

Hut as a Phenomenon of Russian Culture

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ABSTRACT

Discusses socio-cultural phenomenon called Russian hut, describes how the buildings, the use of the hut and many of the features of operation in the harsh natural conditions. The author proposes a new concept of "housing and economic complex of the farmer". It is a question of Russian cuisine, the life of ancient Rus. The Russian hut has not yet developed its resource, the author of the article believes. After all, she experienced other ways of heating detached houses that require large amounts of heating. The author considers it possible to successfully exist and improve the technology of the Russian hut in a long historical time.

Keywords: *the Russian house, a Russian stove, Russian cuisine, economy, farm, premise, hypocaust, smoke*

1. INTRODUCTION

Russian hut is one of the key phenom of Russian culture. She gave shelter not only to one people, but to everyone living in Russia. The peoples survived thanks to the hut and the Russian stove, which stands in the center of the dwelling.

The peasant who built the hut made a solution to a complex problem. He picked up good logs for the log house, measured them with the plan of the house, prepared the bar for the floors, considered the foundation of the construction, in particular, isolated it from the log house and intuitively calculated the size and depth of the foundation, chose the type of roof, gable or four-sloped, laid out the windows, doors, and all this was arranged around the stove. A man planned, improved and brought to mind the task of survival and strengthening the family, and even house management, which in fact is called in Greek "economy".

The concept of a house cannot but include a barn, a hayloft, a cellar, cattle habitat, a bathhouse, a vegetable garden and a garden.

Any sensible peasant was undoubtedly a good economist, jack of all trades and a strong master. This economist and manager was still the head of the family, mentor of sons and daughters. The rite of Christian marriage in the Church likens it to Christ.

The high status of a person who comprehended his role on earth made him a respectable person, respected and loved by others, both near and far. Capital housing built by man was a miracle man-made.

Over the centuries, a classification of huts has been built, their dozens of varieties. But more often, and more noticeably, there are five-wall huts. Throughout Russia,

they are everywhere, but mainly located in the middle lane of the European part of the country.

This is the most economical and thoughtful home. It is crowded, but comfortable. Usually most of the space is occupied by canopies, where reserves are stored, especially for the winter. In the middle of the hut is a Russian stove, it is located in the residential part of the house and heats primarily housing, but also penetrates heat into the canopy.

Since the hut is enclosed by five walls (around the perimeter and in half, to the cage), it is called a five-wall. The richer hut consists of six walls - along the perimeter, on the side, forming small canopies, and perpendicularly along the furnace. The two inner walls are two matrices, and in the five-walled one. And the attic is large, in the five-walled building it is not so obligatory, although it usually occupies half the house if the owners do not live in the north of the country. There is more and more in the six-wall: both the stove, and the ceiling height, and the enclosed space of the house, and the four-pitched roof; in the five-walled she is gable.

The six-member has a separate dining room, kitchen, bedrooms, and even two rooms in the hallway. From time immemorial, huts were built in two or three floors, and even with a mezzanine.



Figure 1 Photo of the Russian stove from an open source

It should also be noted that the house is called a house of logs – pine, oak, cedar, larch. He is the most comfortable, because he "breathes" and has a beneficial effect on

residents. But in the last two centuries began to build brick, and even stone, buildings. It is difficult to name them: the Russian oven is absent, and it performs the three most important functions – it warms up, small children wash in it, and food is cooked in it. All Russian cuisine was created in the Russian oven. Russian stoves ceased to be built in bulk – a unique cuisine disappeared: not only the famous cereals, soups, kvass, crispy bread and various ovens, but also baked potatoes, okroshka, soaked apples, pickled tomatoes, cucumbers, sauerkraut, which were in hay barrels, as well as medicinal herbs and jams on honey.

