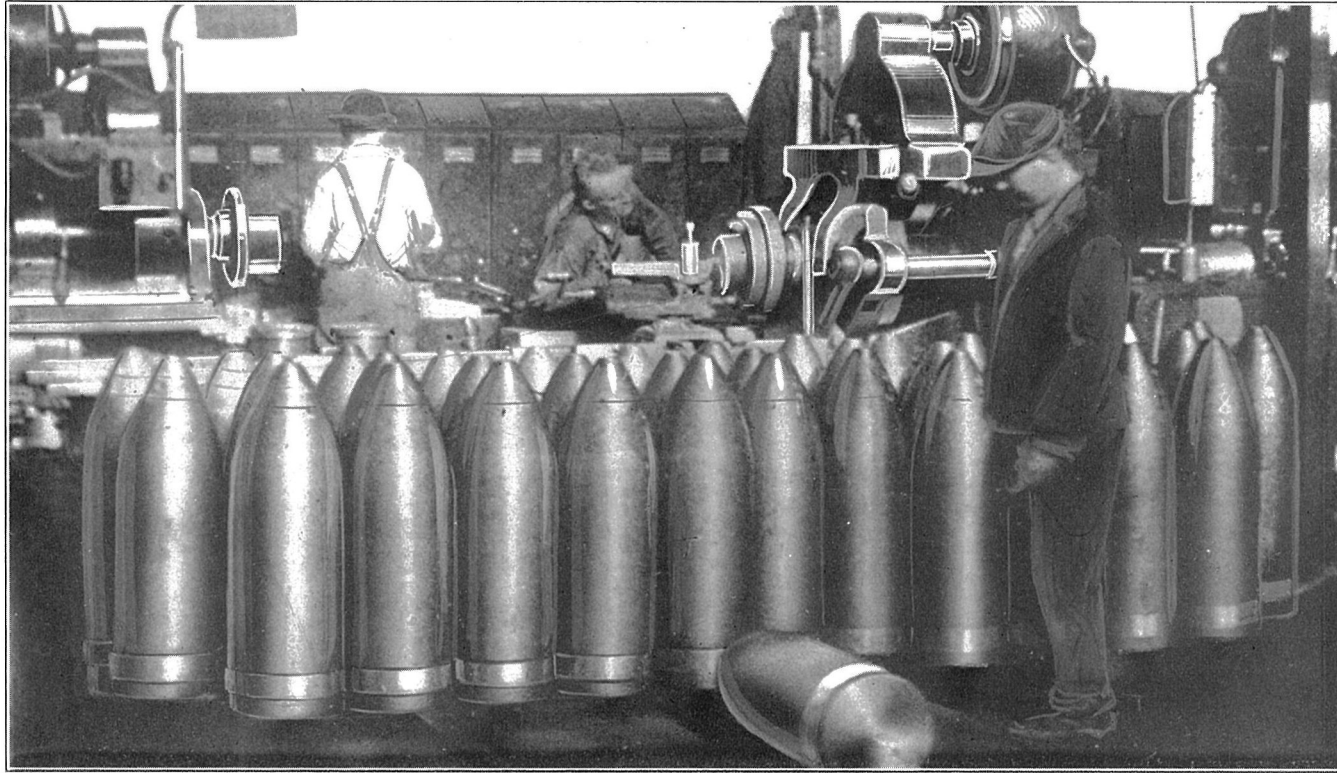
manufactured large quantities of ammunition for the United States Government and continued in operation until after the signing of the armistice. Its entire capital stock was owned by The Baldwin Locomotive Works.

The plants leased to the Midvale Steel and Ordnance Company and the Eddystone Munitions Company were so designed that the buildings could, at the expiration of the leases, be utilized as locomotive shops. The construction of these plants, and the results achieved through their operation, constitute one of the great industrial achievements of the war.

