

Technic Cranes

By Manticore

In the world of LEGO® Technic, the most successful sets are probably those cranes and excavators. No matter how many mechanisms you introduce in a Technic vehicle, it's nothing compared to the possible functions of a crane or excavator. And of course the playability, a term that is sometimes frowned upon in this theme for experts, of a crane or excavator is much greater.

So in this magazine we will have a closer look at what, in my opinion, are the best LEGO Technic cranes, leaving the excavators for a future article. Don't expect excessively technical or complex reviews. I will simply describe the typical mechanisms of these impressive construction vehicles, looking at the most significant developments that have taken place during the Technic history.

Let's start with the obvious: what is a crane? Cranes are one of the main machines used in large constructions and industrial installations, allowing for the vertical transportation of materials or loads that need to be lifted and can be used for any task.

In addition to lifting heavy weights, cranes need to be well balanced; to this end they use stabilizers which allow changes in the centre of gravity of the machine and its load.

There are different kinds of cranes, and their classification is not easy as we can choose different criteria to differentiate them. For example, based on their functionality there are portal cranes (used in naval construction), industrial cranes, foresting cranes, etc. However, a more general classification is done based on the mobility of the crane and its type of installation. In this way, three types of cranes can be differentiated: fixed cranes, cranes on rails and mobile cranes.

LEGO in its Technic theme has marketed mainly mobile cranes. So we will concentrate on what in my opinion are the four most representative sets of mobile cranes. Don't confuse mobile cranes with crane trucks. A mobile crane is a combination of base (on wheels or occasionally on treads), with its own propulsion and steering mechanisms, on top of which a large crane is mounted. A crane truck is basically a truck, while in a mobile crane, despite using a truck-like base for driving, the important part of the vehicle is the crane, not the truck. For those who are still not clear on the difference, and since a picture is worth a thousand words, take a look the 8258 and 8421 to clearly see the difference. And talking of crane

trucks, I may have to write an article about those as well since they will not be referenced in this one. We'll see...

Mobile cranes are made up of two clearly different parts. The chassis or base vehicle, with stabilisers (hydraulic jacks fitted on outriggers) that prevent the crane from falling over, and a turning structure on which the boom of the crane and the control cabin are mounted.

Getting back to LEGO, what four sets are we talking about? Knowing the interest of the author of this article you can easily guess. The first crane, in order to keep even the old-time fans (like me) happy, is the 855, the first Technic crane in the history of LEGO.

The second set is the 8460. A crane that is similar to its older brother, but at a smaller scale.

In third place we'll look at "the set": 8421. The best Technic crane to date. It has become slightly outdated because it arrived just before the PF motor revolution, but even to it is the most complete and functional crane,... and the biggest.

And finally, the most recent Technic crane, the 8053, which incorporates the new linear actuators and has inherited the virtues of its predecessors, as well as some defects.

There are more, but they are mostly small sets and don't add significantly to this article.



855: NOSTALGIA

In 1978, together with other marvellous sets in the 85* range, a small technical wonder appeared. I say small, because today, nearly 35 years later we have seen sets that are much bigger. But in its day it was a true revolution.

A salient detail is that the same set was brought out in the USA one year later with number 995 and, as usual, in the "Expert Builder" theme.

Along with its vintage look (too square for any young fan... younger than me anyway), this crane included all the functions of a real mobile crane: 360 degree rotation, stabilizers, elevation system and telescopic boom. If you have built a Technic set in the last lustrum it may seem too simple, but the features and functions that were built using just 512 bricks and plates (remember, it was back in 1978) are spectacular.