2. METHODOLOGY

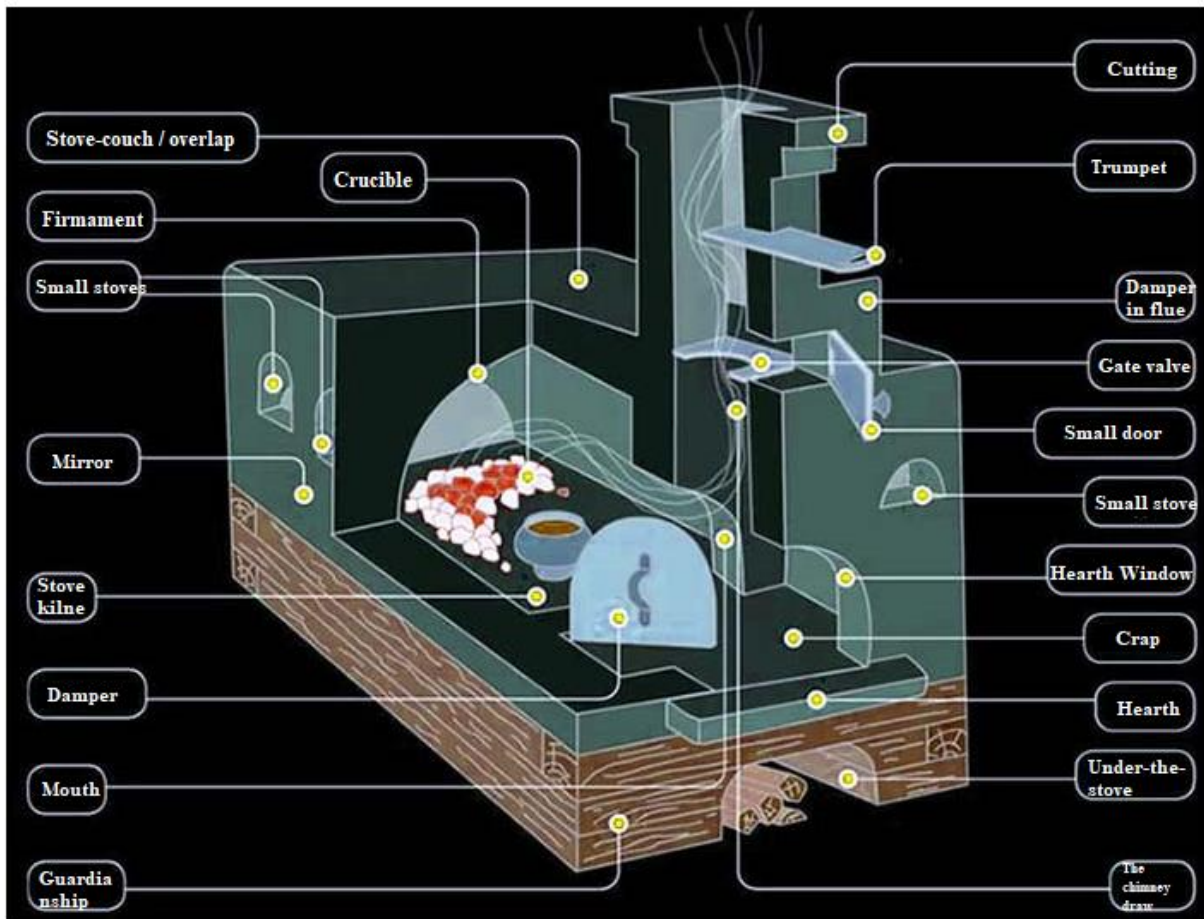


Figure 2 Scheme of the classic Russian stove [1]

In the past 10-15 years, furnaces with a channelless convective system, the so-called bell-type furnaces, have become very widespread. In our opinion, this happened primarily because such systems have a very flexible architecture and offer great opportunities for constructing

furnaces of various configurations (Fig. 2). With the advent of stove-related Internet forums, debate has begun (ongoing and still) about which convective system for brick stoves is preferable. Thus, the topic of bell-type furnaces began to gain momentum even more. The

founder of this trend was the famous metallurgist Vladimir Efimovich Grum-Grzhimailo (1864-1928), and his pupil I.S. Undercity, who developed quite a few designs, as well as furnace concepts, which are widely used now.

Inventor I.S. Podgorodnikov (Podgorodnik) – the author and founder of a series of two-bell domestic stoves, after the Civil War returned to Belarus, to Shklov. There he got a job as a heat engineer at a paper mill. Faced first in their wanderings, and then in everyday life. with the unimportant work of brick heating stoves that did not heat up well, quickly cooled down, and did not warm up the bottom of the room, he, an observant and prone to analysis man, began to think about their improvement. And since 1926, he was closely engaged in the improvement of furnaces. He began to share his observations and doubts with professor V.E. Grum-Grzhimailo, an outstanding metallurgical engineer, author of the hydraulic theory of gas movement. Corresponds with him, builds his stove in Shklov, and travels to Moscow. In 1928, Podgorodnikov received an invitation to go to work at the Moscow Design Institute "Stalproekt"

The main work of Podgorodnikov was the design of metallurgical furnaces, and he spent his free time with V.E. Grum-Grzhimailo devoted to the development, improvement and laying of indoor stoves. The basis was laid on a one-furnace Grum-Grzhimailo (subsequently proved to be ineffective). The disadvantages were taken into account, the designs changed, but the principle remained one-bell. After the death of Grum-Grzhimailo at the end of 1928, Podgorodnikov continued to engage in metallurgical furnaces, and he designed household appliances outside the working hours of the house. The fact that he was interested in this activity is evidenced by the fact that several experimental stoves were built in the summer cottage allocated to their family, in a barn and on the street. Search, reflection and research led him to think about the need to make furnaces not with one, but with two hoods. As it turned out later, it was a revolution in the design of heating furnaces (Fig. 3).