After the United States entered the war in April, 1917, all industries manufacturing war supplies received a great stimulus. A large organization of railroad men,



**Rifle Float in Draft Parade**  
Philadelphia, September 1, 1917

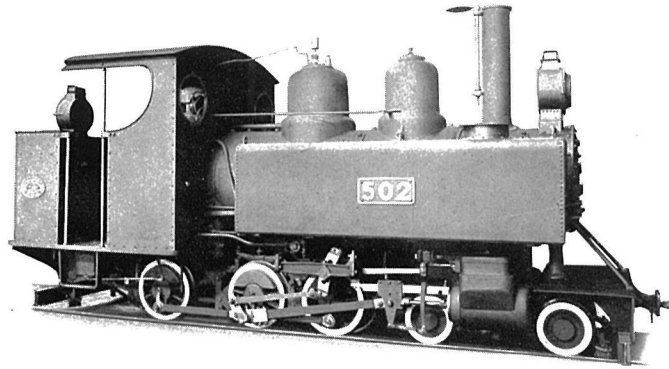


Twelve-Inch Shells Ready for Shipment

(15)



THE BALDWIN LOCOMOTIVE WORKS



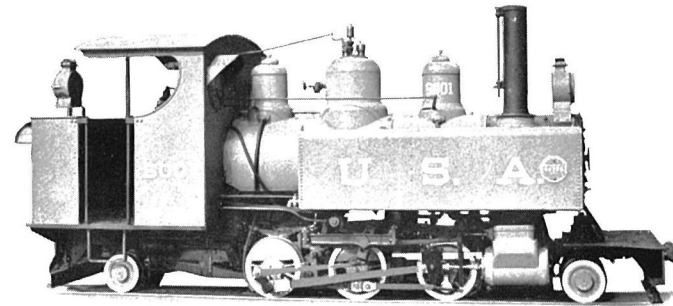
**Ten-Wheeled Six-Coupled Tank Locomotive for the British Government**  
Gauge, 1'-11 $\frac{5}{8}$ "; Cylinders, 9" x 12"; Driving-wheels, diam., 23 $\frac{1}{2}$ "; Weight, total, 32,500 pounds

including executive officers, was dispatched to France, and there played an important part in the final success, not only of General Pershing's army, but also of the armies of our Allies.

From the summer of 1917 until the termination of hostilities, the Government entrusted The Baldwin Locomotive Works with what were probably the largest and most urgent locomotive orders ever placed in the history of locomotive building. The first of these orders was received on July 17th, and called for 150 standard

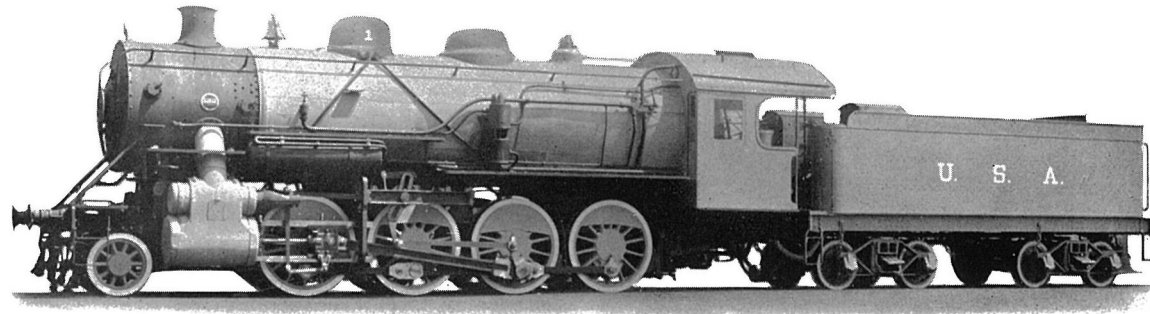
gauge locomotives of the Consolidation (2-8-0) type. A remarkable record was made in shipping these locomotives, as the first one, illustrated on page 17, was completed on August 10th and the last on October 1st. Subsequent orders included large numbers of similar locomotives, which became popularly known as "Pershing engines." A number of these were transferred, while under construction, to the French Government.

