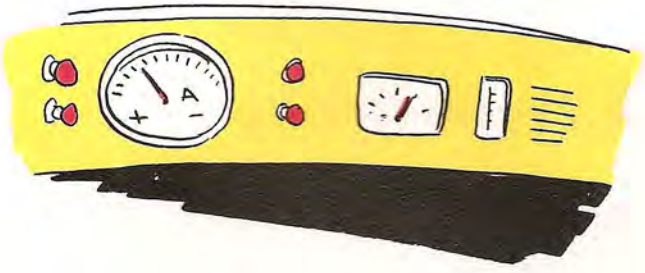
INSTRUMENTS

Make sure that all instruments and warning lights are in working order!

It is especially important that the oil pressure and charging lights are working properly.

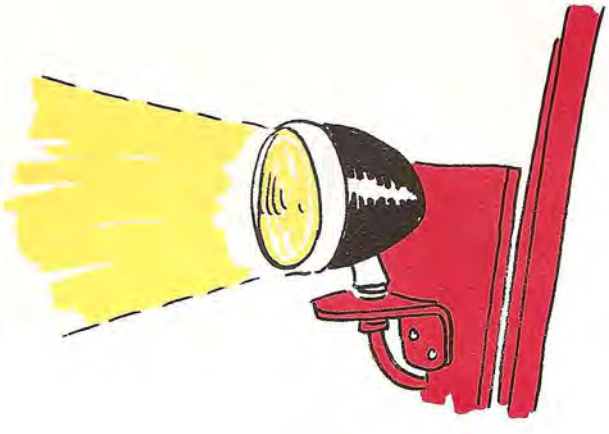


LIGHTS

Check that the direction indicators, brake lights and other warning lights are in working order!

If there is a spotlight fitted, then it too should be checked.

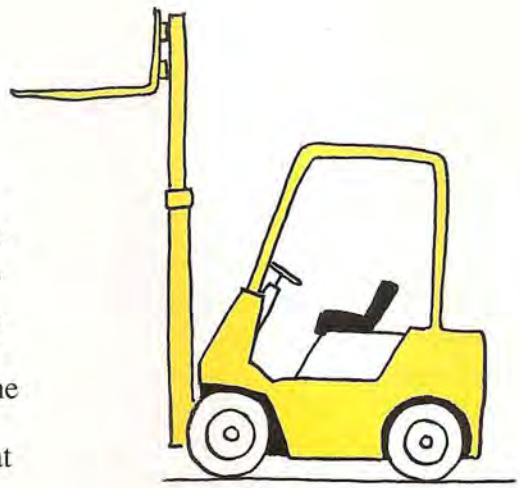
Remember that you must see and be seen!



CHECK THE HORN

Make sure the horn or klaxon is working properly! It is important both for your own and others' safety because using the horn is often your only method of attracting attention.

THE HYDRAULICS MUST BE CHECKED



All hydraulically driven part must be run to their end positions every day. Raise the fork carriage to the top of the mast, tilt fully forwards and backwards. If your truck has other hydraulic functions these should also be tested.

By running the hydraulic functions to their end positions you lubricate the sensitive pistons and reduce the risk of leakage. When you raise the fork carriage to the top of the mast, tilt fully forwards etc., you check at the same time that the hydraulic system is functioning correctly and that there is sufficient oil in the tank.

– At max. lift height – remember the roof height!

– In cold weather raise the temperature of the hydraulic oil e.g. by driving the hydraulically driven part to their end positions to lubricate all the moving parts and to warm the oil.

CHECK THE BRAKES

It is very important that the brakes are working properly and they must be checked.

The foot brake can be tested by driving forward and applying the brake. Braking must be even and the pedal must not travel more than halfway to the floor.

The parking brake should be tested by slowly driving forward and then applying that brake. The truck must stop.

If your truck is equipped with an automatic parking brake you must check that it is working when you leave the operator's compartment. If there is an audible warning device: check that it can be heard if you leave the cab or switch the power off without applying the parking brake.

STEERING

Check the play in the steering wheel before you start the truck. Avoid turning the wheels of a truck at standstill! If you do so, you subject the steering connecting rod to unnecessary strain. The steering must be checked while driving the truck.

