

Exhibit Caption: *Fuzes and Shells: International Arms & Fuze Co.*

One of New Jersey's largest munitions factories, Bloomfield's International Arms & Fuze Company, became a booming business by producing 21-second combination fuzes¹ and shells for our boys to clear barbed wire entanglements and detonate enemy targets. At its height it employed approximately 10,000 people – including 4,000 women who earned a whopping \$35 for a 10-hour workday.

Thousands of homefront hands laboriously produced 155-mm shells² that weighed close to 100 pounds. Male and female employees, pictured here, painstakingly assembled all of the dangerous components – detonator, propellant charge, and a bursting charge of TNT or Amatol, in shells' steel casings. Assembled shells were then tensioned, polished and lacquered, before the live ammunition was carefully packaged and shipped to Allied frontlines via the Orange Branch of the Erie Railroad to Hoboken.

On display:

Company Album of the International Arms & Fuze Co. (page 10 or 17), ca. 1915.

Munitionettes at work photo, *Bloomfield Revisited* (page 118), ca. 1918.

Munitionettes on break photo, *Bloomfield* (page 48), ca. 1918.

Exhibit Caption: *Torpedo Nets of John A. Roebling's Sons Co.*

John A. Roebling's Sons Company, of Brooklyn Bridge fame, applied their patented high carbon wire into revolutionizing technological warfare. From 1914, over 5,000 allied ships had been sunk by German U-boats.⁸ Many of the ships were carrying food and supplies to the Allied forces, necessitating some type of torpedo defense. As evidenced by Alfred D. Carnagy's 1911 patent, the idea for protecting battleships' hulls from submarines and underwater mines was conceived well before the Great War began. Roebling's new torpedo nets superseded previous European designs by producing high-performance grommet nets formed from small woven squares to surround the hulls of battleships, as shown in this newspaper clipping. By the War's start in 1914, the U.S. Navy had committed to purchasing two nets, for the battleships *Nevada* and *Oklahoma*.¹⁰

¹ *Army Ordnance: History of District Offices, [1918-19]*. Washington, 1920. Print.

² *Claims of the International Arms & Fuze Co. (inc.): Hearing Before a Subcommittee of the Committee on War Claims, House of Representatives, Seventy-Second Congress, Second Session, on H.r. 12981, a Bill Conferring Jurisdiction Upon the Court of Claims to Hear and Determine the Claims of the International Arms & Fuze Co. (inc.)*. Washington, DC: United States Government Printing Office, 1933. Print.

⁸ *Publications of the Navy Records Society*. London: Navy Records Society, 1957. Print.

¹⁰ *Proceedings of the United States Naval Institute*. Annapolis, Md: U.S. Naval Institute, 1879. Print.

Torpedo nets extended about 4 feet¹¹ from the sides and hull of a ship on booms reaching a few feet into the water. The net's interlocking grommet design would catch any torpedoes being fired, causing them to explode away from the ship.

On display:

Carnagy, Alfred D. Patent for Torpedo Net Rings, #1010856. ca. Dec. 5, 1911.

"Future War Value of Aeroplanes and Submarines", Newspaper article, ca. Oct. 25, 1914.

Exhibit Caption: *Supporting the War in the Air: Wright-Martin Aircraftings*

Previously only used for aerial reconnaissance, within a few years of static trench combat, aviation rapidly evolved from simple "eyes in the sky" to tactical bombardment and battles in the sky.¹² New Brunswick's Wright-Martin Aircraft Corporation found innovative ways to give our Allies an edge through its patented air-cooled Hispano engine – which kept planes operating longer in battle. Within a year of the company's establishment in 1916, France ordered 800 engines for her aerial aces to spy on Hun trenches. By the war's end, nearly 10,000 of these Wright-Hispano engines had been produced.¹⁴

On display:

Wright Martin Aircraftings Newsletter, vol. 1, no. 24. New Brunswick, NJ. ca. Oct. 5, 1918.

A Group of Core-makers at the New Brunswick Plant of the Wright-Martin Aircraft Corporation. Undated, ca. 1918.

Exhibit Caption: *Johnson & Johnson: Over Here & Over There*

Wartime demand kept Johnson & Johnson factories operating around-the-clock producing sterile gauze, first aid kits, pocket-sized Carlisle dressings, and handy wound dressing field packets. To ensure that homefront doctors, hospitals, pharmacists, and consumers remained unaffected by shortages of raw European supplies, like belladonna – an ingredient in some medicated plasters like the adhesive plaster on display – J&J experimented with growing the plant in Piscataway's Johnson Park.