So 1950-55 years. in the city of Semipalatinsk, on the initiative of the chairman of the Gorplan Lurie, in almost all public buildings (schools, hospitals, kindergartens, etc.), the heating stoves were replaced with new, two-bell stoves. Moreover, they had airtight doors and metal casings. The result of fuel economy was amazing, the costs of stove heating were significantly reduced.

One of the goals of the inventor was to improve the widespread Russian stove. Such attempts were made earlier, but were unsuccessful. Only the application of the theory of free movement of gases allowed to solve the problem, and in 1929-30 a Russian stove was created, heating from floor to ceiling, called "Peasant Teplushka", and won great recognition among the people.

Going to work at the Academy of Public Utilities named after K.Yu. Pamfilova, as a senior researcher, Podgorodnikov in 1946-48 He participated in the research of prefabricated furnaces, and also worked on the creation

of a rational heating furnace for long-term burning on solid fuel, the result of which was the appearance of the AKX-9 tiled stove, put into mass production at the KZPSM plant in Catoire.

Having collected research materials, in 1950 Podgorodnikov defended his dissertation at the ACH on the subject of "Designing heating furnaces and the associated thermal regime of a room" – the result of the author's 24-year-old work. The study of furnaces was carried out using hydraulic models, the method proposed by Acad. M.V. Kirpichev. The results confirmed the correctness of the theoretical premises in the design of furnaces based on the theory of free movement of gases. The last paragraph of the dissertation is also indicative: "With my work, I strengthened the national principle in the design of domestic stoves, developed and deepened the new principle invested by Prof. V.E. Grum-Grzhimailo in the design of a room stove – the free movement of gases, the founder of which is M.V. Lomonosov" [2].

Unfortunately, not all ideas were brought to real constructions; the textbook on the furnace business he had conceived was not written. January 17, 1958 I.S. Podgorodnikov died. In addition to a number of modifications of the Russian Teplushka stove, other types of stoves came to life – heating stoves (a two-tier hood), heating and cooking stoves (IP-1, IP-2), a bell hearth, and a long-burning stove. The best test of the rationality of designs was hundreds of letters (in the first editions of his books he indicated the address) received by him from stove-makers and citizens who built these stoves in different regions of the USSR. These were expressions of gratitude, requests to send drawings, questions on masonry.

During the life of the author, several books with drawings of furnaces and their descriptions were published. 19 copyright certificates were obtained on furnaces of various designs, although Goskomtekhnika rejected the application of Podgorodnikov in the 1940s. on the invention of the "Two-story hood", contrasting a similar stove published in 1939. The reasons for this are explained in his dissertation. Unfortunately, the wonderful furnaces developed by the author were not included in any of the albums recommended for the construction of the Gosstroy of the USSR, except for one of the Teplushka models (it had the Gosstroy's indexing PR-4500N). The authorities perceived the engineer as a lone artisan.

Indifference, the desire to improve, eliminate shortcomings, always led him to help other people. So, during the evacuation in the city of Orsk, Orenburg region, at the local bakery, the bread was baked raw, unbaked. Podgorodnikov offered his help in setting up the furnace. The result was a well-baked tasty bread. And the inventor as a reward received a bag of millet, which still had to be peeled to the millet.

A husband was arrested at a neighbor in the country before the war – she was left alone with two children in a blown shield house. Podgorodnikov helped her warm the

house and specially designed a long burning furnace for her. Later they became interested in this furnace at the Katuarovsky plant. In Moscow, in a damp outbuilding ramp, having remade an existing stove, it was possible to turn a cold, almost uninhabitable room into a warm and comfortable, completely changing the life of the residents. For a long time hundreds of letters of thanks came, requests to send drawings, etc. We will give two of them. Accountant E.G. Bragin 62 years of age from the farm to them. Engels of the Penza District, who built Teplushka in his house, writes in a letter dated April 20, 1930: "We fire with fire with a closed door for three and a half months – from December 12 to April 1. Total firewood consumed 3 cubic meters. m. whereas in other rooms of the same size and in the same house in the presence of an ordinary Russian stove and a Dutchman, 8 cubic meters of firewood was consumed m. And as a result, it was always the same equal heat in my apartment, and my neighbors almost had water freezing on the floor. In my apartment the floor was always warm, walking on it with bare feet was a pleasure, as in summer. My conclusion: the stove is convenient and inexpensive in every respect; It will save fuel by half, which will amount to large millions for our Union. It is necessary, without delay, in the order of the government's decree, to immediately build such stoves in all the peasant houses of the Union, even if they had to go to the aid of the peasants by giving them loans, and the poor would never repay, for which they would issue a state loan "Peasant Teplushka". You can't delay. The fuel crisis is growing".