Battery Care

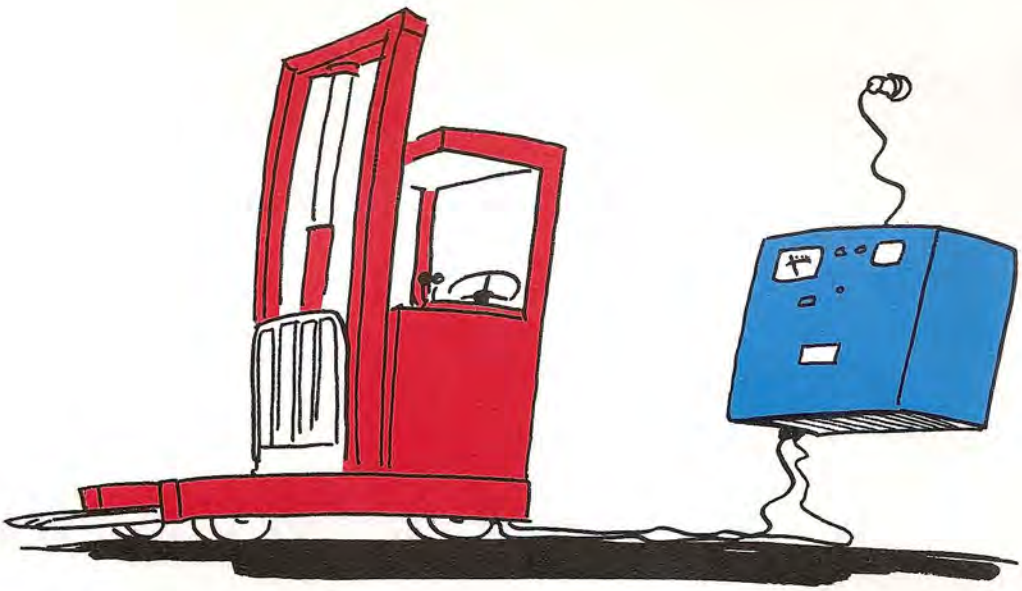
CHARGING BATTERIES

In many cases the task of charging batteries will be carried out by a specially trained person or an electrician, but if you understand what is involved it will increase your understanding of the machine you use.

A battery from which energy has been drained must be recharged. The battery in a motor car is constantly recharged by the generator or alternator. The traction battery on an electrically powered lift truck discharges while the truck is being used and must be recharged, using a special charger after each work period.

Battery charging and servicing must only take place at special charging areas. Batteries must be recharged using the correct charger. Batteries have different voltages and using the wrong charger can permanently damage the battery.

Battery charger instructions must always be followed when recharging. Note that battery chargers are connected to the mains electricity.



NOTE

— Overcharging, insufficient charging or repeated heavy discharging shortens the life of a battery

— A battery which is not in use discharges by itself and must therefore be recharged regularly.

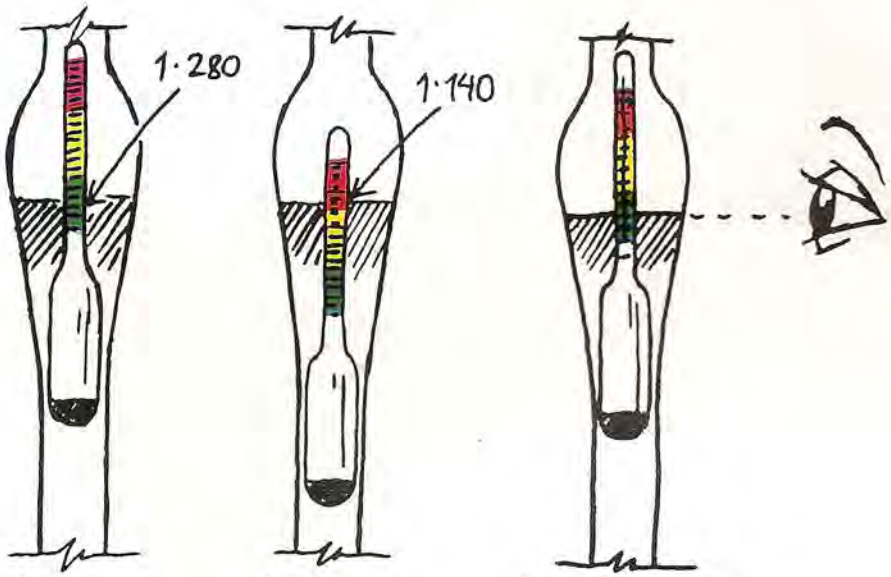
ACID DENSITY

The easiest way to check the amount of charge in a battery is to use a hydrometer. This measures the acid density or specific gravity of the liquid in the battery's cells which in turn indicates the state of charge. It is a good idea to measure the state of the battery at the end-of-work and immediately after recharging. This will indicate whether the battery is being over discharged whilst it is working and whether the charger is fully recharging the battery. If you take and record the readings from two cells at the end-of-work and from the same two cells after recharging, then two different cells on the next cycle, you will have a record of the readings before and after charging of all of the battery's cells over a period of a few days.

