

## CONVEYING, BUILDING, ROAD MACHINES AND EQUIPMENT

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Specialty "Conveying, building, road machines and equipment" refers to the priority areas of technology. In any economic system in the country will build roads, run the mechanization and automation of heavy lifting and transport operations, and therefore will need specialists in these fields. The department prepares mechanical engineers of the generalist who own modern methods of design, operation and repair of vehicles.

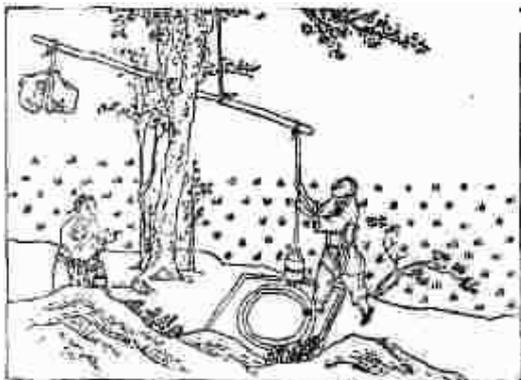
Due to continuous growth of road construction experts on road-building machines are always in demand in organizations and enterprises related to construction, renovation and maintenance of roads.

The history of creating industrial machines. Ancient history

Devices for lifting or moving loads have been known in antiquity. Already in the early stages of human development was necessary in devices for lifting heavy loads (fallen trees, heavy blocks of stone). Lifting and moving a very large weight loads for buildings in the ancient world, such as building the pyramids of Cheops in more than 2000 years BC. er., waterworks in ancient China, in the valley of the Yellow River, built in ancient Rome, have been impossible without the simplest of lifting devices.

The earliest lifting means, apparently, were the levers, rollers and the inclined plane, which allowed to lift and move loads without the use of intermediate parts (chains, ropes), connecting a lifting device with a load. Rollers, levers, inclined planes (ramps) were used, apparently, still in the construction of ancient stone buildings - the dolmens. With their help, transporting and installing the huge sculptures for the Assyrian palaces and temples and huge stone slabs in the construction of the pyramids in ancient Egypt.

Much later came the device, which lift and move cargo through the intermediate element (rope, flexible branches of a tree), these devices include gate block.



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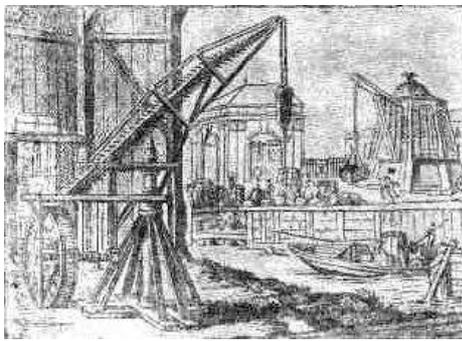
Scissor lifts (a prototype of the boom crane) used for lifting water in ancient China, India and Eastern countries. Long before our time of reckoning in China used the horizontal and vertical winches, hand operated.

Later, the Greeks were put into practice the ore-lifting, transport and construction horse collars, tackles and complex lifting equipment, consisting of unfastening the ropes inclined columns with constant or variable angles to the horizon and the pulley suspended from the posts with simple grippers for unit loads .

Further improvement of these facilities by the Romans led to the creation of rotary cranes. According to the description of Vitruvius, related to the I century BC, the cranes are mounted on a solid wooden beams, which could rotate on rollers in any direction. The rise of such cargo cranes could be at a height of 12 m, they cited the operation of a manual gate or through the mill. In ancient Rome, first appeared as cage lifts - prototypes of modern elevators.

#### Western Europe.

In Western Europe, XI-XII centuries, there is a further development of technology. In XIV-XV centuries. in connection with the development of commerce and navigation and the growth of mining and metallurgical industry has been some improvement lifting devices.



As the mechanical design of hoisting facilities improved. Appeared winches and tackles that allowed by a combination of them to move and lift heavy loads at high speed and with less effort. Compound gate with a block or pulley set up the main component of lifting equipment - lifting mechanism and gave impetus to the emergence of different types of construction cranes (slewing, portable). Interesting examples of past work for lifting hoists, winches and blocks can be found in the history of technological development of our country.

