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Munitions Industry Brings Permanent Assets

CANADA'S Capacity to Produce Munitions—650 Factories are Working
—Munitions Orders Placed Here to Date Total \$850,000,000—
National Factories Established—Standardization of Product and Skill.

IN September, 1914, when Canada undertook the first order for shrapnel shells, the Dominion's capacity to produce shells amounted to 340 18-pr. shrapnel shells per week. These were made at the Dominion Arsenal, Quebec. The capacity of Canadian factories to-day approximates 400,000 18-pr. shrapnel complete rounds per week, including cartridge cases, primers, fuses and propellants. In addition to this amazing output there is a weekly capacity in Canada for nearly 400,000 high explosive shells, ranging in sizes from 18-pounders to 9.2 inches, making an approximate total weekly output of 800,000 shells. This large output, along with other supplies made independently, requires per week about 25,000 tons of steel, 2,500 tons of brass, 750 tons of copper, 250 tons of zinc, 1,500 tons of lead, 200 tons of antimony, 150 tons of resin, several tons of ferro-molybdenum, 500 tons of cordite, 500 tons of trinitrotoluol and 300 tons of nitrocellulose powder. Over 300,000 boxes are required for these shipments per week, and about $3\frac{1}{4}$ million lineal feet of board are used in making these boxes.

The value of munitions orders placed in Canada exceed \$850,000,000, equal to the entire international trade of Canada in 1912. The value of munitions shipped to April 30th was \$470,000,000 and the total disbursements \$543,000,000.

According to Colonel David Carnegie, of the Imperial Munitions Board, in a recent address before the Ottawa branch of the Canadian Society of Civil Engineers, there are 650 factories engaged in 144 towns scattered throughout every province of the Dominion except Prince Edward Island. Cities as far apart as St. John, Newfoundland, and Victoria, B.C. (a distance approximating 4,500 miles), are contributing to the output. Manufacturers from almost every industry in Canada have turned their attention to the production of munitions, and it is gratifying to record that few of them have failed in producing the standard of work required.

Some idea of the amount of plant and machinery installed can be obtained when it is remembered that apart from the large increase in the number of steel-making furnaces which have been installed since the war commenced, there are 26 contractors making shell forgings, with a total forging press capacity of 61,000 tons. This tonnage is represented by 162 forging presses, the largest having a pressure of 1,500 tons and the smallest 200 tons. In order to feed these presses with steel for forgings, 200 furnaces have been built. The presses are driven by 120

sets of pumps, having a total electric motor capacity of 21,000 horse-power. The approximate value of shell forging plant machinery installed is estimated at \$5,000,000.

Coming to the plants for the machining and assembling of shells and the manufacture of component parts, there have been installed over 18,000 machines and 90,000 horse-power to drive them, the estimated cost approximating \$35,000,000.

Almost insuperable difficulties were met in the early days of the war in obtaining gauges for munitions. We can never thank the United States manufacturers sufficiently for what they did in coming to our aid at that time, said Colonel Carnegie. The special skill in making gauges to the limits of accuracy required could not then be found in Canada. To-day there are at least twenty factories producing gauges in Canada, and while we are not independent of help from the United States, some idea of the magnitude of the work can be understood from the monthly bill, which amounts to over \$150,000 for new gauges.

During the month of March about 10,000 new gauges and checks were inspected. The usual accuracy called for on a gauge is .0003 $\frac{3}{10}$ thousands of an inch, and for a check $\frac{1}{10}$ thousand. An army of over 5,000 examiners are engaged upon the inspection under the direction of Colonel Edwards and his staff of officers.

In addition to the production of steel, the manufacture of forgings, the machining and assembling of shells and the manufacture of cartridge cases, fuses, primers, and other components, the mining and metallurgy of metals for munitions manufacture have played an important part in Canada. Copper and zinc are now refined in the Dominion instead of being sent in the form of concentrates of zinc and copper matt to the United States for refining there. Copper products, such as copper bands, are now being manufactured in Canada on a commercial basis. Brass cartridge case material, so difficult to obtain in the early months of the war, is now being made successfully in Canada. Other metals, such as lead, antimony, arsenic, tungsten, molybdenum and aluminum, have been produced for munitions.

Side by side with these developments there has grown a capacity for explosives even greater in proportion than that of metals. In order to complete what we call the fixed 18-pr. round of ammunition, it is necessary to make cordite or nitrocellulose powder, and while experimental amounts of cordite had been produced before the war,