What would be if hadn't been the Screws

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What would be if hadn't been the Screws

"If you truly love nature, you will find beauty everywhere. Nature always wears the colors of the spirit. Look deep into nature, and then you will understand everything better."
NN (Albert Einstein?)

Anything short about

"The screws hold our civilization together", sounds a classic statement. In some sense this is true. Threadless connections are the exception rather than the rule. However, it should be added with one breath that the screw would not be a screw if there was no friction. This fact knew well already Leonardo da Vinci.

How it all started?

In particular, it should be emphasized that the characteristic screw element - thread (spiral) is autochthonous geometry pattern; it means it was not invented, but it was, similar to a circle for example, observed by nature. The human being had enough options for that, just keep your eyes open. And they had them wide open (Fig. 1 - 2). These spirals are everywhere in nature, right from human DNA to the galaxies, from simple to complex substances. It is therefore not surprising that a person noticed this and began to use it to his advantage .

Fig. 1

Fig. 2

Metamorphoses of screws

Archimedes (287 BC–212 BC) which developed the screw principle and used it to construct devices to raise water, already mentioned Leonardo da Vinci (1452 – 1519), later Joseph Whitworth (1803 -1887, UK), William Sellers (1827 – 1905, USA) and many many unnamed pioneers have contributed to the fact that screw, based on the spiral is currently one of the most common elements used in construction and machine design. Without them and without the friction, all machines and structures would fall to pieces.

Of course, they have made tremendous progress over the years. This applies not only to their construction, but also to their materials and surface treatment. The first screws were made of wood (Fig. 3). They were mainly used for the pressing of olive oil or grape wine.

Fig. 3

Prior to that, Johann Gutenberg used screws to fasten his printing machines (Fig. 4) and later the spiral principle was used in the architecture (Fig. 5).

Fig. 4

Fig. 5

Fig. 6

However the biggest boom occurred at the end of the 18th century, during the industrial revolution, when they actually contributed to this revolution. It would not be possible without them. Thanks to James Watt, an industrial revolution could take place in the United Kingdom. Its improved steam engine enabled the unprecedented development of other machines and equipments (Fig. 6).

This was followed by the rapid development of rail and road transport (Fig. 7 and 8). None of this went without screw connections. And there were


Fig. 7


Fig. 8

other useful things and devices whose construction and production were made possible by screw connections - see the small presentation in the pictures: Fig. 9 – cash desk, Fig. 10 – bike, Fig. 11 - fire hydrant. Fig. 12 - Scerw making machine (inventor: Whitworth)

An interesting overview of this is provided by the Museum Würth, Schrauben und Gewinde. We will learn from it, for example, about the bold applications of threaded elements


Fig. 9


Fig. 10


Fig. 11

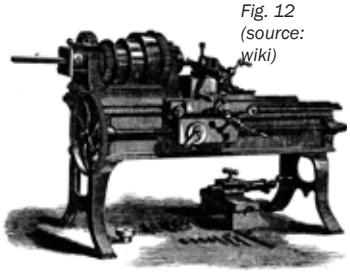
Fig. 12 (source: wiki)

in medicine, the armaments industry, architecture, fine mechanics and optics etc.

Hand in hand with the process of the industrial revolution, screws were also developed. A simple square head and a wood thread (Fig 13) were no longer enough. So-coled nut screws with different types of heads were created (Fig. 14), the head of the screws, the tightening groove changed (Fig. 15) and the development continued also in the field of materials.

At present, strength bolts are commonly made 1200 or 1400 N/mm2, stainless steel fasteners with high corrosion resistance and at the same time high mechanical properties are commonly produced. A typical representative are self-drilling screws made of stainless steel of the martensitic type (Fig. 16). And we could go on by trilobular thread rolling screws (Fig. 17) etc. No wonder the English Nobel Prize laureat for literature Rudyard Kipling noticed these fascinating metamorphoses of screws.

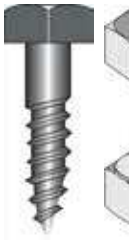
Fig. 13


Fig. 14


Fig. 15


Fig. 16


Fig. 17

He writes in one of his short stories about a small screw on a ship that felt cramped and trying to loosen. When they found out, the beams and ribs of the ship's hull began begging her to stay, because the ship would sink. The screw, so honored, was finally convinced and remained. The ship was rescued.

Unfortunately, not all screws are aware and after a while they decide to "go their own way", in other words their arbitrarily leave the structure to their fate. In fact, every screw connection presents a latent risk of disintegration if the principles of correct assembly are not observed. Let severe accidents, often with fatal consequences, be a memento for the future. Research from the American Transportation Research Institute has produced a database of locations with the highest frequency of large truck rollovers by using more than 50,000 crash records from a nine-year period (from 2001-2009). Many of them were caused by loose wheel bolts. Car manufacturers have had to react appropriately and the result is a wide range of safety fasteners. This also applies to Formula 1 cars.

Summary

As can be seen, screws have played an important role in human life. And nothing has changed in this modern, pre-technological time. At first glance, a threaded joints may seem like a very simple element that holds things together. However, appearances are misleading. In fact, it is a complicated structural highly stressed element without which we cannot imagine life. It therefore deserves increased attention.

Ferodom`s screw theorem:

"The screw connection is not a soulless monster, but a living organism with its own life. Only those who know and respect this life can count on a reward in the form of reliability and safety. Otherwise, he can cruelly avenge".