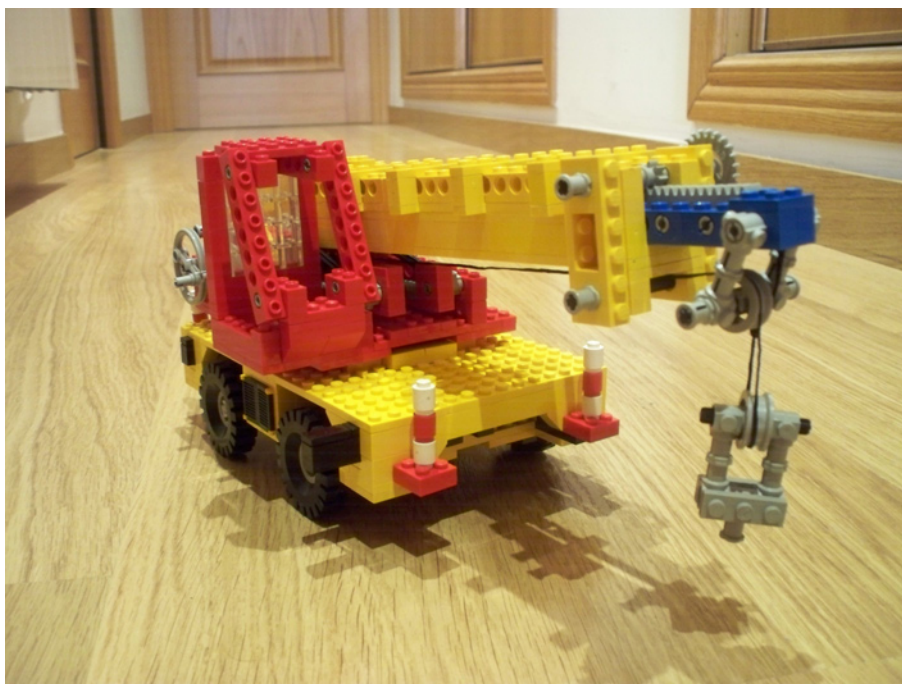
Also, in this set LEGO® introduced new elements which have later become a standard for any crane. The LEGO string/cord for example and the simple but efficient system for keeping the reel in position, using a rubber belt. And something that anyone building Technic has used hundreds of times: attaching wheels with Technic pins.

The telescopic boom

The method for lifting the boom is quite simple. Using two types of gears (8 and 24 teeth) a reduction of 9:1 is achieved, which moves the mechanism until the boom is lifted. At the start of the movement the going is tough, but after achieving an angle of approximately 15 degrees things get easier.

As mentioned before, a simple mechanism prevents the boom from coming down by its own weight. A gear rack 1x4 is anchored to a 24 tooth gear that controls the elevation of the boom.

As for the boom itself, an extendible blue part moves inside the main boom, built in yellow. A handle on the left side controls the movement through a very long Technic axle, the result of combining three 8-stud long axles. OK, no big deal, but in its day it was quite imposing.



It also includes limiters to avoid the boom extending or contracting too much. At its maximum elongation, the telescopic boom extends to 180% its original length.

Driving base:

The first thing that stands out is that the base doesn't appear to be a vehicle. There is no cabin, no steering, let alone suspension, a differential or other mechanisms that today might be considered inexcusable. The union of base and crane is as simple as effective: a 4x4 turntable allows 360° rotation. Manual rotation that is.

For this vehicle to roll effortlessly, four classical 17x43 wheels are used, so often included in so many sets until relatively recently.

The base of the crane is the least interesting part of the set, but at the time it was not so bad at all. One good thing is that it included stabilizers. Very simple ones; black bricks as outriggers, coming out of each of the four corners of the vehicle and by way of "jacks" three round bricks 1x1 and a couple of plates 2x2. Not that it was very effective (they are more aesthetic than functional), but I repeat that the available pieces at the time were not even 10% of what's available now.

There is little else to say about this set. For me personally it was one of those sets I've always wanted to have and only recently I've been able to satisfy the child every AFOL has inside of him.

8460: I'M STILL A CHILD

I bought this set at the early age of 24, when I thought that all the LEGO accumulated during my childhood was just a couple of boxes carefully kept and rarely used. As I said before, this is the first Technic crane I got my hands on until recently. I never had a Technic crane; that was an error that needed to be corrected, even if it meant that deep down inside every AFOL is just a big child. In 1995 the 8460 came onto the market and I was unable to repress my natural instincts and fell for it. And what an instinct, because I soon found it to be an extraordinary set that has only been superseded by the "monster": 8421.

Bigger than its predecessor (the telescopic boom has a total length of 69 studs) and a more realistic look of what a mobile crane looks like today. The improvements in the base are spectacular, starting with the three axles, (two with steering) and stabilizers that can be lowered and support the crane in a very realistic way.

