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DEFENSE MANUFACTURES OF ST. PETERSBURG 1703–1730

IAN M. MATLEY

THE foundation and the rapid growth of St. Petersburg were among the most significant events in Russian history, because the establishment of the city influenced the future economic, social, and political developments of the country. In this article I examine one economic aspect of the early industrialization of the city and its surrounding region—defense manufactures. The need to defend St. Petersburg created manufactural establishments in the city as well as the development of mining and manufacturing far from the city.

Before considering the manufactural development of the St. Petersburg region, the role of Peter the Great as the founder of the city must be addressed. Peter the Great cannot be regarded as a planner in the modern sense of the word. However, he had priorities and was able to implement many of them with a ruthlessness and a singleness of purpose that must be the envy of many modern planners. The vast sums spent on the development of manufacturing and of the new capital city, in spite of the lack of funds in the state coffers, were evidence that Peter clearly thought his plans and their realization to be an “absolutely necessary” matter.¹ Capital cities such as Washington, Canberra, and Brasília rose on previously uninhabited sites, but their construction and the development of their economic base did not proceed with the breakneck rapidity, and they did not cause the countrywide upheaval evident in the case of St. Petersburg. The forced economic development by Peter the Great “was marked by a relentless race against time, dictated by political reasons.”²

In order to ensure the implementation of his economic schemes, Peter established “colleges” or ministries of commerce, mines, and manufacturing. He did not actively encourage agricultural production and did not found any organization to supervise agriculture.³ The *Manufaktur-kollegiya* (manufacturing) was established in 1719 to manage the state factories, to arrange their transfer in certain cases to private ownership, to build factories, to organize labor supplies, and to give loans to manufacturers on favorable terms. The *Berg-kollegiya* (mining) was founded in the same year to manage mines, to supervise the processing of ores, and to arrange loans for the construction of mining enterprises. All production was strictly controlled by those colleges.⁴

¹ Ye. I. Zaozerskaya, *Manufaktura pri Petre I* [Manufacturing under Peter the First] (Moscow and Leningrad: Izdatel'stvo Akademii Nauk S.S.S.R, 1947), p. 38.

² Arcadius Kahan, *Continuity in Economic Activity and Policy during the Post-Petrine Period in Russia*, *Journal of Economic History*, Vol. 25, 1965, p. 61.

³ B. H. Sumner, *Peter the Great and the Emergence of Russia* (New York: Collier Books, 1962), p. 143.

⁴ P. I. Lyashchenko, *Istoriya narodnogo khozyaystva S.S.S.R.* [History of the Economy of the U.S.S.R.] (3 vols.; Moscow: Gosudarstvennoye Izdatel'stvo Politicheskoy Literatury, 1956), Vol. 1, pp. 356–357.

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Peter did not follow any prescribed or established methods to achieve his goals for the economic development of the country, in spite of his organization of manufacturing and mining. Although he generally subscribed to the mercantilistic theories of his time and attempted to reduce imports by the exploitation of domestic resources and the encouragement of indigenous manufacturing, he did not imitate the systematic economic policies of his contemporaries in Western Europe. Nevertheless, the results that he achieved were the outcome of preconceived ideas and clearly identified priorities. In that framework of development, defense considerations for St. Petersburg and its region played a major role.

The decision by Peter the Great to build a new capital and to develop its manufactures must be considered in the context of the situation that Russia faced at that time. Peter considered Russia to be a backward country that required Westernization and modernization. A new, Western-oriented capital, located nearer the rest of Europe than "oriental" Moscow, would hasten these processes. Russia was then contesting with Sweden for supremacy in the Baltic area. The founding of St. Petersburg was designed to consolidate Russian control over its newly won coastal territory and to serve as a major naval base. A third factor influencing Peter's decision was that Russian trade with the West was through the northern port of Arkhangelsk, which was distant from the western European ports and had a severe winter climate. The newly opened Baltic route was shorter and had a longer navigational season. Those factors provided the incentive to establish the new city and influenced the development of its functions.

The location of the new city had certain serious disadvantages. The city was founded on an uninhabited swampy site, subject to periodic flooding, in a sparsely populated region with little local agriculture or manufacturing. Those conditions not only created grave technological problems for the construction of the city but also required the formation of a large labor force recruited from other regions of Russia. In spite of those difficulties, the population of the city numbered some 40,000 by the mid-1720s and was more than double that figure by the 1750s. The rapid expansion of the city was accompanied by the development of various manufactural establishments in the city and its surrounding region (Fig. 1).

DEFENSE MANUFACTURES

The most important factor to be considered initially in an assessment of the aims of Peter the Great in the development of manufacturing is the strategic one. St. Petersburg was founded during a long and hard struggle between the Russians and the Swedes for the mastery of the Baltic Sea. The founding of the city in 1703 occurred near the beginning of a long war that lasted until 1721. In 1703 and 1704 the Swedish fleet still threatened the existence of the new city, and the Swedes attempted an attack by land in 1705. Although the concept of St. Petersburg as a "window on Europe" should not be deemphasized, the phrase "from here we shall threaten the Swede"⁵ has great relevance in ex-

⁵ This phrase was used by Pushkin in his poem, "Mednyy vsadnik [The Bronze Horseman]."