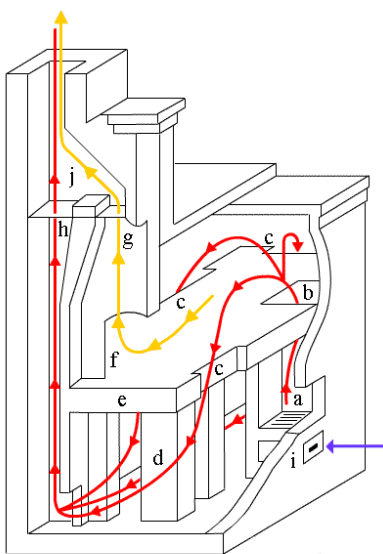


Figure 3 The heat sink, the scheme

An excerpt from the act of June 12, 1945, of the commission of the Academy of Public Utilities and the Office of Architecture under S. M. RSFSR examining the work of Teplushka: M.I. Pugacheva said: "She built the Podgorodnikov's stove in 1929. And it's fine with her

worked until 1939. Then the village stoveman convinced her to replace the Russian Podgorodnikov's stove (1.3 by 1.7 m) with a more compact "Swede". The built "Swede" this one did not suit her either in terms of heat transfer or in her digestive properties, so in 1944 she broke it and put down a Russian stove with a stove in the sixth, the design of the local stove, which she was forced to do due to the death of the stove she had the furnace of Comrade Podgorodnikov and in view of her lack of drawings of "Teplushki" [3].

At present, Pugacheva clearly shows that the best stove was the Podgorodnikov oven – it was heated not only with wood, but also with anthracite. They always drowned only once a day; the house was warm, she attributed this to the warm wall structures; Now he sees that it was in the furnace. "Swedish" had to be drowned twice a day. The control of the valves was very simple; In the summer, Pugacheva often drowned the stove like an ordinary Russian, that is, she made a fire right on the bottom of the stove, and not in the firebox. Last used in the winter and with great cooking. If she had the opportunity, she would gladly replace the existing furnace again with a Podgorodnikov furnace [3, 4].

3. RESULTS

The life in which technical innovations and digital technologies came noticeably has changed. But the natural environment leaves, being replaced by standard materials, such as plastic, silicate brick and many simple and cheap appliances. In the twentieth century, the world was standardized, so globalization came.

The hut is not only a dwelling for a peasant herder and a farmer, but also the center of his economic activity, his social activity (Fig. 1). Therefore, it is more logical to define the Russian hut as a "housing and farming complex of a farmer" (HFCF) [5]. And what is important to note, this socio-cultural phenomenon outgrows its highly specialized purpose, in the national and domestic sense. Indeed, in the Russian hut, representatives of all the peoples of Russia grew and lived for centuries, it preserved the vast majority of its national cultures in a harsh climate.

First of all, it should be noted that the housing and communal services was formed in the most severe climate, because central Russia, or the Central Russian Plain, is located in the area of risky agriculture, where the average annual temperature is 5 degrees. In Canada and Scandinavia, which are unfairly edified, it is much warmer –2, –3 degrees, because the Gulf Stream flows in these world regions, and people live there most of all in the southern regions.

Therefore, the crops in Europe and North America have always been "sam-7" – "sam-9", but in Russia – not higher than "sam-3" (meaning that one seed thrown into arable land gave from two to nine seeds of the crop). Now, little has changed in this, because it takes 7 months

to heat homes and jobs, but the crop may not succeed. Cattle also cannot graze on pastures for a long time. In addition, in Russia one cannot expect to grow agricultural crops in more than 5 months. From here comes one important feature of the Russian character: to be able to quickly and dexterously perform hard work.

In such conditions, the Russian log hut helps out, because this building shelters from any weather, cold climate, and even allows you to feed on quality food and saves cattle from frost and hunger.