Although I don't have the figures, I'm sure the crane sold well, as it was re-released in 2002 (set number 8431) and again in 2003 (set number 8438). In both cases the model was practically identical, with only a few pieces being substituted for newer version.

Driving base:

A comparison with the 855 in this aspect should be prohibited; but since I'm not a pro I'll have a go. As mentioned before, the improvements are remarkable.

The steering mechanism uses a HOG (Hand of God), that is, from either of the two revolving lights on top of the cabin. As usual the front axle turns farther than the second steered axle. This is achieved using a reduction in the transmission of the movement from one axle to the other with two different gears (8 and 16 teeth respectively).

The set uses new 20x30 tires, which are much more realistic... but less vintage.

The rotation of the superstructure of the crane is also a step forward when compared to the 855. It is placed on a Technic Turntable which by means of a large reduction of 21:1 allows a complete 360° turn.

The crane includes two sets of stabilizers, controlled by two cranks, which really fix the crane to the floor. A 24 tooth gear on a worm wheel transmits the movement to each set.

It would have been more logical to control each set of stabilizers individually (front and back), but the result is so good one can hardly complain.

The telescopic boom

This is where we find the main innovation in this set: the Pneumatic system. This system, which was first introduced in 1984, had been used in several sets, but the first large crane that used it to lift the crane boom was this set. To be precise, a combination of two opposed pneumatic cylinders lift the weight of the boom without the least problem.

There is a single valve to regulate the airflow to expand (lift the boom) or contract (lower the boom) the cylinders.

When both cylinders are completely expanded, the boom has a 60° inclination, which allows for hours play in any LEGO® building construction site... if you don't mind mixing Technic and minifigs... right?

As for the telescopic boom, the system is quite similar to the previous one. Some 20 years have passed, but if it works, there's no reason to change it. Completely extended it also reaches 180% of the initial length and the movement is transmitted by a long combination of axles that end in a worm gear that moves the inner part of the boom.

The hook is better than the one from the 855. One of the few metal LEGO pieces that, thanks to its weight, keeps the



necessary tension on the cable. However, sometimes the cable gets tangled on the reel which can have nasty consequences.

8421: THE DEFINITIVE CRANE

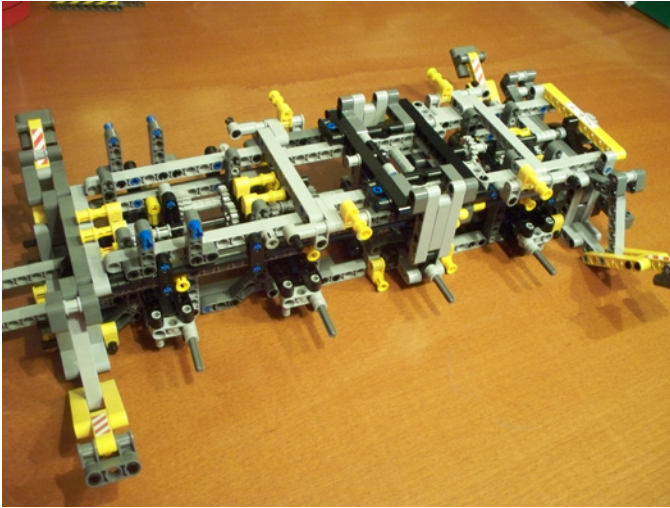
It may sound a little pretentious, but that's what I thought when I first saw this set. I grew up adoring the 855, maybe because I never got it as a child, but I always thought the telescopic boom was a little weak compared to what you see in real life. I'm not talking about the gigantic 6 or 7 element telescopic arms, but at least three segments would add a level of realism. It appears my prayers were heard in Billund, because in 2005 LEGO brought out the 8421, for many "the set until another monster with PF technology came onto the scene (the 8043 excavator).

Driving base:

If the 8460 broke the mould compared to its predecessor, the 855, in this case that didn't happen. It is much larger and detailed, but the structure is quite similar to the 8460. Instead of 3 axles it has four and three of them are steering axles. If this trend holds, the next crane should have 5 axles, four with steering...