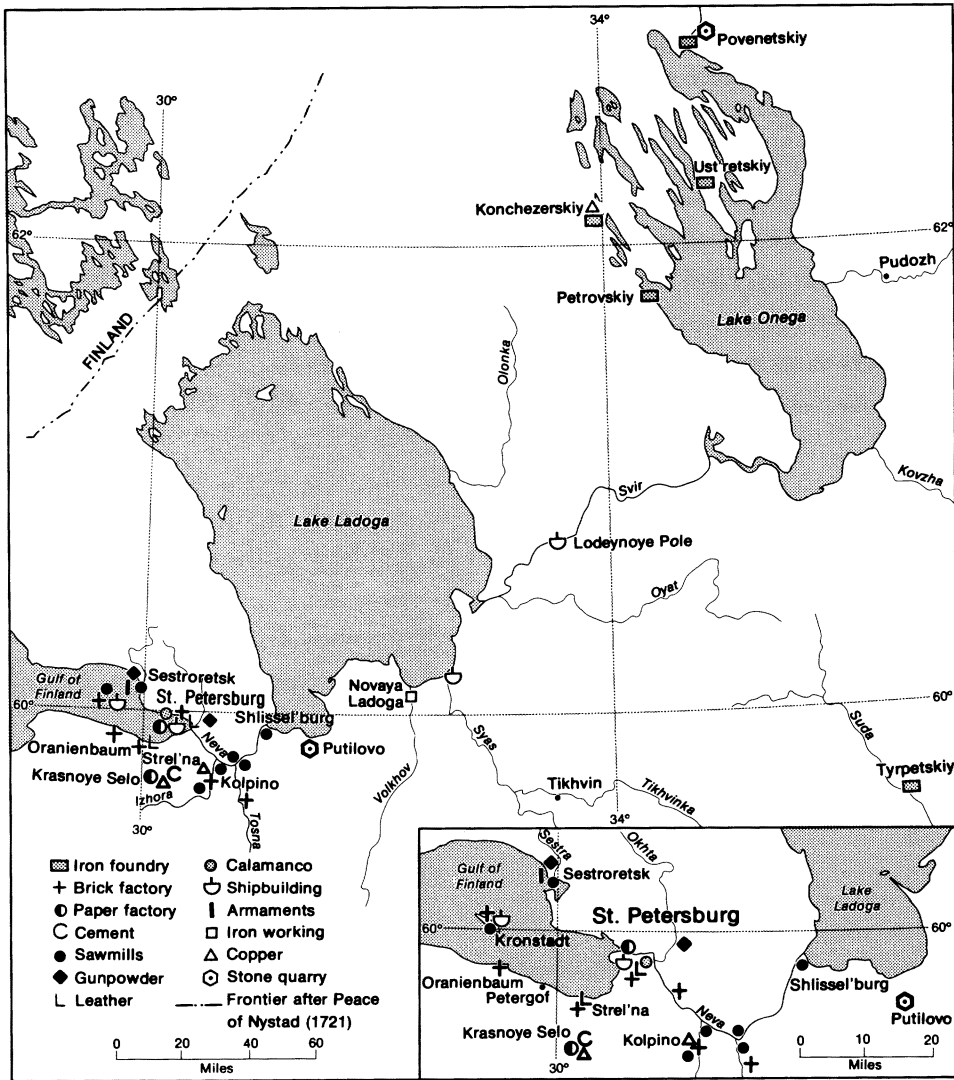


FIG. 1—Manufactures in northwestern Russia, circa 1725.

plaining the early development of the city and its manufactural activities. Although the site of the city was unsatisfactory from the viewpoint of environment, it was the only suitable place on the Baltic coast accessible at that time to the Russians. The construction of the Peter and Paul fortress as the first building in the projected city and the concurrent fortification of Kotlin Island emphasized the importance of defense. After the Battle of Poltava in 1709 and the defeat of Charles XII of Sweden, Peter the Great wrote, "Now with the help of God a perfect stone has been laid in the foundation of St. Petersburg."⁶ It

⁶ Rossiya, Polnoye geograficheskoye opisaniye nashego otechestva [Russia, A Complete Geographical Description of Our Country] (edited by P. P. Semenov-Tyan-Shanskiy; 19 vols.; St. Petersburg, 1900), Vol. 3: Ozernaya oblast' [The Lake Region], p. 243.

was not until the Treaty of Nystad in 1721 that Russia gained complete control over Estonia and the Karelian Isthmus and achieved the protection required to ensure a certain future for the new city. The concern for protection was the major impetus for the development of defense-oriented manufactures in and around St. Petersburg during the first two decades of its existence.

The admiralty wharf was built on the bank of the Neva River opposite the protective guns of the Peter and Paul fortress. That wharf became the largest enterprise in the city during the first half of the eighteenth century. It launched its first ship in 1706. Artisans were brought from the small wharves in the Olonets region, from the Novgorod region, and from Rostov. The wharf employed 900 workers in 1709, and during the next twenty years large numbers of workers came to the wharf from many parts of Russia. The government in 1710 ordered 4,720 laborers to the city to work at the admiralty wharf and in the construction of the city.⁷ Two years later, another 2,000 men came from the wharf at Voronezh, established to supply ships for Peter's unsuccessful attempt to gain access to the Black Sea in 1695–1696. One thousand carpenters were ordered to the city in 1713. That year was the height of the war with Sweden. The admiralty wharf then had 10,000 workers, but by 1727 the number dropped to 4,672.⁸

STATE MANUFACTURES AND THE LABOR FORCE

The development of the admiralty wharf set the pattern for the operation of much manufacturing in St. Petersburg: state-owned with workers often obtained by forcible recruitment from other parts of Russia. The lack of workers to labor for hire on a voluntary basis led to the employment of state serfs. Many artisans with their families were sent permanently to St. Petersburg. For example, in 1720 the government dispatched an officer to the villages in the region west of Vologda to bring 413 carpenters to the capital for shipbuilding. Many persons so conscripted never arrived at the capital.⁹ Of the 6,597 persons sent in 1712 from the Moscow, Smolensk, Kazan, and Arkhangelsk regions, 842 persons did not reach St. Petersburg: 14 died, 387 became ill and stopped en route, and 441 escaped.¹⁰

The organization of a manufactural labor force was a major problem for Peter the Great. He operated in a system of serfdom inherited from his predecessors, and, like the serfs, he was unable to escape it. He placed heavy

⁷ A. Ye. Suknovalov, *Ekonomicheskaya zhizn' Peterburga do 60-kh godov XVIII v.* [The Economic Life of St. Petersburg to the 1760s], in *Ocherki istorii Leningrada* [Essays on the History of Leningrad] (edited by M. P. Vyatkin; 2 vols.; Moscow and Leningrad: Izdatel'stvo Akademii Nauk S.S.S.R., 1955), Vol. 1, pp. 55 and 58.

⁸ V. G. Geyman, *Manufakturnaya promyshlennost' Peterburga Petrovskogo vremeni* [Manufacturing Industry in St. Petersburg in the Time of Peter], in *Petr Velikiy: sbornik statey* [Peter the Great: A Symposium] (edited by A. I. Andreyev; 2 vols.; Moscow and Leningrad: Izdatel'stvo Akademii Nauk S.S.S.R., 1947), Vol. 1, p. 254; and I. K. Kirilov, *Tsvetushcheye sostoyaniye Vserossiyskogo gosudarstva* [The Flourishing Condition of the All-Russian State] (Moscow: Izdatel'stvo "Nauka," 1977 [originally published in 1727]), p. 49. Figures appearing in the 1831 edition of Kirilov's work are often quoted by historians. The figures used in this article are from the revised edition of 1977.

⁹ B. Mansurov, *Okhtenskiye admiralteyskiye seleniya* [Admiralty Settlements on the Okhta] (St. Petersburg, 1885), pp. 10–11.