Below are some typical hydrometer readings at 60°F (15°C).

1.280	=	Fully charged
1.210	=	Half charged - further charging necessary
1.140	=	Discharged - Must be recharged

THE HYDROMETER



High float means high specific gravity

Low float means low specific gravity

Correct method of reading hydrometer. Eye on level with electrolyte surface

To use the hydrometer, a quantity of liquid is drawn from the battery cell until the float, floats freely. Do not remove the hydrometer from the battery cell during this operation. The specific gravity is then read at the point where the scale on the float emerges from the liquid. It is important to return the liquid to the cell which it was taken from. Do not spill the liquid.

EXPLOSIVE GAS

Hydrogen gas is formed in the cells when a battery is being charged. It is extremely explosive which is why smoking or naked flames are strictly prohibited near the batteries. You must also remove or prop open the battery lids during charging and if there are several chargers operating at the same time in a charging area it may be necessary to fit extractor fans.

The charger itself must be adequately ventilated. You will see that it has ventilation ducts built into its casing. These must never be obstructed as this would create a very real risk of a fire breaking out.

You must also be careful using metal tools near a battery as a spark caused by a short circuit is enough to ignite any hydrogen that may be present. It is a good idea to cover the top of the battery with some form of insulation material if you have to use tools or other metal objects close to a battery.

When you collect your truck after the battery has been recharged, make sure that the charger is turned off at the mains in order not to cause any sparks. Do not forget to hang up the leads off the floor.

Check daily that:

- **The battery is properly secured.**
- **Lids are locked firmly in place.**
- **Cables and connections are not broken or frayed.**

Inspection procedures

The truck must be checked at the beginning of each shift. Some companies have their own procedures. Sometimes this means that you, the truck operator, are not required to do all the work involved. However, you, the operator, will always be responsible for ensuring that the truck is in a safe condition. If your company does not have its own procedure for recording the inspection the following method can be easily created, using a simple exercise book.

Upon commencement of each day or shift the operator should spend a few minutes inspecting the truck to ensure that it is fit for use. A simple checklist covering both engine powered or electric trucks is provided below. The result of this inspection should be recorded as shown in the following example.

Report all faults to your supervisor.

Date and Shift	Department	Condition of Truck	Faults Reported to	Action Taken and Supervisors Signature	Operator's Signature
7/11/77 3	STORES	BRAKES NOT WORKING	J.SMITH FOREMAN	TRUCK OUT OF SERVICE ENGINEER CALLED	J.Bloggs