On display:

Johnson & Johnson Factory Rules. ca. Nov. 1, 1917.

Johnson & Johnson Adhesive Plaster. Undated, ca. 1917-1919. *Loan Courtesy the National Guard and Militia Museum of New Jersey.*

¹¹ Russell, Phil. "Anti-Torpedo Nets." *The Great War Primary Document Archive*. GWPDA, Inc., 29 Aug. 2002. Web. 24 Oct. 2016.

¹² C N Trueman "Aircraft and World War One" historylearningsite.co.uk. The History Learning Site, 17 Apr 2015. Web. 05 Oct 2016.

¹⁴ Lawrence, Harry. *Aviation and the Role of Government*. Dubuque, Iowa: Kendall/Hunt Pub, 2004. Print.

Exhibit Caption: *Making Masters of Infection: Mass-Producing the Carrel-Dakin Solution*
Fred Kilmer, Johnson & Johnson's scientific director, knew that nearly 80% of battlefield wounds resulted in amputations due to infection. In 1917, Kilmer developed the Carrel-Dakin Solution – pre-measured bottles of sterilization chemicals – in order to make surgeons the “master of infection” for the newest European medical innovation, the Carrel-Dakin Method of antiseptic irrigation for wounds.

On display:

Drawing of the complete Carrel-Dakin equipment. In Fred Kilmer's “The Birth of a New Era in Surgery.” *Red Cross Notes*, Series VII, No. 8, ca. 1917, p. 195. *Reproduction courtesy Johnson & Johnson.*

Exhibit Overall Case Caption: *Jersey Makes, the World Takes: Industry in The Great War Era*

The Jersey factory-worker and the American doughboy were known as “the combination that will win the war.” The geographic location of New Jersey, particularly central areas like New Brunswick, Bloomfield, and Sayreville, made the region an essential wartime manufacturing zone. Spacious amounts of land afforded NJ to be used for training new soldiers, including Fort Dix, Camp Merritt, and Camp Raritan. Access to ports in both Hoboken and New York made it easier to transport and ship supplies “over there.” Jersey companies transitioned their workflow to manufacture products for the Allies long before we officially entered the War. A diverse segment of industries called the Garden State home including manufacturers, petroleum producers, munitions, and warfront technology.

At minimum, industrious Jersey employees would work up to a 60-hour work week, depending on how dangerous the factory was. Since munitions factories were most dangerous, employees had restrictive hours that were not to exceed 10-hour days. The manpower pinch necessitated that homefront women step up and defy gender norms as semi-skilled operatives in tire, chemical, and munitions plants. Despite resistance, they would become a pivotal part of the war effort by making up nearly 80% of the armaments workforce¹⁸ and 20% of the manufacturing workforce throughout the US.¹⁹ Though women were admitted to work alongside men in industrious factories, they began striking once they realized there was a wage gap.²⁰ Women were paid much less to do the same task as a man²¹, something women still struggle to rectify today.

¹⁸ Anitha, Sundari, and Ruth Pearson. "World War I: 1914-1918 Women and Work." *Striking Women*. N.p., 2013. Web. 06 Oct. 2016.

¹⁹ "Employment of Women in War Production." *Social Security Bulletin* 5.7 (1942): 4. Social Security Administration. Web. 24 Oct. 2016.

²⁰ Macarthur, Mary R. "The Lesson of the 'Bus Girls' Strike: Why Women Must Have Equal Pay." *Striking Women*. N.p., 25 Aug. 1918. Web. 24 Oct. 2016.

²¹ Anitha, Sundari, and Ruth Pearson. "Gender Pay Gap and the Struggle for Equal Pay." *Striking Women*. N.p., 2013. Web. 24 Oct. 2016.

Anti-submarine torpedo nets, enduring airplane engines, and millions of fuzes were just a fraction of the innovations originating from New Jersey during the Great War. Jersey resource and resilience helped the Allies fight the war by air, land, and sea.

On display:

Triedler, Adolph. "The Combination That Will Win the War." Undated, ca. 1918-1919.