The hut is set quickly, but building materials should be prepared in advance. Otherwise, the dwelling will not stand idle for a long time: a bug will eat it up, destroy the mold, destroy the fire. Therefore, you should pick up the wood, process it, adjust according to the parameters and then build the house. Pines with healthy wood and bark usually become the basis of the hut [6]. The lower part of the tree trunk goes to the house, and the upper to the bathroom and outbuildings.

But before this, the logs are processed. From ancient times, heated the bark, they were laid for several months in a pit with salt water. Then they transferred to another pit with melted resin. Or cultivated on the ground, pouring hot resin. If the dried logs, when tapped by a pickaxe, rang, they were recognized as fit. No bugs, no mold, no fire took them. With the most careful processing, the tree became the most reliable material: durable, "breathable", resistant to environmental influences. Huts from oak, larch, cedar, built in the XVIII century., As a rule, are still standing. It is now sold a lot of impregnations, making wooden building materials protected from both fire and insects and rot.

While the woodwork was underway, a Russian stove was being built at the hut's construction site. It was best built by a hereditary stove-maker who knew how to build a crucible with a vault, a chuck with a hearth, a mouth with a cheek, a chimney and hoods, and then it was most clever to clean a long chimney. As soon as the stove was ready, it was possible to erect a log house and put up the walls of the entire dwelling.

Russian huts were distinguished by a wide variety of designs, these are huts with a small residential part (if with a gable roof), six-walled or with several rooms (with a four-gable roof), two-and three-story, with large and small canopies, with cellars and glaciers, or an underground, tubular or shaft well and so on. You can count dozens of types, the main among them are northern huts with large canopies and an attached farmyard, sometimes on stilts (the dwelling of hunters, artisans), and simple five-walled houses (housing of poor or lonely peasants). The classical hut in central Russia is a gable five-wall with large canopies, and a wealthy family with a huge household in the yard could live in it. A large family of three generations could fit in any hut – in cramped conditions, but not in insult – but a strong man with adult sons was able to rebuild more quickly. By the way, in order to help such families, Russia still has a law on the

free provision of 150 cubic meters of solid wood for housing.

So, the stove is ready, you can put a log house – the residential part of the hut. Before that, the log house should have gathered and dried in the sun in the summer months, and all its parts should be adjusted to each other. Then it is disassembled and each log is checked for reliability, and, if necessary, is oiled again, or replaced. The final assembly of the log house occurs only around the furnace. A log house (and then a canopy) is placed on a stone, brick or reliable wooden base, isolated from the log house with materials impregnated with resin or other insulating materials (roofing, birch bark, tow).

Then, a canopy with a porch, a crate is attached to the log house, moreover, the entrance to the house is not at the door of the residential part. Then the rafters are erected, a roof covering the canopy and the log house is attached to them. The floor is also being made, along with three or six windows with platbands, two doors, drapes, a table, benches. A house is considered a dwelling for people when a furnace is melted, a samovar is placed on a table, a lamp or candle is lit in front of the icon in the red corner, and the family sits down in benches.

Gradually, the hut settles in with dishes, household tools, and then food, baskets, baskets, pastries and various toys and knitted and embroidered things, or even a cradle.

The economy is growing due to the indispensable bathroom, barn, farmyard, vegetable garden, at best, and a garden. An important place in the household is given to cages and canopies, which in the summer turn into a bedroom and a place for children's games, and in the winter in a storehouse of food supplies, a nursery for lambs, calves, chickens, and also for gatherings for village youth. The canopy even at any time of the year serves as the air condition of the hut: when the street is not very cold and even hot, the door to the house opens and the house becomes cooler. If it's frosty, on the contrary, the melted furnace heats the walls of the log house, the pipe itself, and gets warm in the hallway.

In addition, in the canopy there are winter stocks of the family: lari with potatoes, cereals, flour, and other equally important dried vegetables and fruits. Barrels with sauerkraut, light-salted tomatoes and cucumbers, with soaked apples stand along the walls.

But the center of the whole family world is the Russian stove. It is always warm here, the fire plays merrily, mother and grandmother, and also sisters, bake pies with apples, cherries, cabbage, sometimes with meat. But in the Russian oven, the cabbage soup, pancakes, cereals covered with a brown crust, kvass, compote, bread, magnificent flat cakes are always the most delicious, and in the summer it's okay kvass, which completely removes thirst in the heat when they pour a plate with fresh tomatoes and cucumbers, meat, green onions, horseradish, sour cream, a little sprinkled with salt [7].