The appearance of distinct structures of cranes to the period of XIV-XV centuries. When in Europe (Italy, Germany, and Czech Republic) were created swivel, jib cranes and chain with the skeleton of wood and horse-driven through a treadmill. In connection with the industrial development of Europe crane building was developed in the late XVIII and early XIX century. after the invention of the steam engine (Watt, 1763).

Feature of the lifting mechanisms, installations and devices put into operation before the XIX century. Was the use of wood as building material for critical components (cores, pillars, gates, etc.). For example, the rim and the teeth of gears in these mechanisms and installing wooden. Steel is used only long parts such as axles, ratchets, hooks.

Replacing wood with metal begins relatively widely implemented only in the first quarter of the XIX century.

In the twenties of the XIX century in Paris, was built entirely of wood first gantry crane. Wood and wood-on-metal bearing structures of bridge and gantry cranes, portal cranes of arrows are often used relatively more in the last quarter of the XIX century.

Activation of this mechanism and installations carried out by muscle power of man or animal. Water engines, known to the ancient peoples of the Middle Ages and wind turbines have not received them wide distribution. Only at the beginning of last century when the development of industry and transport are increasingly there was a need to lift heavy loads, increasing the lifting speed and lateral movement, begins to apply machine drive for heavy-duty cranes and lifts for the general purpose.

The earliest time for use in machines of this group was a hydraulic drive, which served as the working fluid water supplied to the working cylinder under pressure, several tens of atmospheres. The beginning of this drive is the end of the XVIII century. However, the first crane with hydraulic drive was launched in England in 1846-1847gg. And only in the second half of XIX century. hydraulic actuator widely used in stationary and mobile cranes, passenger and freight lifts (elevators), jacks, etc.

In 1811, Betancourt in Russia was built multi-Scoop dredge steam-driven, in the 80's of last century was built the first steam railway crane and in 1877 - cable crane. About this time that the creation and design of bridge and gantry cranes.

In the thirties of the XIX century. in England (1827g.) was first carried out the construction of a stationary steam crane. But thereafter, steam-driven cranes do not have a noticeable spread due to imperfect design. In the 90 years. XIX century. Due to improved steam power plants, reducing their overall dimensions and weight, the steam valves are gradually replacing hydraulic cranes.

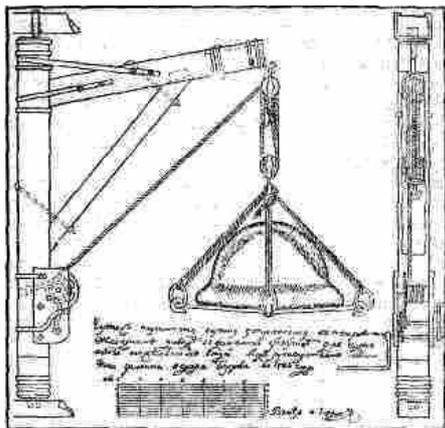
In 1880, Germany had built the first electric elevator (lift) with a lifting mechanism, consisting of an engine, the worm gear and toothed wheels that engages with the teeth of the fixed guide rail. At the same time in Germany was built by an electric bridge crane with a drive of all the mechanisms from a single motor, and in 1889, the U.S. was put into operation the first electric overhead traveling crane with individual electric load lifting mechanism, movement of trolley and crane bridge movement. In 1885 and 1891. application of electric drive extends to gantry, semi-and stationary cranes. In 1895, for a mobile crane was first used to drive internal combustion engines.

Industrial crane building was developed especially after the invention of the electric drive. With the advent of the electric drive in Germany were established electric winch-Friction (1880) and electro-reversing (1908). This period is the creation of electric lifts (1880) and overhead cranes.

With the development of housing and industrial construction has appeared a need for cranes to replace the heavy human labor. In 1902, were created jib-crane, consisting of a metal boom (the flat triangular trusses) with the blocks mounted on wooden tubular mast and a winch mounted on the ground. In 1905, Germany was first established free-standing swivel stationary, and in 1908 - the mobile tower cranes with luffing with trolley moving on the boom. In 1914 was created by tower crane with a lifting boom, which has all the basic features of modern designs.