Through the energy and initiative of Mr. S. M. Felton, Director-General of Military Railways, and his Mechanical Aide, Colonel Milliken, an interesting method



**Six-Coupled Double-Ender Tank Locomotive for the United States Government**  
Gauge, 1'-11 $\frac{5}{8}$ "; Cylinders, 9" x 12"; Driving-wheels, diam., 23 $\frac{1}{2}$ "; Weight, total, 33,700 pounds

THE BALDWIN LOCOMOTIVE WORKS



**Consolidation Type Locomotive for the United States Government. The First "Pershing Locomotive" Built**  
Gauge, 4'-8½"; Cylinders, 21" x 28"; Driving-wheels, diam., 56"; Weight, total Engine, 166,400 pounds

was developed of shipping the Pershing locomotives to France, erected complete with the exception of the smoke-stack, cab and a few other details. The locomotives and tenders were placed in the holds of the vessels on their own wheels, and when unloaded at St. Nazaire, France, were prepared for service with but little delay. This was a matter of importance, especially during the last few months of the war; because as the Allied armies advanced and the Germans receded, the transportation requirements of the former naturally increased, and the need for additional locomotives became more and more

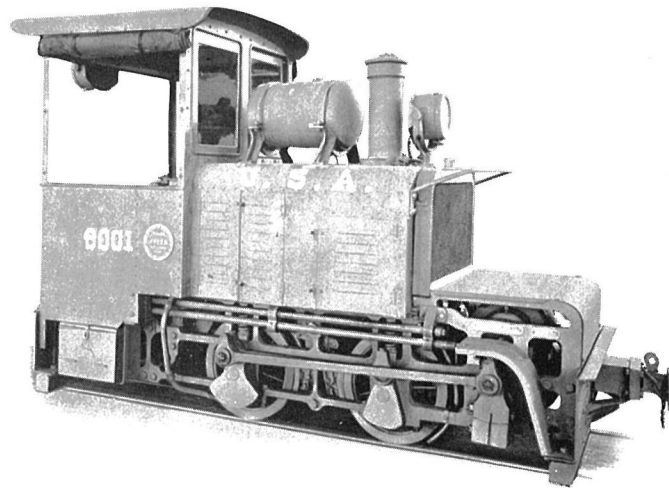
urgent. Had it become necessary to carry active military operations far into Germany, the need of additional locomotives and railway equipment would have become still more pressing. At the conclusion of hostilities, the building program of The Baldwin Locomotive Works called for the completion of 300 Pershing engines per month; and in consideration of the difficulties in obtaining materials promptly, and in securing an adequate supply of labor, the record made in the construction and delivery of these locomotives was unprecedented.

In addition to the Pershing engines, orders from the

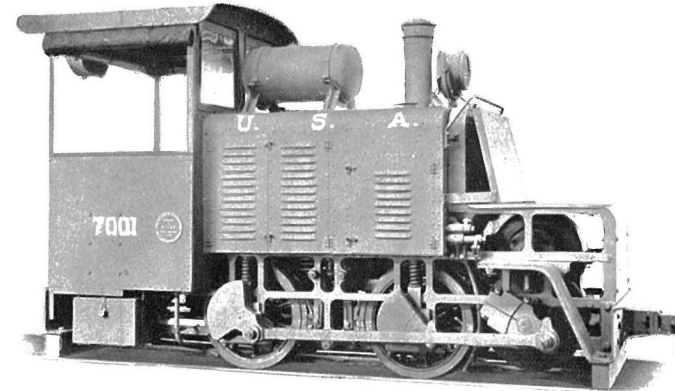
THE BALDWIN LOCOMOTIVE WORKS

Government included narrow-gauge steam locomotives of the 2-6-2 type, and three sizes of gasoline locomotives, the largest of standard, and the other two of narrow gauge. These locomotives are illustrated on this page, and on pages 16 and 19.

Among the most interesting products of The Baldwin Locomotive Works since the entry of the United States



**Gasoline Locomotive for the United States Government**  
Gauge, 1'-11 $\frac{3}{8}$ " ; Weight, 10,000 pounds



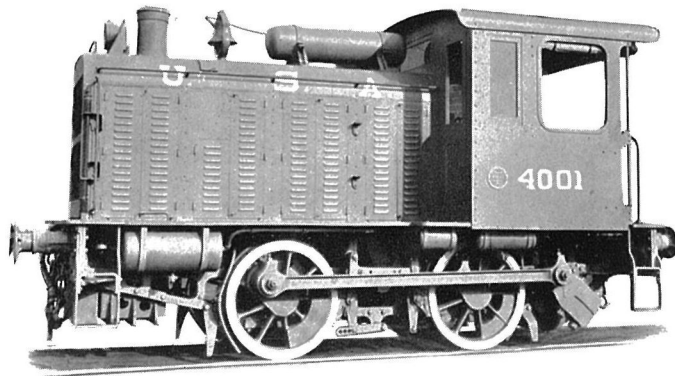
**Gasoline Locomotive for the United States Government**  
Gauge, 1'-11 $\frac{3}{8}$ " ; Weight, 15,000 pounds