As you can see, the historical dwelling of a Russian man is completely interfaced with his life, in accordance with everyday traditions and seasonal conditions, but the hut is

a more universal phenomenon, stylistically rooted and therefore permanent. In addition, the type of home in harsh climatic conditions most fully demonstrates the owner's work ethic, fully involving him in the social and labor process, and thereby in the perception of the world around him. The structure of life among the Eastern Slavs gave rise to rich vocabulary, and original folklore, and a way of thinking, which became not all clear and necessary. For example, a large dictionary of names from the life of peasants and artisans in the housing and communal services, defining the world of labor and the universe, has gone out of use.

The stove gives warmth to the home and unites the family. Someone chopped wood, someone brought them home and dumped them in front of the firebox, others melted the stove and cooked porridge and cabbage soup, set up a samovar, and then they all gathered at the table and had lunch to talk about the economy and events in the village, the country and the world.

Fire in the house is the first thing. And the Russian stove, which is indispensable in harsh climates, carried a lot of heat. But the meaning of this concept is changing, sometimes any heating structure is called the Russian stove.

A similar heating system – a tiled stove – has been operating in Europe to date, although it, in our opinion, is more cumbersome and energy-intensive. In geographic central Europe, it was most often heated with coal, and from briquette savings – pressed coal chips. Nowadays, gas burners are often installed inside a tiled stove, and with this innovation everything ends, if you do not keep in mind all kinds of electric heating systems.

But in Russia, central heating reigns, however, there is a greater variety – stoves, Dutch, bath stoves, for almost a hundred years, as the "Teplushka Podgorodnikova" appeared, which is constantly being improved [8].

Having locked a fire in an enclosed space, our distant ancestors laid the foundation for the art of pechestroeniya. At first it was a hearth, fenced by walls in a semi-dugout. Thus, the dwelling was heated "in the black" – smoke came out through narrow openings under the roof.

Later, a chimney appeared (a method of drawing smoke and soot from the furnace) and channels in the furnace.

But the hearths of the furnace were not called until the grate-fired furnaces appeared. When the grate fire chambers appeared, it was necessary to somehow separate some furnaces from others, hence the name hearth furnace and grate fire chamber in a round furnace. The latter is characterized by the presence of a cast-iron or steel grate on the bottom of the grate, through which air enters the furnace.

The main feature of the Russian stove is a tunnel-shaped vaulted cooking chamber – a crucible (Fig. 2), which is heated to 200 gr. C. This is exactly the temperature required for baking bread. In addition, the heated crucible for hours keeps heat, which means that you can simmer milk in it, boil friable cereals, and cook roast. This design rested on a wooden guard.

It is easy to list and explain the reasons for the popular recognition of the Russian oven: it is baking bread, cooking and evening warming up food; cooking (steaming) feed for livestock; preparation of hot water for household needs (washing dishes and floors, washing clothes, etc.); drying clothes, vegetables, mushrooms and grains; use of the cooking chamber as a steam room; the use of the furnace ceiling (along with the adjusted gates) for sleeping in the cold season; heating and ventilation of residential premises.

The main disadvantage of the classic Russian stove is that it weakly heats the lower layers of air in the room. Studies of the thermal efficiency of the Russian furnace in the 1940s yielded a result of 68%. Therefore, in order to maintain a normal temperature in the room, the Russian stove has to spend a large amount of fuel.

Teplushka removed one drawback of the Russian classical stove – incomplete heating of the space above the hut floor. This qualitative arrangement is complicated only by the fact that a chamber with lower heating appears on the path of the gases. And it's more compact [1].

4. DISCUSSION

Today it is rarely possible to meet the classic Russian stove. If it comes across one of the old village houses, then most likely it will be an improved Russian stove, which does not have a wooden underfloor and with an additional stove attached to the front of the furnace or to the side of the stove.

This design is called "Teplushka", it was developed by Podgorodnikov.

In the design of "Teplushki", in contrast to the classic "Russian stove", the bottom of the stove was heated, which greatly improved its efficiency, the climate in the house with such a stove became more comfortable. There are still various furnace designs belonging to other inventors [1].

But the most popular were Teplushki, which replaced the traditional Russian stoves, and already these stoves were called the "Russian stove", or Podgorodnikov's stove "Teplushka". The main difference between Teplushki and classical Russian stoves is the heating of the lower oven rows.

Moreover, a whole branch of wooden construction is emerging, both in Russia and abroad, and mainly in North America, which can be called building industry. At the same time, abroad are embarrassed to talk about the Russian roots of wooden structures.

We managed to find instructions from the American annual magazine: [9]. Here, step by step, it is described how to put a log cabin of a small hut from processed round logs (round logs). The background is as follows. The 1961 USSR-US Caribbean crisis spawned the "survivalist" movement in the west. Enthusiasts-hikers somewhere got blueprints, either gatehouses, or bathhouses, or hunter's huts, and began to build a hut in

completely Russian style, and a bomb shelter was nearby. Thus, we have only the technology for building a log house in American style, in fact, it is in Russian [10].