Catalog Caption: *Fuzes and Shells: International Arms & Fuze Co.*

One of New Jersey's largest munitions factories, Bloomfield's International Arms & Fuze Company began in 1915 with a plant on Bloomfield Avenue and Grove Street. The company became a booming business by producing 21-second combination fuzes (nose of projectile that gives shell its exploding function) and howitzer shells for our boys to clear barbed wire entanglements and detonate enemy targets. Thousands of homefront hands laboriously produced 155-mm shells²³ that weighed close to 100 pounds.²⁴ Male and female employees, pictured here, painstakingly assembled all of the dangerous components – detonator, propellant charge, and a bursting charge of TNT or Amatol, in shells' steel casings. The powder used in the manufacturing of fuzes was stored on Crow Hill, the present-day site of the Forest Hill Golf Club.²⁵ Assembled shells were then tensioned, polished and lacquered, before the live ammunition was carefully inspected, packaged and shipped to Allied frontlines via the Orange Branch of the Erie Railroad to Hoboken.²⁶

At its height it employed approximately 10,000 people – including 4,000 women, who earned up to \$35 for a ten-hour workday.²⁷ International Arms & Fuze Company's employees heeded the patriotic call to duty with courage and endurance; working in munitions factories was dangerous, nerve-racking, and unbearably noisy. Employees weren't allowed to wear any metal on them in case of explosion, including hairpins, buttons, and buckles. Assembling the munitions such as shells exposed workers to harmful explosives like TNT, which caused toxic jaundice and earned female munitions' workers the nickname "Canary Girls." But despite these conditions, Jersey munitionettes felt a sense of pride in helping their country anyway they could.²⁸

²³ *Claims of the International Arms & Fuze Co. (inc.): Hearing Before a Subcommittee of the Committee on War Claims, House of Representatives, Seventy-Second Congress, Second Session, on H.r. 12981, a Bill Conferring Jurisdiction Upon the Court of Claims to Hear and Determine the Claims of the International Arms & Fuze Co. (inc.).* Washington, DC: United States Government Printing Office, 1933. Print.

²⁴ Branch, Frederick, Jean Kuras, and Mark Scurman. *Bloomfield.* Charleston, SC: Arcadia, 2001. Print.

²⁵ Branch, Frederick, Jean Kuras, and Mark Scurman. *Bloomfield.* Charleston, SC: Arcadia, 2001. Print.

²⁶ Birnie, R. *Inspectors' Manual for Fuze Assembly.* New York: International Arms & Fuze Co, 1918. Print.

²⁷ "Women." *The Home Front Encyclopedia: United States, Britain, and Canada in World Wars I and II.* Ed. James Ciment and Thaddeus Russell. Vol. 1. Santa Barbara, CA: ABC-CLIO, 2007. 504. Print.

²⁸ Clements, Kate. "9 Women Reveal The Dangers Of Working In A First World War Munitions Factory." *Imperial War Museums.* N.p., n.d. Web. 05 Oct. 2016.

After the signing of the Armistice in November, 1918, International Arms & Fuze Co. stopped production resulting in the Bloomfield factory closing and being used for other machinery production.²⁹

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On display:

Carnagy, Alfred D. Patent for Torpedo Net Rings, #1010856. ca. Dec. 5, 1911.

"Future War Value of Aeroplanes and Submarines", Newspaper article, ca. Oct. 25, 1914.

²⁹ *Moody's Manual of Railroads and Corporation Securities*. New York: Moody Pub. Co, 1905. Print.

³⁰ *Publications of the Navy Records Society*. London: Navy Records Society, 1957. Print.

³¹ Comegno, Carol. "Roebling Exhibit Examines Wartime Efforts." *Courier-Post*. Courier-Post, 16 May 2015. Web. 05 Oct. 2016.

³² *Proceedings of the United States Naval Institute*. Annapolis, Md: U.S. Naval Institute, 1879. Print.

³³ Sneddon, Matthew. "The John A. Roebling's Sons Company Kinkora Works: Independent Steel and Wire-making in an Era of Consolidation, 1904-1952." *Lehigh Preserve*. Lehigh University, 1998. Web. 24 Oct. 2016.

³⁴ Russell, Phil. "ANTI - TORPEDO NETS." The Russo-Japanese War Research Society, 2002. Web. 24 Oct. 2016.

³⁵ Russell, Phil. "Anti-Torpedo Nets." *The Great War Primary Document Archive*. GWPDA, Inc., 29 Aug. 2002. Web. 24 Oct. 2016.