¹⁰ *Doklady i prigovory Senata* [Reports and Judgments of the Senate] (St. Petersburg, 1883), Vol. 2, 1712, Book 1, No. 410, pp. 299–300.

burdens of forced labor at construction and manufactural enterprises, of military service, and of exorbitant taxes on the populace. One result was the flight of serfs to the borderlands and even abroad.¹¹ Attempts to escape the rigorous working conditions in the new city must have been numerous.

The preference for a predominantly state-owned manufactural system was not solely the consequence of using serfs as the principal component of the labor force but also was due to the necessity for rapidly increased production for defense needs. State ownership was abandoned to a great extent in the 1720s when private manufacturers were encouraged to assume a number of state enterprises. Private manufacturers were permitted to buy entire villages, whose inhabitants were thus permanently tied to a particular enterprise. Serfs were also assigned to certain factories, a practice that led to friction between merchants and nobles over the rights to the compulsory labor of the serfs. On the whole, Peter's labor policies lacked consistency and were not markedly successful.¹²

SHIPBUILDING AND TIMBER SUPPLIES

Although the admiralty wharf was the most important shipyard in the region, the Olonets wharf at Lodeynoye Pole on the Svir River launched the first warship of the Baltic fleet in August, 1703. Ships built there, however, had to make the difficult passage over the rapids in the Neva River in order to reach St. Petersburg and the sea. After 1702 ships were built along the banks of the Svir River, at the mouth of the Syas River, and along the Volkhov and Neva rivers. Because of the problems of moving the finished ships to St. Petersburg, Peter decided to make his city the major shipbuilding center.¹³ But other centers of shipbuilding were not prohibited or neglected. The wharf at Kronstadt on Kotlin Island had 1,140 workers by 1727, and the private wharf in St. Petersburg had approximately 500 workers. The latter produced mainly small vessels, as did other small wharves in the city.¹⁴

A satisfactory supply of ship timber was a major problem. Although the wharves of St. Petersburg were close to coniferous forests, their timber was suitable for masts, but not for planking and other timber needs for ships. Oak timber was necessary, and little of it was available in the St. Petersburg region. A German forester, ordered to mark all oaks in the forests of Ingria, now the western half of the Leningrad oblast, and in the Novgorod region, found none to mark. Peter ordered two old oaks on Kotlin Island to be preserved as examples, and he established a nursery for oaks along the road to Petergof.¹⁵ Those efforts, however, did not yield any significant production of oaken ship timber. The supplies had to come from farther afield. The upper Volga region, especially around Alatyr and Sergach, became the major supply areas, and Kazan was an important center for processing timber for shipbuilding in St.

¹¹ Lyashchenko, footnote 4 above, pp. 355–356.

¹² Lyashchenko, footnote 4 above, pp. 374 and 384.

¹³ Geyman, footnote 8 above, p. 247.

¹⁴ Kirilov, footnote 8 above, p. 56; and F. F. Veselago, *Ocherk russkoy morskoy istorii* [An Essay on Russian Maritime History] (2 vols.; St. Petersburg, 1875), Vol. 1, pp. 525 and 529.

¹⁵ Jakob Staehlin von Storcksburg, *Original Anecdotes of Peter the Great* (New York: Arno Press, 1970 [originally published in 1788]), p. 168.

Petersburg.¹⁶ The timber was sawed in local sawmills, some of which were already under construction at the beginning of the eighteenth century.

The growth of shipbuilding was a great impetus to regional sawmilling, although the rate of expansion was not as rapid as hoped. The Swedes constructed small sawmills near Shlissel'burg, which fell into the hands of the Russians. The first new sawmills were built in St. Petersburg, but later ones were located along the Neva, the Izhora, the Tosna, and other nearby streams.¹⁷ The choice of site was influenced by the supply of wood, the existence of water routes, and the possibility of using waterpower. A few wind-driven sawmills appeared, at first on Vasilevskiy Island and later on the banks of the Moyka River. The sawmills on the Izhora were the largest. Including the persons employed in the timber storehouses, there were 279 workers at the admiralty sawmill at Kolpino, and an additional 820 persons loaded wood, carried planks, and did other chores in 1715.¹⁸ That mill had 135 artisans and apprentices in 1725, a time of peace. By the end of the 1720s the St. Petersburg region had more than ten sawmills, and thirty-two such mills by 1754.¹⁹ Most were state-owned and supplied the shipbuilding manufacturers, although some mills supplied construction timber to the city. Private enterprise was limited, and the few private mills either were auxiliary to large state-owned enterprises or concentrated on export.

Other centers of sawmilling emerged in northwest Russia. In 1706 the first sawmill in Arkhangelsk began operation. The presence of a state-shipbuilding wharf there encouraged the construction of additional mills. One was built at Narva, and timber exported from there. There were also two sawmills in the Novgorod region, one on the Syas River and one near Vyshni Volochek, both thus on water routes to the capital.²⁰ The supply of timber for the capital was never sufficient, in spite of the creation of forest reserves and the promulgation of severe penalties for the private cutting of ship timber. After Peter's death in 1725, the neglect of the fleet led to the closing of many sawmills in the St. Petersburg region.

ARMAMENTS MANUFACTURES

The production of metals, especially iron and copper, was closely allied to shipbuilding. The new fleet required cannons, anchors, chains, and other metal equipment, while the army needed cannons, muskets, swords, uniform buttons, and a host of other metal items. The unsuccessful siege of Narva in 1700 revealed the inferior quality of Russian-made weapons, and Peter determined to improve it. Until the opening of the Great Northern War, Russia relied on

¹⁶ P. G. Lyubomirov, *Ocherki po istorii russkoy promyshlennosti (XVII, XVIII i nachalo XIX veka)* [Essays on the History of Russian Industry (17th, 18th and the Beginning of the 19th Centuries)] (Moscow: Gosudarstvennoye Izdatel'stvo Politicheskoy Literatury, 1947), p. 699; and Suknovalov, footnote 7 above, p. 62.

¹⁷ Lyubomirov, footnote 16 above, p. 699; and Zaozerskaya, footnote 1 above, pp. 182–184. An appendix in Zaozerskaya's work lists all the manufacturing establishments founded in Russia between 1695 and 1725.

¹⁸ Geyman, footnote 8 above, p. 250; and Lyubomirov, footnote 16 above, p. 699.

¹⁹ Suknovalov, footnote 7 above, p. 72; Lyubomirov, footnote 16 above, p. 699; and Kirilov, footnote 8 above, p. 55.

²⁰ Kirilov, footnote 8 above, p. 90.

imports of iron from Sweden. An indigenous armaments manufacture, supplying good-quality weapons from Russian-made metals, was essential.