into the war, have been the railway gun mounts for the United States Navy. These mounts were built to carry fourteen-inch rifles, fifty calibres in length, which had been furnished by the Navy. The complete designs of the mount were prepared at the United States Naval Gun Factory, Washington Navy Yard. The mounts were erected, and the guns assembled with them, at the Eddy-stone plant of The Baldwin Locomotive Works. The first five mounts were ordered on February 18th, 1918; the first one was completed and shipped to Sandy Hook Proving

#### THE BALDWIN LOCOMOTIVE WORKS

Grounds on April 25th, and the last on May 23rd, 1918. These mounts were shipped to France by the Navy, and were effectively used in action against the German lines of communication for several weeks prior to the signing of the armistice. One of them is illustrated on page 20.

When firing at low angles, the entire weight of the gun is carried by the trucks; but when firing at angles of from fifteen to forty-five degrees, a structural steel foundation, surrounding a pit, is necessary for the purpose



**Gasoline Locomotive for the United States Government**  
Gauge, 4'-8½"; Weight, 50,000 pounds

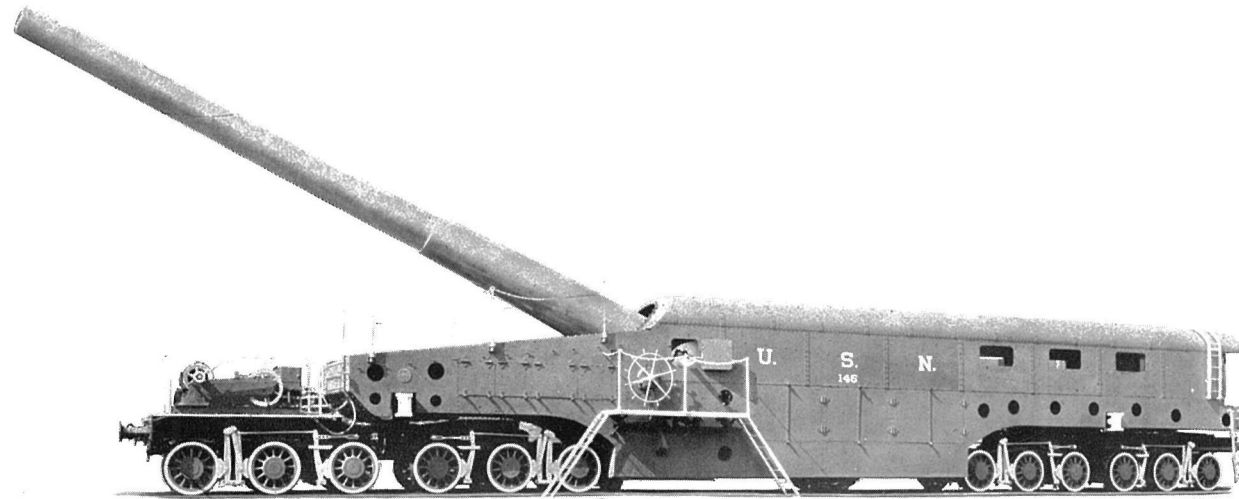
of absorbing a portion of the shock and also providing room for the recoil of the gun. The weight of the gun is transferred to the foundation by means of jacks. These foundations were also supplied by The Baldwin Locomotive Works.

An improved type of mount for fourteen-inch guns was built subsequent to those just described. In this type no separate foundation is necessary, as the gun can be fired at angles up to forty-three degrees without relieving the supporting trucks of its weight.

The Baldwin Locomotive Works has also been engaged in the construction of seven-inch "caterpillar" mounts for the United States Navy. These mounts have broad caterpillar treads, similar to those used on tractors which are designed to operate over rough roads and soft soil. These mounts were designed at the United States Naval Gun Factory, and The Baldwin Locomotive Works contracted to furnish them complete, with the exception of the gun and breech mechanism, which were supplied by the Gun Factory.