CHECKLIST

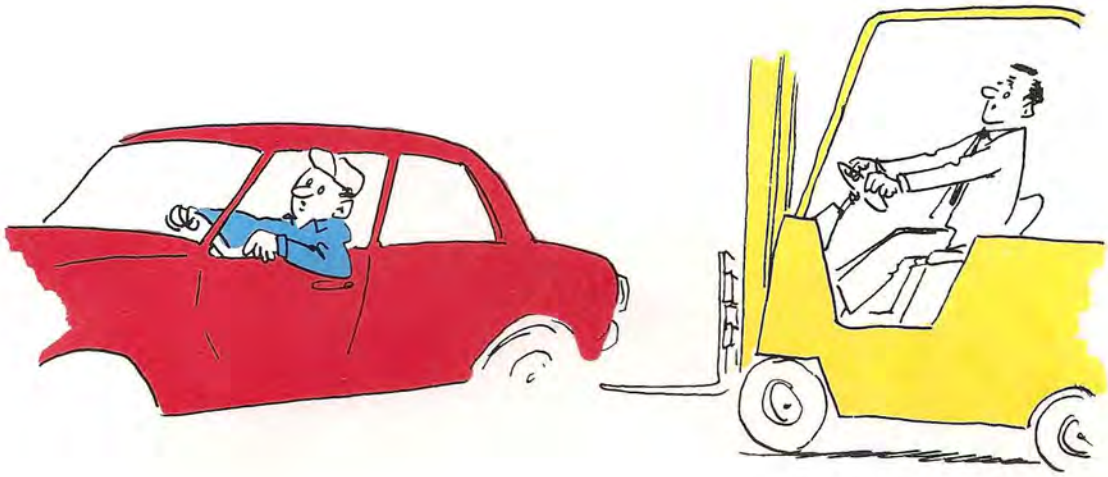
No.	ITEM	CHECK FOR
1	FORKS	(CRACKS-DISTORTIONS-PINS SECURE)
2	CARRIAGE PLATE	(STOP BOLTS-DAMAGE)
3	BACKREST EXTENSION	(SECURITY-DISTORTION)
4	MAST	(DAMAGE-FOREIGN BODIES)
5	LIFT CHAIN	(DAMAGED-DIRT-WEAR)
6	REACH CHANNELS (IF APPLICABLE)	(EXCESSIVE WEAR-DIRT)
7	WHEELS	(TYRE PRESSURES-DAMAGE-WEAR) (IF APPLICABLE)
8	BATTERY LIDS	(SECURITY-DAMAGE)
9	BATTERY LEADS (IF APPLICABLE)	(DAMAGE)
10	OVERHEAD GUARD	(SECURITY-DAMAGE)
11	SEAT (IF APPLICABLE)	(DAMAGE-SEAT SWITCH-SECURE)
12	COCKPIT	(EXCESSIVE DIRT-DAMAGED CONTROLS)
13	HYDRAULIC OIL	(CORRECT LEVEL)
14	ENGINE OIL (IF APPLICABLE)	I/C ENGINE-(CORRECT LEVEL)
15	COOLANT (IF APPLICABLE)	I/C ENGINE-(CORRECT LEVEL)
16	BRAKE FLUID	(CORRECT LEVEL)
17	FUEL (IF APPLICABLE)	(S.G.READING-GAS-DIESEL) (BATTERIES)
18	ALL CONTROLS (WHERE APPLICABLE)	(FUNCTION OF KEY SWITCH-INSTRUMENTS HYDRAULIC CONTROLS-DIRECTION CONTROLS-FOOT AND PARKING BRAKES-STEERING-LIGHTS
19	HORN	(CHECK IT WORKS)
20	ATTACHMENTS	(CORRECT OPERATION)

SAFETY FIRST

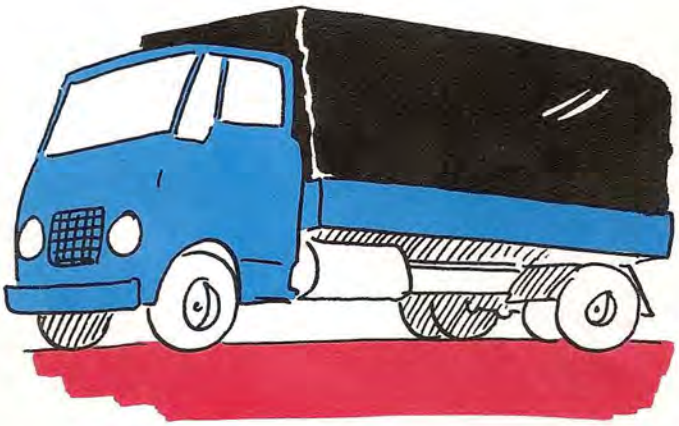
The daily inspection is not an end in itself. Its purpose is to reduce the risk of accidents caused by mechanical defects. Take out "insurance" by checking your machine properly every day, then treat it properly throughout the work shift.

Forklift Truck Stability

It is wrong to say that one can drive a forklift truck just because one can drive a car. There are certain similarities between a truck and a car, but there are at least as many differences.