The first major establishment for the manufacture of cannons in St. Petersburg was the *pushechno-liteynyy dvor* (cannon-casting foundry), located east of the admiralty wharf. Built between 1711 and 1713 the foundry first produced brass cannons; after 1717 the cannons were cast and then bored by horse-powered lathes. Attempts to use waterpower were unsuccessful.²¹ In June, 1714, there were thirty-seven workers at the foundry. That year approximately one-third to one-half of the workers, mostly artisans, at the Moscow cannon foundry moved to St. Petersburg, so that the total number of workers there rose to 200. Fifty gunsmiths came permanently from Tula in 1716, but the stay of other transported workers was only temporary. In 1720 the foundry was renamed the Arsenal, and by the mid-1720s it employed 214 artisans.²² The Arsenal was never a large enterprise, because the lack of waterpower restricted expansion, although proximity to the admiralty wharf was an obvious locational advantage.

Other metalworking factories were not so conveniently located. An armaments factory was built between 1721 and 1723 at Sestroretsk on a site selected because of the favorable conditions for the use of waterpower. That factory was one of the largest and technically one of the best metalworking factories established by Peter the Great. It manufactured guns, bayonets, swords, pistols, anchors, nails, wire, and tinplate. In 1727 there were 653 workers, many of whom came from factories in Moscow, Tula, and Olonets. The supplies of iron came mainly from the Urals.²³

A small iron factory, originally operating at Ladoga on the southern shore of Lake Ladoga to service the fleet, was moved to Kronstadt in 1722, but it was merged with the Sestroretsk factory two years later.²⁴ Using waterpower, the old Izhora state sawmill at Kolpino began to produce anchors and copper plates for ship bottoms in 1719, but the equipment was taken to the new factory at Sestroretsk in 1724.²⁵

METALLURGICAL MANUFACTURES

The absence of deposits of metallic ores in the vicinity of St. Petersburg was a deterrent to the development of iron-ore processing in or around the city. The activities were thus dispersed far from the consumers. Peter particularly designated the Olonets region of Karelia on the western shores of Lake Onega for development. Smelting of iron and copper ores dated to early times, and iron manufacturing had considerable development there by the end of the seventeenth century. The state was initially interested in copper production. Between 1666 and 1674 efforts to increase the scale of copper production were

²¹ Suknovalov, footnote 7 above, p. 65.

²² R. S. Livshits, *Razmeshcheniye promyshlennosti v dorevolyutsionnoy Rossii* [The Distribution of Industry in Prerevolutionary Russia] (Moscow: Izdatel'stvo Akademii Nauk S.S.S.R., 1955), pp. 52–53; and Kirilov, footnote 8 above, p. 54.

²³ Suknovalov, footnote 7 above, p. 66; Lyashchenko, footnote 4 above, p. 383; and Kirilov, footnote 8 above, p. 54.

²⁴ *Opisaniye del Arkhiva Morskogo ministerstva* [Description of the Affairs of the Archives of the Ministry of the Navy] (St. Petersburg, 1879), p. 563.

²⁵ Suknovalov, footnote 7 above, p. 72.

unsuccessful. Production of iron was considerable by the 1680s, although the exact number of factories is unknown. Russian and Karelian iron masters were the main operators. Local free peasants were the hired labor in contrast with the use of foreign artisans and serfs in the activity elsewhere in Russia. The factories used waterpower. Unrest among the peasant laborers in the 1680s and 1690s affected the operations of the factories. By the beginning of the eighteenth century, Peter's desire for a rapid increase in Russian iron production led to the expansion of Olonets production. The factories were privately owned until 1703 when they were taken over by the state.²⁶

THE OLONETS IRON MANUFACTURES

Peter the Great had firsthand knowledge of the potential of the Olonets region as a source of metallic ores (Fig. 2). When he was exploring the possibilities of a rapid route between Arkhangelsk and Lake Ladoga in 1702, he met some Olonets peasants who were digging ores and learned from them of the extent of the copper and iron deposits in the region.²⁷ He ordered the construction of three new factories in the same year. The Alekseyevskiy factory was located on the northern slope of a ridge forming the watershed between the White Sea and Lake Onega near the mouth of the Telekina River. The factory had two blast furnaces with hammers. The Povenetskiy factory was founded approximately twenty-five miles to the south on the Povenets River. That factory had four blast furnaces, hammers, a wire-making machine, and an anchor smithy with four forges. The Vichkovskiy factory was on the bank of the Vichka River, some twenty miles from the Povenetskiy factory. There were a blast furnace, two forges, and hammers. A fourth factory was established in 1703 on the Lososinka River where it flows into Lake Onega. Named the Petrovskiy factory, it was built in a record three months and became the largest in the region with four blast furnaces, a water-powered cannon-borer, an anchor workshop, machines to draw wire, and a weapon workshop for guns and swords. The factory employed almost 1,000 workers and by 1725 produced approximately 60 percent of the pig-iron production of the Olonets region. The Konchezerskiy factory was built in 1707 some twenty-five miles to the north of the Petrovskiy factory on the channel between lakes Pertnavolok and Konchezerskoye. Those factories were organized under united management as the Olonets factories. Of the old Olonets factories that were taken over by the state in 1703, all were closed, except the Ust'retskiy factory which remained in operation.²⁸

The Olonets factories concentrated on the production of heavy cannons and anchors. At first the operation of the factories was badly organized, and techniques were primitive. Organization and production were greatly improved by the 1720s, but output was limited. Local ores were depleted, and a shortage

²⁶ Joseph T. Fuhrmann, *The Origins of Capitalism in Russia* (Chicago: Quadrangle Books, 1972), pp. 117–128.

²⁷ Rossiya, footnote 6 above, p. 162.

²⁸ A. P. Glagoleva, *Olonetskiye metallurgicheskiye zavody pri Petre I* [The Olonets Metallurgical Factories under Peter the First], *Istoricheskiye zapiski*, Vol. 35, 1950, pp. 175–179; and Livshits, footnote 22 above, pp. 54–55.