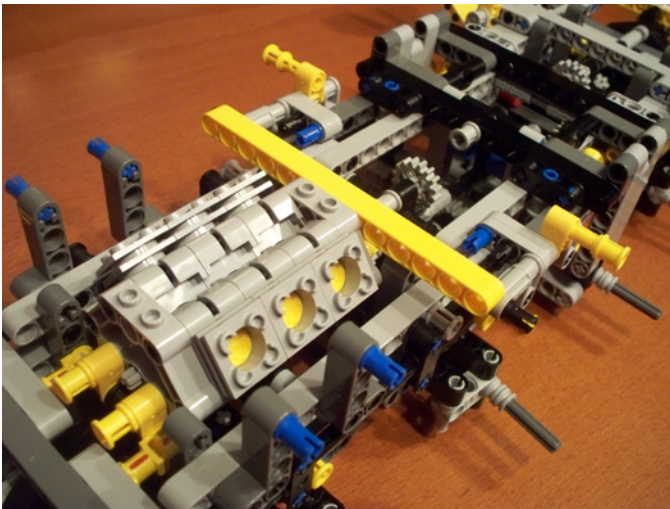
The wheels are quite a lot bigger (62.4x20), and the steering is not accessible by HOG, but by a gear at the back of the vehicle. It is a curious way of controlling the movement of the vehicle, but you end up getting used to it.





One thing that is an improvement is the v6 engine, located behind the cabin of the vehicle. The extra length of this case allows for the inclusion, but the 8460 is rather empty without a motor.

The stabilizers have the same structure as in the 8460. The boom is longer and the hydraulic system is better built, but the best part is that all four are controlled from the same gear wheel, located right above the one that controls the steering of the vehicle at the rear.

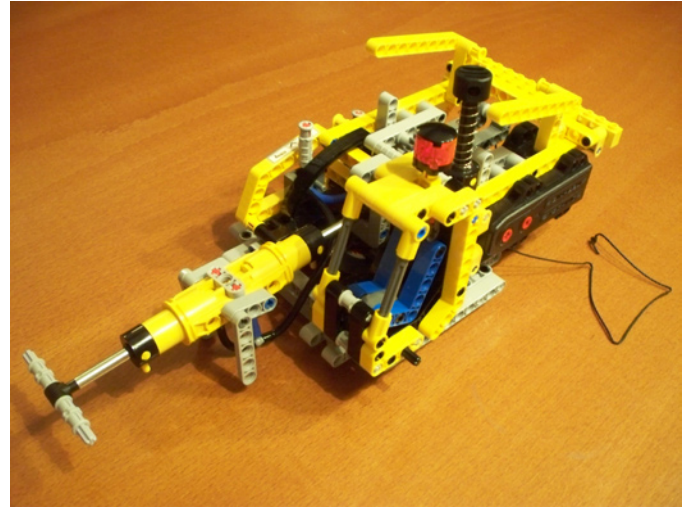


With these two gears you can place the vehicle where it need to work (LEGOLAND needs to be built), lower the stabilizers to fix the crane in place and... wait, how do we control the superstructure? This is the main failure of the set. The turning is done manually, as in the old 855; I'm no mechanical engineer, but given the size of the set I'm certain a solution could have been found.

The telescopic boom:

I'm tempted to do a copy&paste of the previous set as the elements are practically identical, though longer. As an example, there is a 32 stud long axle.

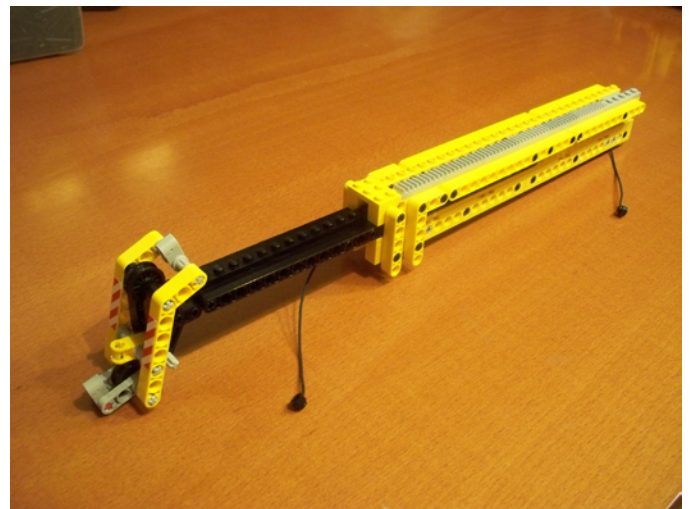
The Pneumatics system that controls the elevation of the boom also includes opposed cylinders. A new type of cylinder (with a round base) but really the same system. Again a single valve controls airflow to lift the boom or let it drop.



