

The City College of New York

The Excavator

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The Excavator

Definition of mechanism and purpose in industry:

In the world of construction, the excavator is one of the most important heavy machineries that is used in any structural construction, such as building, or roads. Its main function is digging, lifting, and carrying various materials from one place to another. A company benefits from these functions as it enables for more projects to be possible in any type of soil because of the ease in which excavation can be carried out.

History and Evolution:

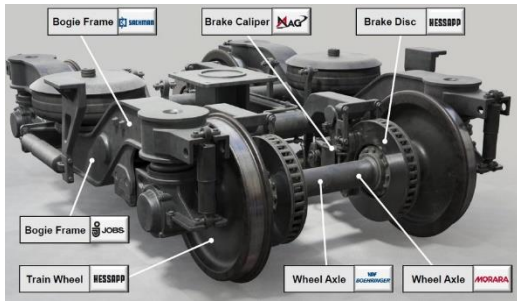
The first excavator was invented in 1796 by Boulton and Watt a British engineering/manufacturing company. This excavator was a steamed-power excavator, but no image or depiction of this excavator could be found. Although unclear of its appearance it can be assumed that it looked like the steam shovel. The steam shovel was invented in 1839 by William Otis.



This picture was taken in 1841 and shows the earliest depiction of a type of excavator. This invention, although revolutionary for the time, had multiple drawbacks in the way it was able to operate. Firstly, it was only able to run in train track meaning that when it was used temporary tracks were placed at the time that

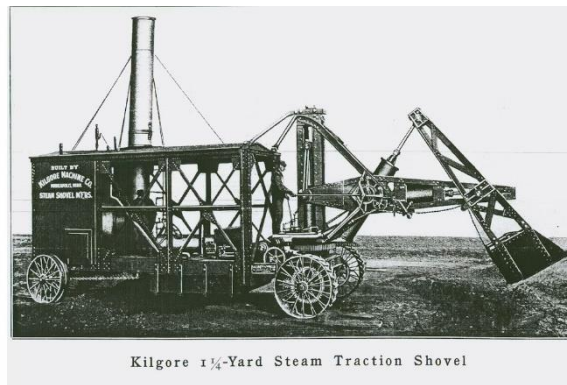
the excavator was meant to be used, and the tracks will also be adjusted by workers if needed.

Secondly this excavator was unable to have a 360-degree movement of the claw which hindered the productivity of the machine. And lastly every excavator was built on top of a railway chassis



in which all parts of the excavator were mounted, the exact positioning of the different parts of the machine is what hindered its productivity. The arm and driving engine were mounted at one end of the chassis which was the reason for the limited movement of the arm.

The first modern excavator, aka an all-hydraulic excavator, was made in 1897 by the Kilgore Machine Company. As depicted to the right this excavator was no longer restricted to railways but its



Kilgore 1/4-Yard Steam Traction Shovel

claw was still unable to do a 360-degree turn it also was a hydraulic machine meaning that it was more powerful than previous models.

Lastly, the first 360-degree excavator was presumably invented in 1971 and was called the TB1000 a 360-degree compact excavator and was invented by Takeuchi Manufacturing. This



model resembles modern excavators as the machine doesn't have any more impactful flaws that might hinder its functions.

The excavator can be described as a heavy mechanism that has two main parts. One is the vehicle in which the operation will be in as well as

where the motors and engines are to make the vehicle function properly. Attached to the vehicle is the claw. This part of the machine is the main piece as it does all the digging, carrying, and