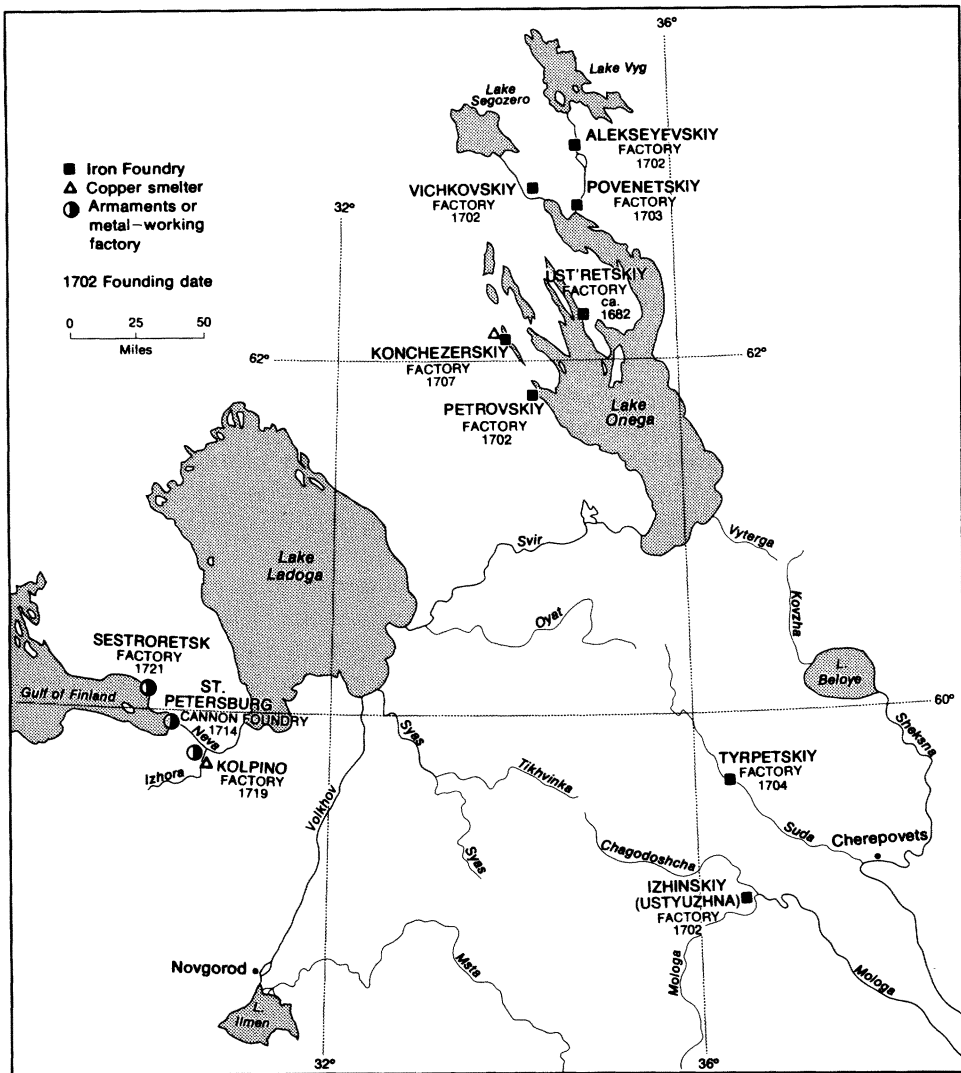


FIG. 2—Metallurgical factories in northwestern Russia 1700–1730.

of wood resulted from excessive felling of timber in the surrounding forests.²⁹ Because of the use of low grade ores, the quality of the cannons deteriorated. During Peter's reign the cost of pig iron from the Olonets region doubled. Because of those problems, changes were made in the operations of the Olonets factories. The Alekseyevskiy and Vichkovskiy factories were closed.³⁰ All the gunsmiths at the Petrovskiy factory were transferred in 1724 to the Sestroretsk

²⁹ V. de-Genin, *Opisaniye ural'skikh i sibirskikh zavodov* [A Description of the Ural and Siberian Factories] (Moscow: Gosudarstvennoye Izdatel'stvo, 1937 [originally published in 1735]), p. 74.

³⁰ Livshits, footnote 22 above, p. 55.

factory. The Konchezerskiy was not operating in 1727. The Povenetskiy factory was transferred to private ownership in 1726 and then liquidated. Later it was decided to cease the casting of cannons at the Petrovskiy factory and to transfer the activity to the reactivated Konchezerskiy factory. Although it has the best location for the extraction of ore, the Konchezerskiy factory was badly situated in terms of transportation. It was far from Lake Onega, and the channel between the lakes on which it was located had a shallow depth.³¹

The period of maximum production for the Olonets factories was short-lived. Because of the rising costs of production—the cost of pig iron from the Petrovskiy and Konchezerskiy factories in 1727 was ten times more than pig iron from the state factories in the Urals—the Admiralty began to look carefully at cost factors after the end of the Great Northern War in 1721. Then also the reduced scale of shipbuilding lowered demand for naval equipment and armaments. Those factors influenced the decision to transfer the factories to private ownership. The possibility of closing the Olonets factories was raised during the last years of Peter's reign, but Peter opposed the action. "Although iron in Olonets is expensive, because of the nearness of the factories to Petersburg, it is impossible to close them."³² Strategic factors clearly outweighed economic ones. Peter attempted to bring the armaments enterprises as close as possible to the capital. The designation of the armaments factory at Sestroretsk as the main arsenal for the armed forces was at the expense of the Petrovskiy factory. The factories of the Olonets region were viewed as a reserve to be used if the Ural factories and Sestroretsk could not fill demands.

The development of metallurgical enterprises had a profound effect on the local population. Most serfs in the Olonets region were tied to work in the factories, with the exception of some families in areas to the north and the northwest of Lake Onega. The serfs who lived near the ore deposits were hired to work them, while serfs elsewhere did other tasks in the production processes. In 1718 the Olonets factories registered 43,244 male workers. With the decline of production after the war, only 15,835 workers were registered in 1725 when the state disposed of the four Olonets factories. Limited local agriculture made difficult the maintenance of a food supply, and the peasants relied heavily on hunting and fishing. Before the development of the metallurgical activities, the lack of local employment encouraged considerable out-migration.³³ There is no evidence that the Olonets factories attracted many workers from outside the region, except for managers and artisans.

THE URAL AND OTHER IRON MANUFACTURES

Even before the founding of St. Petersburg and the development of the Olonets manufactures, Peter the Great had decided that he would not rely on

³¹ Lyubomirov, footnote 16 above, pp. 331 and 407.

³² V. I. Rozhkov, *Gornozavodskiy promysel v Olonetskom kraye* [Mining and Metallurgy in the Olonets Region], *Gornyy zhurnal*, No. 2, 1888, p. 301; and N. I. Pavlenko, *Razvitiye metallurgicheskoy promyshlennosti Rossii v pervoy polovine XVIII veka* [The Development of the Metallurgical Industry of Russia in the First Half of the 18th Century] (Moscow: Izdatel'stvo Akademii Nauk S.S.S.R., 1953), pp. 54–55.