#### Russia

At the end of the XVII century. in the Moscow Kremlin has been raised with hand winches (winches), using counterweights and levers Tsar bell weighing over 130 tons

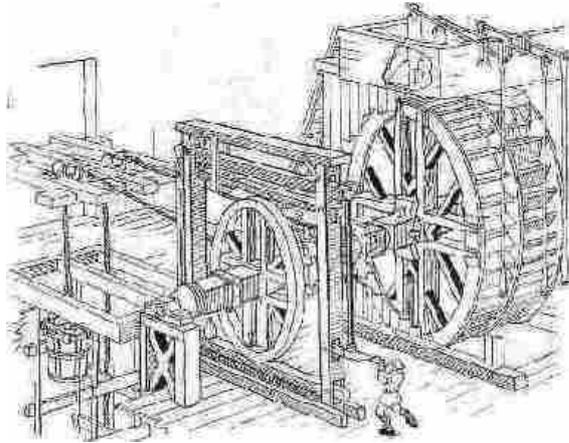
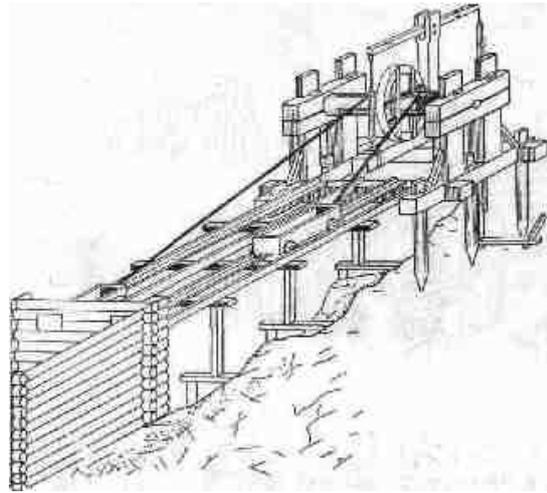


winches at the same time were placed on the tower. Raised in advance small loads, counterweights were placed on platforms suspended from ropes thrown over rectangular blocks. The use of balances significantly reduced the effort to lift cargo.

The figure shows a device for lifting the ore, as proposed in 1752 two loading platforms were connected with the collar so that the ore laden platform under its own weight component of the platform and the cargo is moved down and lifted at the same time arranged in parallel empty platform. To control the speed of descent was used one shoe brake pad system of levers which operated on a large brake wheel, impaled on the shaft of the gate. Such pendulum pitched devices have found application in mining industrial practice.

Until the XVIII century. main sources of energy for lifting equipment were muscular strength, human or animal and the power of falling water. Frolov's machine, equipped with two alternately rising tubs, set in motion the power of falling water. Change direction ropes could move through a special gate the flow of falling water on the right or the left half of the drive wheel. The car was equipped with a single shoe brakes, a manually operated via lever system.

Example of the use of winches, pulleys and rollers for moving goods over long distances can serve as delivery of a granite stone weighing about 1000 pounds for the base of the monument to Peter I in 1769 Stone was moved to a special deck of two wooden frames, clips, had longitudinal grooves, reinforced with sheets of copper . In the trenches between the upper and lower cage, placed the bronze balls. Cage with the balls form a kind of ball thrust bearing. As we move forward under a stone is placed on top of a wooden frame-holder, fit new bottom cage with balls.



With the help of wooden woods and wooden gates in the years 1828-1830. in St. Petersburg was carried out works to install the columns of the colonnade of St. Isaac's Cathedral bunk, and in 1832 - installation of the Alexander Column, whose weight exceeds 600 tons.

In pre-revolutionary Russia still has about one hundred and fifty years ago, individual custom manufacture of cranes was conducted in the Kostroma mechanical plant. At the end of the XIX century. production of various types of lifting equipment has been mastered a number of major engineering plants (Sormovskiy, Kolomna, Bryansk, Kramatorsky, Putilov, etc.).