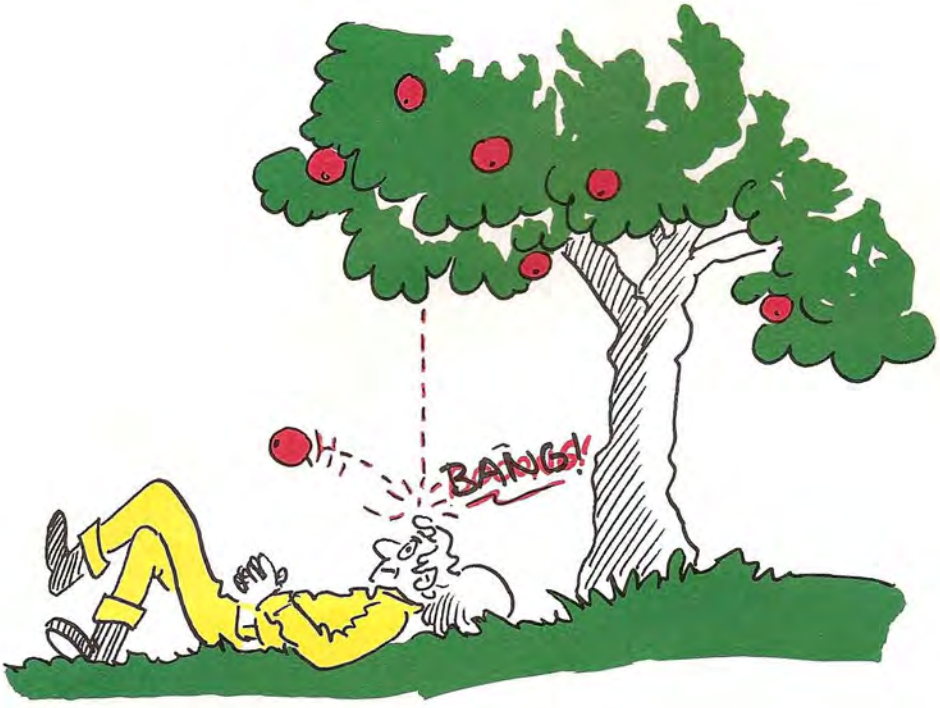


Nearly all vehicles carry their load between the wheels, but a counterbalanced forklift truck normally carries its load in front of the front axle. This means that the forklift truck behaves differently and this is something we must study in greater detail.



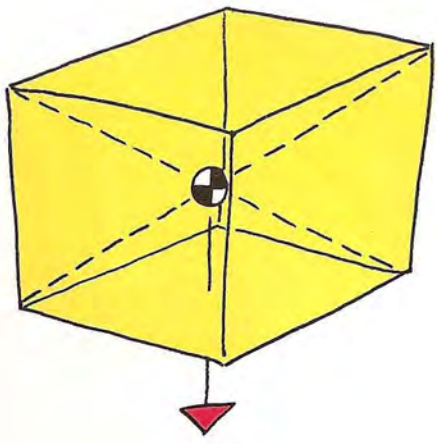
THE LAW OF GRAVITATION

Perhaps you remember Isaac Newton? He was the person who formulated the Law of Gravitation, after an apple had fallen on his head. It states that a body always tries to fall to the ground due to the attraction of the earth. This attraction increases with the weight of the body.



THE CENTRE OF GRAVITY

Every object has a centre of gravity, i.e. a point in the object where the mass seems to be concentrated. The centre of gravity of an unsymmetrical object is more difficult to determine.

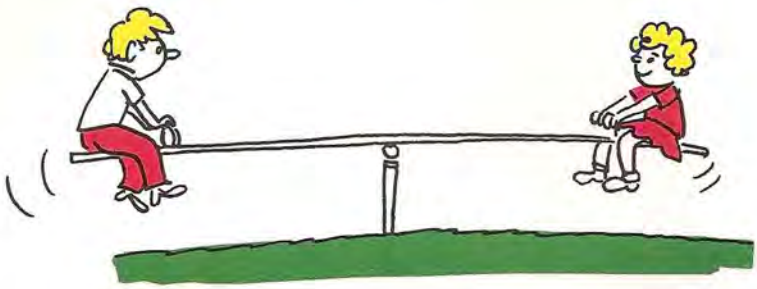


Note: The black and white symbol represents "centre of gravity".

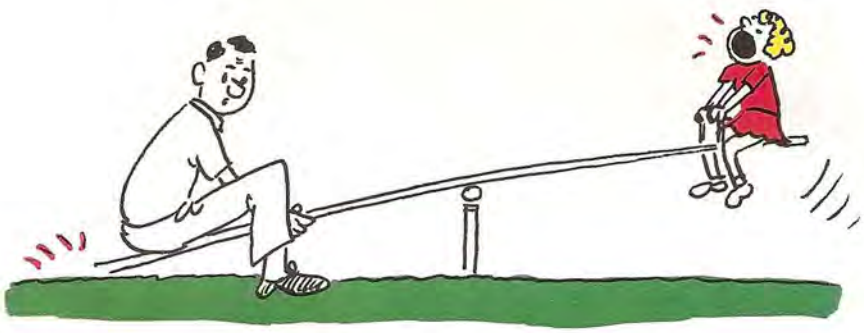
The see-saw

EQUILIBRUM

A see-saw can, if it is balanced properly, be in a state of equilibrium – or perfect balance.