Already in the new century and in Russia, fans of the post-apocalypse subculture appeared. Some just like to dream about a possible BP (combat situation), they read books like “Metro 2033” or “Marauder”, play computer games of the “S.T.A.L.K.E.R” and “Fallout” series, and collect numerous films about “survivors”. Only here are some important costs that we recently wrote about in an article [11].

There are not so many traditional heating systems for dwellings in countries with a warmer climate than in Russia. It is believed that the first smokeless heating system in Western Europe was invented by the ancient Romans, and it existed until the VI century. AD, the time of the fall of the Roman Empire [6]. Both are inaccurate.

Firstly, this system was continued to be used in most of Europe, and later it was upgraded to a “underfloor heating system” – a stove under the floor, on top of which granite stones were laid to let out hot air through the valves in the floor. This means that the room, thanks to just one furnace fire, could remain warm for several days.

This is a hypocaust (hipokaust or gipokaust) – a heating system that distributes heat from the stove under the floor throughout the space [6, 12]. The heat was then absorbed by the floor and went up the room. The effect was similar to a modern hot water heating system or an electric floor heating system. The Roman hypocaust was characterized by the presence of empty space under the floor, which was created with the help of small pillars covered with floor slabs. Sometimes heat also passed through the voids in the walls, helping to warm the room.

Secondly, the Romans were not the first to come up with a heating system in which heat from the fire spread under the floor from one side of the room to the other. The Chinese kang and dikang, the Korean ondol and the Afghan tawakhaneh were based on a similar principle and belonged to an even earlier time. In addition, the Romans probably learned about technology from the Greeks. However, it was the Romans who modernized the hypocaust into a more sophisticated heating system, especially in the public bath houses that were built throughout Europe and the Mediterranean.

The technology was also popular in the Eastern Roman (Byzantine) empire and was used in hammams by the Arabs who again popularized the hypocaust in Western Europe when they built the Alhambra Palace in the 13th century. Smaller and cheaper systems used pipes instead of poles – they were also used in small buildings. These hypocausts heated only part of the floor. A similar hypocaust is still used in a remote village in Spain.

Due to the small thermal capacity, the Roman hypocaust had to be launched constantly. The addition of a stone room to create a heat storage of the hypocaust facilitated the accumulation of heat, which meant there was no need to constantly heat the furnace. In 1822, many experiments were conducted to increase the effectiveness of the 400-

year-old hypocaust system in the Polish castle Malbork. One such experiment consisted in heating a castle banquet hall with an area of 850 square meters [6, 7, 12].

On April 3, a cold stove was heated for three and a half hours, using 0.7 cubic meters of expensive wood. When the valves in the tile opened, hot (200 °C) air burst into the banquet hall, raising the temperature from 6 to 22.5 ° C in just 20 minutes. Then the shutters were closed. By the next morning (April 4), the air temperature in the room dropped to 14 ° C. The dampers were reopened and the temperature rose to 19 ° C in one hour – without additional kindling of the furnace.

On April 5, the air temperature near the valves was 94 ° C, and the temperature in the room increased from 10 to 16 ° C in half an hour. On April 6, three days after the fire was extinguished, the air was still hot enough to raise the room temperature from 10 to 12 ° C. Even on April 9, six days later, warm (46 ° C) air rising from the valves managed to raise the temperature in the room from 8 to 10 ° C [6].

Hypocaust heating systems were mainly used in the Baltic region of northern Germany, Denmark, Sweden, Finland, Estonia, Latvia, Lithuania and Poland. To a lesser extent, they were common in the south and east, in places such as western and southern Germany, Switzerland, Austria, the Czech Republic, Hungary and Russia. Most of them were built in the 1400s and 1500s.

A study of the history of the hypocaust heating system continues to this day. In his 1998 innovation study, Klaus Bingenheimer found that in Medieval Europe there were a total of 500 hypocausts, 154 of which were equipped with thermal storage. Since then, however, more hypocausts have been discovered. For example, while Bingenheimer had evidence of the existence of only two hypocaust heating systems in Estonia, a 2009 article by Andres Tvauri already listed 95 such systems [5-7, 12].

An overview of Andres Tvauri's hypocaust heating system in Estonia is teeming with technical details. Special coverings or plugs made of metal, stone or burnt clay were supposed to “seal” the valves with hot air in the floor tiles. Small ceramic dishes were placed in hot stones directly under these holes. It is believed that water was poured on them to get steam and thus increase the level of air humidity.