Catalog Caption: *Supporting the War in the Air: The Wright-Martin Aircraft Corporation*
Aerial strategies used in the Great War laid the foundations for modern warfare in the sky. Previously only used for aerial reconnaissance, within a few years of static trench combat, aviation rapidly evolved from simple “eyes in the sky” to tactical bombardment and battles in the sky.³⁶

Jersey’s aircraft industry began as part of the industrial infrastructure supporting the Great War. New Brunswick’s Wright-Martin Aircraft Corporation found innovative ways to give our Allies an edge through its patented air-cooled Hispano engine – which kept planes operating longer in battle. Within a year of the company’s establishment in 1916, France ordered 800 engines for her aerial aces to spy on Hun trenches.

By the war’s end, nearly 10,000 of these Wright-Hispano engines had been produced. Though their demand was great on the front line, once the Armistice was signed, large surpluses devalued both the engines and parts.³⁷

On display:

Wright Martin Aircraftings Newsletter, vol. 1, no. 24. New Brunswick, NJ. ca. Oct. 5, 1918.

A Group of Core-makers at the New Brunswick Plant of the Wright-Martin Aircraft Corporation. Undated, ca. 1918.

Catalog Caption: *Johnson & Johnson: Over Here & Over There*

The War presented Johnson & Johnson with the opportunity to expand its products and market, while adhering to its founding mission to create sterilization and surgical products. During this time, many of the factory’s employees were deployed to fight as soldiers or help with the war effort as nurses. Wartime demand kept Johnson & Johnson factories operating around-the-clock producing sterile gauze, first aid kits, pocket-sized Carlisle dressings, and handy wound dressing field packets. To ensure that homefront doctors, hospitals, pharmacists, and consumers remained unaffected by shortages of raw European supplies, J&J even went so far as to cultivate its own. The company experimented with growing belladonna – an ingredient in some medicated plasters like the adhesive plaster on display – in Piscataway’s Johnson Park.

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Johnson & Johnson Factory Rules. ca. Nov. 1, 1917.

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Fred Kilmer, Johnson & Johnson's scientific director, knew that nearly 80% of battlefield wounds resulted in amputations due to infection. In 1917, Kilmer developed the Carrel-Dakin Solution – pre-measured bottles of sterilization chemicals – in order to make surgeons the “master of infection” for the newest European medical innovation, the Carrel-Dakin Method of antiseptic irrigation for wounds. The brainchild of the prominent French surgeon, Dr. Alexis Carrel, and English chemist, the Carrel-Dakin Method called for the sterilization solution to be administered via an intermittent irrigation of the wound. Crucially, the solution had to be mixed in precise measurements at the time of need – if the ratio was off, it would be too toxic, on the other hand, or on the other, sterilization would fail. Knowing how important this discovery was, Kilmer developed a delivery method that was reliable and ready-to-use. Johnson & Johnson was responsible for mass-producing the Carrel-Dakin Solution and putting this life-saving formula into the hands of Allied doctors, nurses and field medics, who would not have otherwise had access given poor frontline conditions.³⁹

On display:

Drawing of the complete Carrel-Dakin equipment. In Fred Kilmer's “The Birth of a New Era in Surgery.” *Red Cross Notes*, Series VII, No. 8, ca. 1917, p. 195. *Reproduction courtesy Johnson & Johnson.*

³⁹ Gurowitz, Margaret. "Making the Revolutionary New Carrel-Dakin Wound Treatment Available to Save Soldiers' Lives During World War I." Web log post. *Kilmer House*. Johnson & Johnson, 8 Nov. 2013. Web. 03 Oct. 2016.

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At minimum, industrious Jersey employees would work up to a 60-hour work week, depending on how dangerous the factory was. Since munitions factories were most dangerous, employees had restrictive hours that were not to exceed 10-hour days. The manpower pinch necessitated that homefront women step up and defy gender norms as semi-skilled operatives in tire, chemical, and munitions plants. Despite resistance, they would become a pivotal part of the war effort by making up nearly 80% of the armaments workforce⁴⁰ and 20% of the manufacturing workforce throughout the US.⁴¹ Though women were admitted to work alongside men in industrious factories, they began striking once they realized there was a wage gap.⁴² Women were paid much less to do the same task as a man⁴³, something women still struggle to rectify today.

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