I say "let it drop" because this is another failure in this otherwise great set. The weight of the boom is so big that the pneumatic system can't hold it and the boom literally crashes down. I've also been able to check that when lifted, the boom will come down after a couple of hours. Even with the valve closed, the weight of the boom makes it come down to a horizontal position. This error can be corrected by a simple substitution of the pneumatic cylinders by Linear Actuators, as in the 8053 crane.

The superiority of this set is in the telescopic boom. The construction is similar to that of the 8460, but after building the secondary boom which is inserted in the main boom, you notice there is still space for a lighter, but completely operational third part. This third boom is not controlled independently, but move together with the secondary boom thanks to a LEGO® string with studs.

The result is spectacular. Especially since the movement of the boom is motorised. I've saved the best for last. An RC motor



(normally used for radio controlled racing cars) allows you to control the extension/contraction of the boom, and, of course, the movement of the hook.

8053: THE FUTURE

Finally we'll have a look at the latest Technic crane, the 8053. I bought this one very recently, while working on this article. I hope the editors are listening and my next paycheck includes



Steering and the movement of the stabilisers are controlled in exactly the same way as in the 8421. At the rear of the vehicle there are two gear wheels that control both functions.

Just like this crane inherits certain virtues from its predecessor, one of its main defects is also inherited: the upper structure turns manually. It is not controlled from an external knob like the steering function and the stabilisers. Again, I suppose something could have been done to fix this.

The telescopic boom:

Very similar to the earlier cranes. It doesn't reach the level of the 8421, which has a three part boom. The extension mechanism is basically the same as in the first crane, the 855. Obviously with higher efficiency due to the use of newer parts, like the worm gear or gears with different ratios.

extra expenses. What? How do you mean "non-profit"? That won't convince my wife... there's a serious risk of divorce when you get into these colourful Technic sets. Jokes aside, the best part of this set is that it combines the best from the best (the 8421) with improvements in the failures. Let's take it one step at a time.

Driving base:

This is very similar to its bigger brother. A little narrower and shorter. And the wheels, logically, are also smaller (56x26 Balloon), although the use of the balloon type creates the visual impression of larger wheels.

All four axles have steering, which allows you to manoeuvre the vehicle very easily. However, I didn't like the fact that it doesn't include an engine. In the case of the 8460 it was obvious because it simply wouldn't fit. But in this set there is more than enough space for one.

The stabilizers are completely different. After seeing cranes and crane trucks with stabilisers that come vertically out of the structure of the vehicle, in this case they extend to form a large X. The hydraulic jacks are operated individually with a worm gear that lowers the axle of each of the four supports. The effect is aesthetically overwhelming, but the system is rather weak, probably due to the length of the arms; or because we've forgotten that this is only a toy.

The best part of this set is the substitution of the pneumatic cylinders by Linear Actuators. In this case one is sufficient to easily lift the arm, without it coming down at the slightest touch. The system is controlled from the sides of the superstructure, but I recommend the inclusion of a PF motor to improve the set. What's more, I don't see the point of a Technic crane without a motor. But that of course is a personal opinion. Once motorized, despite the fact that the battery box is rather large to include in the superstructure, three functions are controlled with it: raising and lowering the boom, Extending and contracting the boom and controlling the hook. Using a single motor, this is achieved with a gearbox, typical of the more advanced Technic vehicles, which allows you to select different combinations of gears.

What's left is a wish for LEGO® to make some kind of mega Technic set, (a UCS of sorts), that includes a powerful base, similar to the 8421, but with motorised stabilisers with LAs, controls for turning the superstructure, and a boom of at least 3 or 4 parts that is lifted by means of linear actuators. If we add lights and an invitation to the park in Billund that would be heaven. Of course the motors should be controlled by IR. Dreaming is free, right?

After this review of the best Technic cranes, there are no more excuses for not building our LEGO city. Oh yes, we'll need excavators and crane trucks. We'll have to wait for future editions of HBM.

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