³³ Pavlenko, footnote 32 above, p. 238; and Lyubomirov, footnote 16 above, p. 408.

foreign manufacturers to arm and to equip the Russian army and navy. As early as 1700 and 1701 forges were established in Siberia and in the Urals. Polish miners identified the iron-ore deposits near Kazan and Kaluga.³⁴ But the Ural region became the major center of the new iron manufacturing, eventually eclipsing the Olonets in total output. In spite of the distance from St. Petersburg, the conditions for metallurgical manufactures in the Urals were favorable. Iron ore was of good quality, and the deposits were close to the surface of the ground. Timber for charcoal was plentiful, and waterpower was available on the many rivers and streams.

The founding of the iron manufactures in the Urals predated the first major closings of the Olonets factories and was a response to the shortage of timber for fuel that developed in the Tula region at the beginning of the eighteenth century. Until that time, Tula had been the major iron-producing region of Russia. Peter in 1703 ordered the cessation of new factory construction and the destruction of all privately owned hand-smelting furnaces in Tula and adjacent regions in order to save local resources.³⁵ If the initial establishment of the Ural manufactures was not directly linked to the founding of St. Petersburg, later developments in the Urals were related to the demands of the defense activities of the capital. Although a distance of some 1,000 miles separated the two areas, supplies of metals and metallic products reached St. Petersburg in increased quantities.

The original two iron foundries in the Urals were followed by the Uktuskiy factory in 1702 and the Alapayevskiy factory in 1704. Those factories produced matériel used by the Russian armies fighting the Swedes. Transportation to the Baltic front was a serious problem, and one of the main reasons for Peter's desire to develop iron manufactures in the Olonets region as rapidly as possible. He also founded iron plants at the intermediate location near Lake Beloye, where between 1703 and 1707 the Tyrpetskiy factory on the Suda River and the Izhinskiy or Ustyuzhskiy factory at Ustyuzhna approximately sixty miles southwest of Cherepovets were built.³⁶ Those factories produced bombs, cannon balls, and shipbuilding tools. The region previously contained a number of small foundries owned and worked by peasants that produced a variety of iron goods, especially nails. A small factory at Ustyuzhna produced cannon balls during the first half of the seventeenth century. Production at those factories ceased because of depletion of local ores. The Izhinskiy factory closed at the end of the Great Northern War, and the Tyrpetskiy factory closed in 1732.³⁷

In 1703 two iron furnaces were built at Lipetsk, some 200 miles south of Moscow. The primary production of those factories was cannons, guns, and anchors for the Azov fleet, the southern forts, and the army participating in

³⁴ E. Pernet, *Pierre le Grand, Mercantiliste* (Paris: Librairie Générale de Droit et de Jurisprudence, 1913), pp. 63–64.

³⁵ Livshits, footnote 22 above, pp. 55–56.

³⁶ Zaozerskaya, footnote 1 above, p. 11.

³⁷ P. A. Kolesnikov, *Iz istorii metallurgii Ustyuzhno-Zhelezopol'skogo rayona v XVI–XVII vv.* [From the History of Metallurgy in the Ustyuzhna Zhelezopol'skaya District in the 16th and 17th Centuries], in *Voprosy sotsial'no-ekonomicheskoy istorii i istochnikovedeniya period feodalizma v Rossii* [Problems of the Social-Economic History and Study of Sources of the Period of Feudalism in Russia] (edited by N. V. Ustyugov; Moscow: Izdatel'stvo Akademii Nauk S.S.S.R., 1961), p. 39; Lyubomirov, footnote 16 above, pp. 329–330 and 411; and Kirilov, footnote 8 above, pp. 97–98.

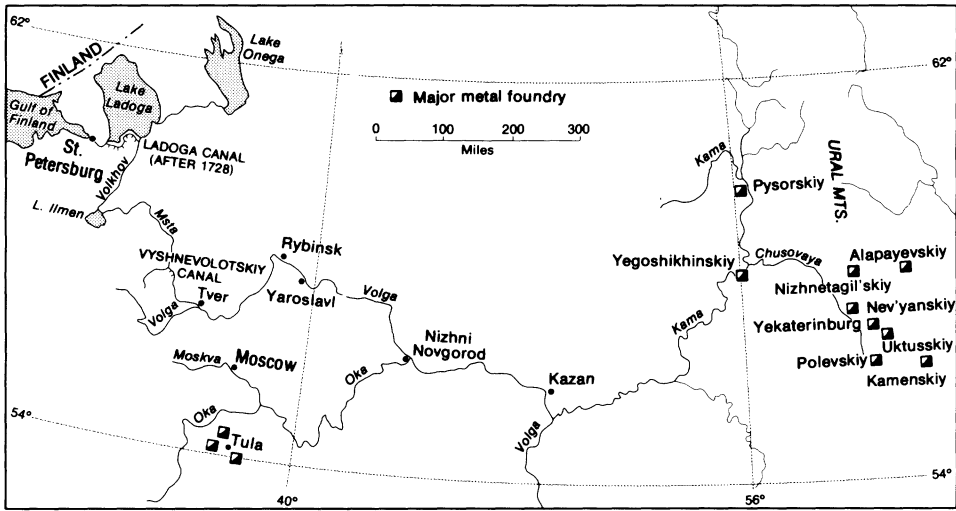


FIG. 3—Urals—St. Petersburg water route circa 1725.

the ill-fated Prut campaign of 1711. After the surrender of Azov to the Turks in 1711, the Admiralty in St. Petersburg became the main customer. The expense of transportation to St. Petersburg reduced the output for the fleet, and the artisans of the anchor workshop were transferred to the Olonets factories in 1722.³⁸

THE URAL—ST. PETERSBURG WATER ROUTE

Improved transportation was required to link the Urals and St. Petersburg. The answer to the problem was a water route connecting the two regions (Fig. 3). Construction of the so-called *Vyshnevolotskaya sistema* went forth between 1703 and 1709. The digging of a canal began between the Tsna and the Tvertsa rivers, and evidence indicates that the canal was being used by 1710.³⁹ Problems arose mainly because the rapids permitted boats to move only in the direction of St. Petersburg and not in the reverse direction. The flat-bottomed boats had considerable trouble in crossing Lake Ilmen and especially Lake Ladoga on account of the prevailing west winds and the frequent squalls. Work began in 1718 on a canal along the southern shore of Lake Ladoga between the Volkhov and the Neva rivers. The canal was in use by 1728, and 1,240 barges had passed through it by 1729.⁴⁰ Peter planned another series of canals, but they were not built in his lifetime.

