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Computing in Russia

The History of Computer Devices and Information Technology revealed

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The calculating machine invented by Jacobson was preserved and now is kept at the M. Lomonosov Museum of Science in St. Petersburg [1]. Its first description was given in the works [2] and [3]. The inventor of the machine, Jevno Jakobson, was a mechanic and clock maker from the town of Nesvizh in West Russia (now Belorus). The machine is executed as a brass casket with a richly decorated cover. From the style of its ornament, one can conclude that it was manufactured before 1770. The machine was very compact. Its dimensions were: 34 cm long, 21.8 cm broad and 3.4 cm high. It had four turned legs, 1 cm high and 1.6 cm in diameter each. Jakobson placed pinion groups of neighboring tens on different levels and thus very efficiently utilized the case's volume. Aside from the rich ornament, the machine's cover also had several engraved numbers

1 One of the first known integrators in Russia was designed by the naval engineer A. Krylov (later an admiral and famous mathematician) in 1904 in St.Petersburg. (see the biographical article).

2 For more on inventions by A. Shchukarev, see the articles by G.N. Povarov.

and inscriptions. For instance, interestingly, the same text in German and Polish: "Mechanische Rechnungsmaschine" and "Machina Mechaniszna do Rachunku". Another interesting inscription: "*Zu der Aufgabe des Addirens, Subtantirenes, Multiplicirenes, und Devidirenes von den Nummer Eins bis zu Tausend Millionen und ubrig bleibt von der Division und das kann man hier in der Bruchen zertheilen*". About himself, the inventor wrote: "*Erfunden und verfertigen von dem Hebreer Jewna Jacobson, Uhrmacher und Mechanicis in der Stadt Neswiez in Lithauen, Gouvernement Minsk*". All other inscriptions were also in German. Since the city of Minsk as a part of West Belorussia (incl. Nesvizh) belonged to the territory of Lithuania only until 1793, when East Poland was officially included into the Russian Empire, Jacobson could only have made his machine before 1793.

Fig. 1 Calculation machine of J. Jakobson (1770)

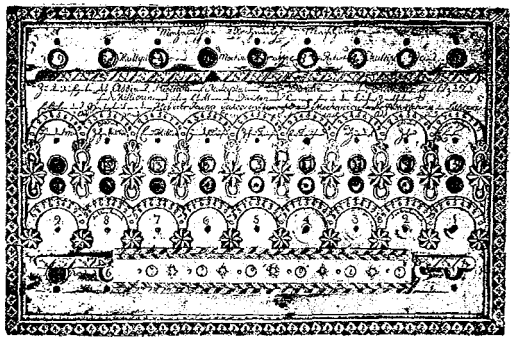

Фото 9. Машина Якобсона

The machine's design is basically a classical pinion wheel combination for addition, subtraction and tens carry operations, which takes its origin in Schickard's machine. Nevertheless, despite the seeming similarities, Jakobson's machine has some original features and is generally more advanced. It is also not clear whether Jakobson knew anything about the work of Schickard at all. Anyway, he did not make a copy but introduced his own component, namely a semi-disk, which performed the functions of both the input device and the first step in the train of gears.

This machine operated with numbers up to nine tens in length, and was mainly intended for adding or subtracting. The inventor himself also suggested its usage for multiplication and division. The performance of the former operation was additionally facilitated by the multiplication table, which was engraved on the cover.

A well-known way of multiplication in every adding machine is a series of addition operations, but it suggests no necessity of real adding it to itself N times (where N is a factor). For example, the calculation of the product of 327*145 does not mean that 327 is added to itself 145 times. There are more rational methods. The multiplicand is multiplied by hundred and the result is stored (written down). Using the machine, it is then multiplied by 40, that is 327 is added to itself three times and the result is also written with an additional zero. After that, 327 is multiplied by 5 (added four times with the machine). Finally, the three intermediate results are all added together. In this example, multiplication is performed with nine machine additions, and supplemented with writing the intermediate results on paper.

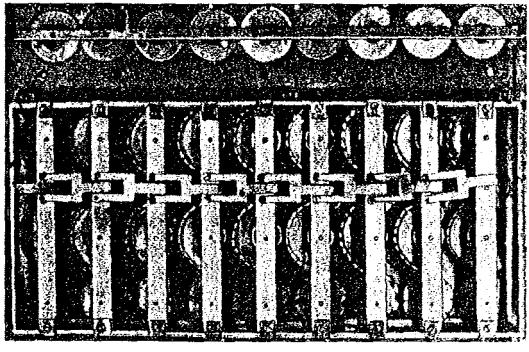

Fig. 2 The mechanism of Jakobson's machine

In an operation of division, the number of the divisor subtractions from the dividend was calculated by the machine itself. For this purpose, an auxiliary mechanism was built in. The

machine also had a special device for storing the intermediate calculation results, and an interesting input device. The numbers were dialed with special keys. Obviously, Jakobson implemented them in order to minimize the efforts necessary for driving the decade transfer mechanism. Since it was a lever of a certain length moving in and off itself, the correctly calculated key could bring the efforts to minimum. Perhaps one of the most important features of Jakobson's invention was its convenience in operation and its very high reliability. As a result, it was a very practical device. The numerous deep traces of driving keys on its cover also could be evidence of its intensive usage.