In Tallinn's houses, a room with a hypocaust heating system and a heated bedroom on the ground floor were usually connected by a stairwell.

The furnace was covered with a cylindrical arch, on which stones with a diameter of 40-50 centimeters were stacked to accumulate heat. The vault bricks were laid so as to form three or four arches with gaps of about 20 centimeters in between, and medieval builders probably used an old barrel to form the vault arches. It was there that the furnace itself was assembled [2, 6, 12-15].

Nowadays, in Russia, at dachas and in country houses, Russian stoves are most often built using simplified technology. But this is not actually a Russian stove, but a “non-Russian” one. In our opinion, the builders (or the

owners of the site) do not take into account the entire furnace system, simplifying it. And they build, for example, a furnace only for heating.

Perhaps, through collective efforts, a new product will be created cheaper than basement units with powerful titans? After all, the stove in Russia remains relevant, but in Western Europe, especially on the British Isles, in the short winter you will not always find heated houses or rooms, it is expensive, especially since they cannot keep up with hypocausts in this part.

In our opinion, the Russian stove and log hut have not yet exhausted their resources, having survived other methods of heating detached houses that require large amounts of money to heat. But it remains relevant to develop, on the basis of the Russian hut, new modern improved housing technologies.

5. CONCLUSIONS

We have already acquainted the reader with the Russian hut, explained its signs, so we will avoid characteristics similar to those that claim to have an exhaustive understanding of the subject of conversation. Moreover, the ancient log hut cannot but differ from the modern one. New design improvements of the Russian stove in the USSR and Russia were also examined in detail, but they did not exhaust this technical issue. On the contrary, a new problem has arisen related to the Russian hut, which we discussed in the Discussion. Those who are interested are referred to our works and book [16].

The most important thing is that the Russian hut and its indispensable application, the Russian stove, marks an important concept of Russian culture. This is a large-scale problem, which is enough to cover and analyze more than one generation of culturologists, builders, heat engineers.

REFERENCES

- [1] K. Korepov, Myths and truth about Kuznetsov's furnaces, Available at: <https://www.tproekt.com/mify-i-pravda-o-pecah-kuznecova>.
- [2] Kris De Dekker, Heat Storage Hypocausts: Air Heating in the Middle Ages, 2017, Available at: <https://www.lowtechmagazine.com/2017/03/heat-storage-hypocausts-air-heating-middle-ages.html>.
- [3] A. Batsulin, Inventor and designer of domestic stoves I.S. Podgorodnikov (1888-1958), 2011, Available at: kirpichiki.pro/readarticles/podgorodnikov.html.
- [4] V.I. Nemtsev, Russian stove and medieval options, *Science and Culture of Russia* 1 (2017) 12-14.
- [5] V.I. Nemtsev, The hut as a shell of Russian culture and clothing as a shell of a person, *Science and Culture of Russia* 1 (2016) 117-120.
- [6] Admincheg, Hypocaust: how rooms were heated in the Middle Ages, 2017, Available at: http://muz4in.net/newsgipokaust_kak_otaplivali_pomeshchenija_v_ehpokhu_srednevekovja 2017-03-16-42836.
- [7] V.I. Nemtsev, Questions about Russia, Monography, Publishing Solutions, Ekaterinburg, 2016.
- [8] I.S. Podgorodnikov, Long-burning furnaces, *Rural construction* 1 (1992) 32-34.
- [9] How to put a blockhouse, *Popular mechanics: instructions from the journal*, 1983.
- [10] V.I. Nemtsev, The philosophy of the Russian hut, In the manuscript, 2020.
- [11] V.I. Nemtsev, Hemingway and a new type of war, *Bulletin of the Samara Scientific Center of the Russian Academy of Sciences* 21(66) (2019) 66-70.
- [12] K. Bingenheimer, Die Luftheizungen des Mittelalters, Zur Typologie und Entwicklung eines Technikgeschichtlichen Phänomens, 1998.
- [13] R. Atzbach, The 'Stube' and its Heating, Archaeological Evidence for a Smoke-Free Living Room between Alps and North Sea, in: *Dwellings, Identities and Homes, European Housing Culture from the Viking Age to the Renaissance*, (2014).
- [14] K. Truu, Keskaegsed kerishüpokaustid Tallinna vanalinnas, 2016.
- [15] A. Tvauri, Late Medieval Hypocausts with Heat Storage in Estonia, *Baltic Journal of Art History* (2009).
- [16] G.Ya. Fedotov, Russian stove, Eksmo Publishing House, 2003.