Most metal factories in the Urals were built along the banks of small rivers that connected with water routes to the capital. The output of those factories moved from those rivers to the Kama, then along the Volga River to Tver (now Kalinin), from where the route to St. Petersburg was along the Tvertsa River,

³⁸ Pavlenko, footnote 32 above, p. 59; and Kirilov, footnote 8 above, p. 188.

³⁹ Rossiya, footnote 6 above, pp. 210–211.

⁴⁰ Suknovalov, footnote 7 above, pp. 81–82.

through the canal at Vyshni Volochek to the Msta River and Lake Ilmen, and then down the Volkhov River to the Ladoga canal and the Neva River. Movement on that route was slow. Convoys of special boats, assembled in the spring at the wharves of the Ural factories, departed on the journey to St. Petersburg and Tula. The convoys were often stopped by strong winds on the Kama River and by the shoals and the sandbanks of the Volga River. Convoys that departed the factories on the Kama and the Vyatka rivers at the beginning of May reached Nizhni Novgorod only at the end of June or the first half of July. Some convoys from Nizhni Novgorod followed the Oka route to Tula and Moscow, but the convoys to St. Petersburg went by a route via Rybinsk and Vyshni Volochek. An average of four to five and a half or more months was consumed by the entire journey from the Urals to St. Petersburg, which the convoys usually reached in September or October. In some instances the convoys did not reach their destination before the river froze and were thus forced to winter en route.⁴¹

The export of iron became an increasingly important item in Russian trade after the end of the Great Northern War. Most of the iron was exported from St. Petersburg and, after 1731, through other Baltic ports. By 1725 Russia was the major producer of iron in Europe. Approximately 60 percent of the production came from state and privately owned foundries in the Urals.

One effect of the construction of the Ladoga canal was a population increase in the immediate area. Thousands of troops along with hired laborers, including 20,000 Cossacks from the Ukraine, were employed in the construction of the canal. New villages arose to house the workers along the canal and the banks of the Neva River. The entire operation cost millions of rubles and was very unpopular at the time. When the bulk of the workers departed, the state serfs remained to service the shipping on the canal and the Volkhov River. Vessels were towed either by horses or by haulers.⁴²

Iron from the Tyrpetskiy and Izhinskiy factories reached the capital by the Suda and Oyat rivers and by the Chagodoshcha, Tikhvinka, and Syas rivers respectively. In the winter, iron from the Izhinskiy factory was brought by sledge to Novgorod.⁴³ The close relationships between iron and copper manufacturing and defense needs explain the long distances over which the output of the Ural factories was transported and the continuation of the Olonets factories in spite of high costs.

TEXTILE MANUFACTURES

The manufacture of textiles was also important to the defense of the country. Textiles were required for ship sails and for military uniforms. The first state

⁴¹ V. K. Yatsunskiy, *Geografiya rynka zheleza v doreformennoy Rossii* [The Geography of the Market for Iron in Prereform Russia], *Voprosy geografii* [Problems of Geography], Vol. 50, 1960, pp. 127 and 130; Roger Portal, *L'Oural au XVIIIe siècle* (Paris: Institut d'études slaves, 1950); and Pavlenko, footnote 32 above, pp. 248–271.

⁴² S. V. Kalesnik, *Peterburg-Leningrad: istoriko-geograficheskiy atlas* [St. Petersburg-Leningrad: A Historical-Geographical Atlas] (Leningrad: Izdatel'stvo Leningradskogo Universiteta, 1957), Vol. 1, p. 20; Sumner, footnote 3 above, p. 82; and A. V. Darinskiy, *Leningradskaya Oblast' [Leningrad Region]* (Leningrad: Lenizdat, 1970), p. 60.

⁴³ Lyubomirov, footnote 16 above, p. 330.

factory to manufacture sails was established in Moscow in 1696, and the activity remained located primarily in the Moscow and the Yaroslavl regions. In the first quarter of the eighteenth century, the state sail factory in Moscow had no fewer than 1,159 workers.⁴⁴ The factories in those regions were close to sources of flax for the manufacture of linen canvas. Although they were some distance from the shipbuilding activities at St. Petersburg, the transport of the sail material presented no major problem.

Peter tended to establish nonmetallurgical factories between 1696 and 1710 in Moscow. After 1710 he established most of his new factories in St. Petersburg.⁴⁵ A factory there in 1718 started production of calamanco, a woolen cloth used for uniforms. That enterprise was small and employed only fifty-eight workers in 1723. Calamanco was also manufactured at Yekateringof, a palace located on the southwestern edge of the city. That factory employed 148 persons in 1724.⁴⁶ Peter's ambition to clothe his troops entirely in Russian-made uniforms in five years was never realized.

Linen was being manufactured for export by the late 1720s. The cloth was sold to foreign merchants at St. Petersburg and Riga, but the export of canvas was prohibited. Canvas was kept in storehouses in St. Petersburg for the exclusive use of the armed forces.⁴⁷ In response to the demands for rope by the navy, rope factories were built. The first state rope factory in St. Petersburg began operation in 1718; another rope factory started in Reval in the same year. A private rope factory began at St. Petersburg in 1722. Until those factories were established in the ports, the major centers of Russian rope manufacture were Vologda and Nizhni Novgorod where local supplies of hemp were available.⁴⁸

The Russian armed forces needed a variety of leather products such as footwear, belts, pouches, and harnesses. Leather factories were built to meet those needs. One of the most important leather factories in St. Petersburg began in 1718. Four leather factories were operative in the city by 1727.⁴⁹ Hides came from the Kazan and Ufa regions, as well as from Yaroslavl, a major center for tanning in the eighteenth century.⁵⁰

GUNPOWDER MANUFACTURES

Equipping the armed forces with weapons and uniforms of Russian manufacture, according to Peter's plans, had to be accompanied by a supply of gunpowder adequate for the needs of the growing army and navy and the prosecution of the war with Sweden. Until that time powder factories had been located mainly in the Moscow region. Peter regarded it as necessary that gunpowder should also be produced in the St. Petersburg area, close to the fleet

⁴⁴ Zaozerskaya, footnote 1 above, p. 22; and Kirilov, footnote 8 above, p. 124.

⁴⁵ Zaozerskaya, footnote 1 above, p. 38.

⁴⁶ Suknovalov, footnote 7 above, p. 75; and Lyubomirov, footnote 16 above, p. 34.

⁴⁷ Lyubomirov, footnote 16 above, pp. 76–103.

⁴⁸ Zaozerskaya, footnote 1 above, pp. 178–179 and 181; and Fuhrmann, footnote 26 above, p. 151.