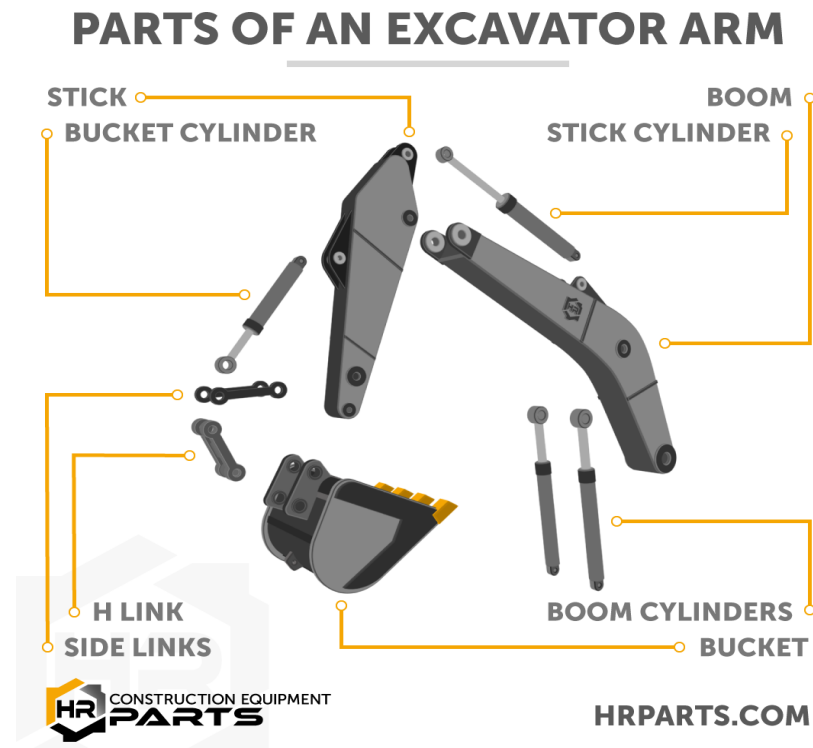
lifting. The excavator is a giant operative part in which the operator is controlling the machine with a giant claw attached to the machine.

How parts function in unison:

1. **Boom**: The boom is the largest part of the machine that has the purpose of controlling the height of the machine allowing the driver to lower or raise the excavator arm as he sees fit.

2. **Stick**: The stick is part of the mechanism that controls the horizontal movement of the claw, and by changing the angle of the stick the operator inserts the bucket/attachment deeper than the tracks of the machine

3. **Attachment/Bucket**: The attachment is the part of the machine furthest from the operator. that has the main purpose of holding material inside. Although there is a variety of attachments the most used attachment is the bucket.



4. **Boom Cylinders**: These cylinders are attached to the Boom and serve to raise or lower the claw by extending or contracting.
5. **Stick Cylinder**: This cylinder serves as an attachment between the stick and the boom and will rotate the stick as it pivots around the connection to the boom.
6. **Bucket Cylinder**: This cylinder is attached with the linkage and when extended will make the attachment perform a specific action. If the attachment is the bucket this cylinder will control the loading and dumping of the bucket. Since the Boom and Stick can rotate, the bucket requires angle rotation for the digging to be efficient while digging and after the digging is done.
7. **H Link and Side Link aka Linkage**: These are heavy-duty connectors that are between the stick and the attachment, and that help define and control the movements of the attachments.
8. **Function of the Mechanism as a whole:**

The way this mechanism works in unison is simple: The Boom alongside its respective cylinder controls the height of the claw both moving upwards or downwards to either dig or lift rocks, dirt, sand, etc. Alongside the Boom is the Stick with its respective cylinder, this part of the claw



that controls horizontal movements again it can be used for both digging and lifting materials. The unison of these two parts serves as a way for the operator to have full control of the claw's direct position at all times. Lastly comes the Bucket/Attachment alongside with its cylinder and links, as it was expected this is the part of the claw that does both the digging and lifting of any material. Working as a unison allows for both the Boom and Stick to control the movement of the arm going deeper or to the side if necessary for digging/lifting, the Bucket is separated from the other two but works alongside them to ensure safety and efficiency opening or closing as well as side to side. The unison of all parts of this mechanism is what makes it so efficient and safe.

Impact of the mechanism in the industry/ Overall importance of it in the industry:

To conclude this paper, the impact that the excavator has had on the construction industry is although simply very crucial, the excavator has made it possible for significant increase in the speed at which construction projects are completed. The excavator can perform heavy-duty tasks with a speed and precision that helps projects be completed faster. In any construction project there's bound to be an excavator highlighting its importance in the construction industry.

My overall thoughts on the mechanism

In my opinion the excavator is one of, if not the most crucial heavy-duty machinery in a construction site, it has such an impact that there can be delays of weeks if not months in a construction project without excavators.

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