This mount, complete with gun, as shown on page 21, weighs about 72,000 pounds, and the bearing pressure under the treads is approximately ten pounds per square inch. The guns are transported in the field by means of Holt tractors of 120 horse-power.

THE BALDWIN LOCOMOTIVE WORKS



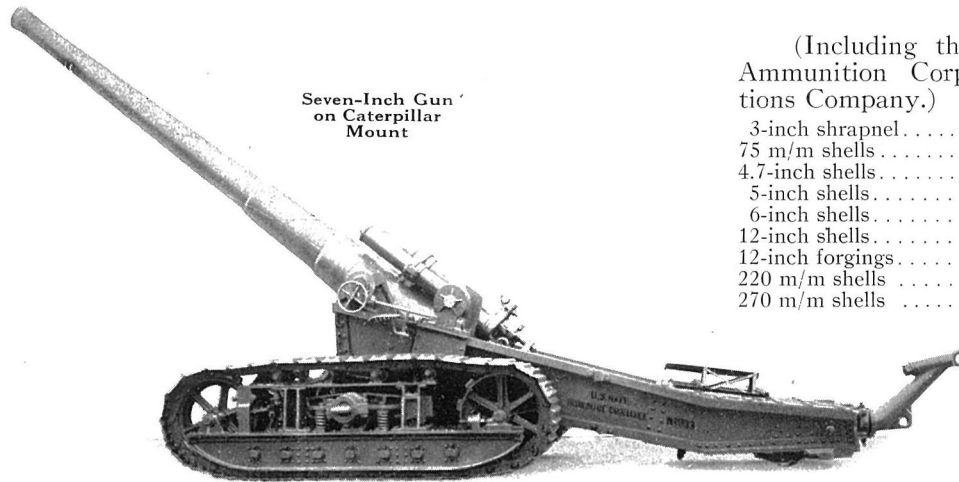
**Fourteen-Inch Navy Gun on Railway Mount**

Maximum firing elevation, 45 degrees. Maximum effective range, 30 miles

In addition to building complete mounts, The Baldwin Locomotive Works constructed several styles of railway trucks for gun and howitzer mounts. At the time hostilities closed, preparations were being made for the manufacture, on a large scale, of heavy tanks

equipped with Liberty motors. These were intended to destroy the wire defenses and machine-gun nests put up by the Germans in their retreat. After the signing of the armistice, however, the order for these tanks was cancelled.

THE BALDWIN LOCOMOTIVE WORKS



Seven-Inch Gun  
on Caterpillar  
Mount

Summarizing, the war activities of The Baldwin Locomotive Works, for all the belligerent nations including our own, comprise the following:

**LOCOMOTIVES**

Broad-gauge steam locomotives of various types . . . . .	3246
Narrow-gauge steam locomotives of various types . . . . .	1146
Broad-gauge gasoline locomotives . . . . .	20
Narrow-gauge gasoline locomotives . . . . .	1139
Total . . . . .	<u>5551</u>

**SHELLS**

(Including those manufactured by the Eddystone Ammunition Corporation and the Eddystone Munitions Company.)

3-inch shrapnel . . . . .	2,300,000
75 m/m shells . . . . .	2,351,555
4.7-inch shells . . . . .	225,399
5-inch shells . . . . .	150,281
6-inch shells . . . . .	1,068,157
12-inch shells . . . . .	112,553
12-inch forgings . . . . .	9,000
220 m/m shells . . . . .	213,615
270 m/m shells . . . . .	134,795

Total number of shells 6,565,355

Cartridge cases . . . . .	1,863,900
Miscellaneous ammunition items . . . . .	1,905,213

**GUN MOUNTS**

14-inch railway mounts . . . . .	11
Foundations for 14-inch mounts . . . . .	20
14-inch railway mounts, improved type . . . . .	2
7-inch caterpillar mounts . . . . .	38
Trucks for gun and howitzer mounts . . . . .	5 sets

The total number of rifles manufactured at the Eddystone rifle plant was approximately 2,200,000.

The aggregate value of the war contracts executed and delivered by The Baldwin Locomotive Works and its associated companies, the Standard Steel Works Company, the Eddystone Ammunition Corporation, and the Eddystone Munitions Company, was approximately \$250,000,000.