⁴⁹ Kirilov, footnote 8 above, p. 55; and Zaozerskaya, footnote 1 above, pp. 176–177.

⁵⁰ Kirilov, footnote 8 above, p. 101; and Ye. I. Zaozerskaya, *Razvitiye legkoy promyshlennosti v Moskve v pervoy chetverti XVIII v.* [The Development of Light Industry in Moscow in the First Quarter of the 18th Century] (Moscow: Izdatel'stvo Akademii Nauk S.S.S.R., 1953), p. 147.

and the theater of war. In 1715 he decreed that more gunpowder should be produced in St. Petersburg than in Moscow.⁵¹ A state factory had already started production in 1714 on the banks of the Karpovka River on St. Petersburg Island, at the northern edge of the city. The staff came from Moscow and in 1727 the factory had fifty-three workers. It proved impossible to use waterpower, so horse and manual power was used.⁵² In 1715 a factory was built on the Okhta River, just outside the city. A dam was constructed across the river, and the factory was operated by waterpower. Another factory was erected on the Luppa, a tributary of the Okhta, in 1723. Both factories had eighty-five workers in 1727.⁵³ The banks of the Okhta and its tributaries were a suitable site for this type of factory because waterpower was available and because the location was near the naval installations of the Admiralty and yet far enough removed from the city for safety reasons. It should be remembered that several serious fires threatened the existence of the wooden areas of the city during the eighteenth century and that the location of powder factories in the city would have increased the safety problems.

In 1725 a gunpowder factory was built at the Sestroretsk armaments factory. It had seventy-five employees in 1727 and produced more powder than the other installations in the region, the chief consumer being the fleet. Some powder was also produced at the Arsenal.⁵⁴ In spite of Peter's decree, by 1725 Moscow still produced more gunpowder than did St. Petersburg.⁵⁵ The reason for that situation was probably the closer proximity of Moscow to supplies of sulfur and saltpeter. In the seventeenth century supplies of those materials came partially from abroad. However, with the advent of the war with Sweden, the further development of domestic sources became necessary. Sulfur came mainly from the state factories at Sergiyevsk and Samara (present-day Kuybyshev) in the Volga region. There was also a factory in the Moscow area. Saltpeter came from the central Ukraine and from Tsaritsyn (present-day Volgograd) and Astrakhan on the Volga. Peter particularly encouraged the saltpeter manufacture.⁵⁶ Transportation of the raw materials by river routes to Moscow was easier and more rapid than to St. Petersburg. Charcoal was obtained from local sources.

Allied to the manufacture of gunpowder was the production of special parchment cartridges for the charges of naval guns. Two admiralty factories produced those cartridges. One was located in St. Petersburg and the other at Dudergof (present-day Krasnoye Selo), south of the city, where a paper factory was also sited.⁵⁷ Skins for the parchment probably came from local leather factories.

⁵¹ Geyman, footnote 8 above, p. 261–262.

⁵² Suknovalov, footnote 7 above, p. 68; and Kirilov, footnote 8 above, p. 53.

⁵³ Kirilov, footnote 8 above, p. 53; and Geyman, footnote 8 above, p. 266.

⁵⁴ Suknovalov, footnote 7 above, pp. 68–69; and Kirilov, footnote 8 above, p. 55.

⁵⁵ Geyman, footnote 8 above, p. 267.

⁵⁶ Kirilov, footnote 8 above, pp. 129 and 215; and Ye. I. Zaozerskaya, *Manufaktura* [Manufacturing], in *Ocherki istorii S.S.S.R., period feodalizma: Rossiya v pervoy chetverti XVIII v. Preobrazovaniya Petra I* [Essays on the History of the U.S.S.R., Feudal Period: Russia in the First Quarter of the 18th Century. The Reforms of Peter the First] (edited by B. B. Kafengauz and N. I. Pavlenko; Moscow: Izdatel'stvo Akademii Nauk S.S.S.R., 1954), p. 96; and Zaozerskaya, footnote 1 above, pp. 164–165.

⁵⁷ Geyman, footnote 8 above, p. 251; and Suknovalov, footnote 7 above, p. 76.

CONCLUSION

A defense orientation characterized the basic manufactures established in St. Petersburg by Peter the Great. Naval shipbuilding received top priority. Because Russia controlled only a limited amount of coastline along the Gulf of Finland and faced the continued threat of Swedish attack, Peter located the shipbuilding enterprises in the city under the protective guns of its fortress. Local timber resources were unsatisfactory, and ship timber was imported from other regions of the country. Labor was forcibly recruited from elsewhere in Russia and frequently involved the mass transfer of artisans from factories in other cities.

Supplies of cannons, anchors, guns, and other metal equipment for the armed forces were assembled under severe locational disadvantages. The Arsenal was near the admiralty shipyards, but distant from sources of metals, and its site was unsuitable for the use of waterpower. Those factors restricted operations and forced Peter to develop many metallurgical and cannon manufactures elsewhere. Most such sites had to be on or adjacent to the navigable water routes used to move the goods and supplies to and from the capital.

The location of the large armaments factory at Sestroretsk was a compromise because the site was suitable for waterpower, was reasonably close to the admiralty shipyards, but was far from the metal supplies of the Urals. The factories in the Olonets region partially solved the problem of proximity to metal-ore sources, but depletion of those ores and distance from St. Petersburg meant high costs and uneconomical operations. Though more reliable producers than the Olonets factories, the iron factories in the Urals were great distances from the consumers. The intermediate Tyrpetskiy and Izhinskiy factories were relatively unsuccessful because of the depletion of local ores. The manufacture of linen for sails had few locational problems, because flax was readily available and the finished product could be transported with ease. Gunpowder factories were located at sites where waterpower could be used, near the consumers, but distant enough to pose no threat of fire to the city. Assemblage of raw materials presented some problems.

On the whole, the defense manufactures serving St. Petersburg had serious locational problems, caused basically by the lack of local raw materials and by the necessity to transport them over considerable distances by a slow, inadequate inland waterway system that was inoperable during part of the year. The manufactures thus were high cost and generally uneconomical. The closing of many factories during the decade following the end of the Great Northern War in 1721 underscored the problems and showed that many factories were founded more as temporary necessity than as long-term investments. Locational problems have plagued basic industries of Russia to the present day, and the defense manufactures of Peter the Great were the first to experience the problems. In the context of the time and the available technology, options other than the ones used by Peter were probably not feasible. The development of the Russian fleet and army, their rapid equipment, and the solid foundation laid for the future growth of St. Petersburg witness that Peter, like his chronologically distant successor Stalin, was willing to sacrifice economic solvency for the security of Russia and its capital.