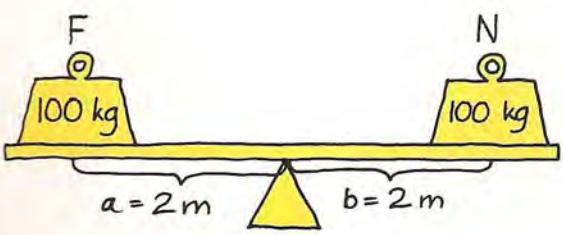
If the equilibrium is upset, the see-saw tips over to one side. It is not just the weight of the person sitting on each end that is important, but also the distance they sit from the pivot point.

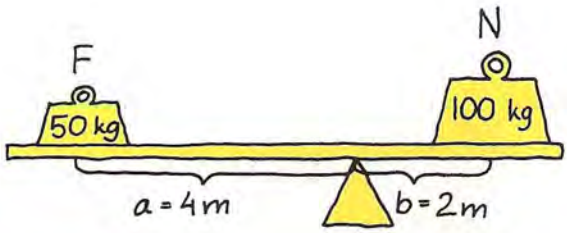


THE LAW OF LEVERAGE

The equilibrium of the see-saw can be illustrated with the aid of the law of leverage. When the force times the length of the lever (the distance from the force to the pivot point) is equal on both sides of the pivot point the see-saw is in a state of equilibrium – or perfect balance.

It both figures below - if F is multiplied by 'a', the answer is the same as N multiplied by 'b'. So, in both cases, the see-saw is balanced (in a state of equilibrium). In both cases, however, a very small change in either weight or distance on one side of the see-saw would be sufficient to cause it to tip.

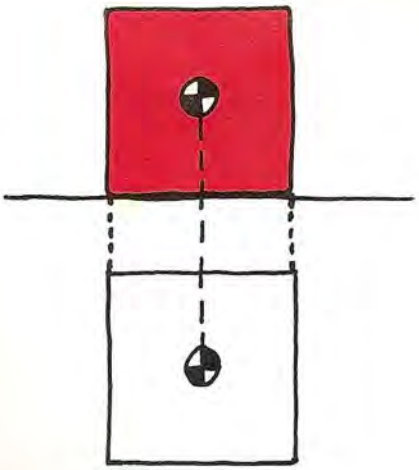


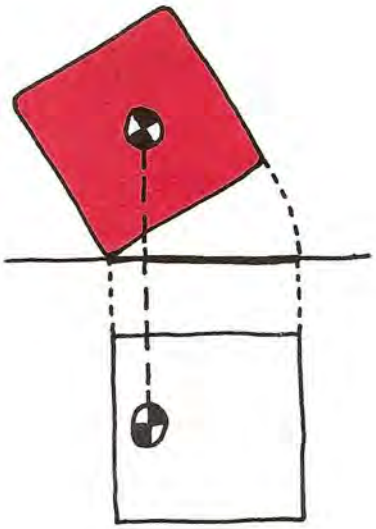


$$F \times a = N \times b$$

BEARING SURFACE

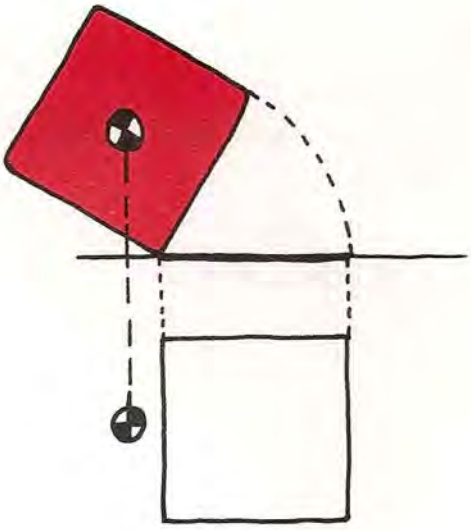
A box lying on one side is stable. The surface under the box is its bearing surface. If you raise the box a little on one edge and then let go, it will fall back into its rest position.

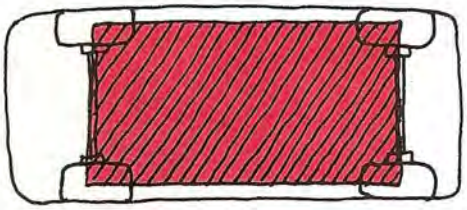




The centre of gravity of the box moves during lifting. The higher the box is lifted on one edge, the nearer the centre of gravity is to that edge of the bearing surface.

If the box is raised high enough it will fall over and land on a different side. This occurs when the centre of gravity of the box falls outside the bearing surface.



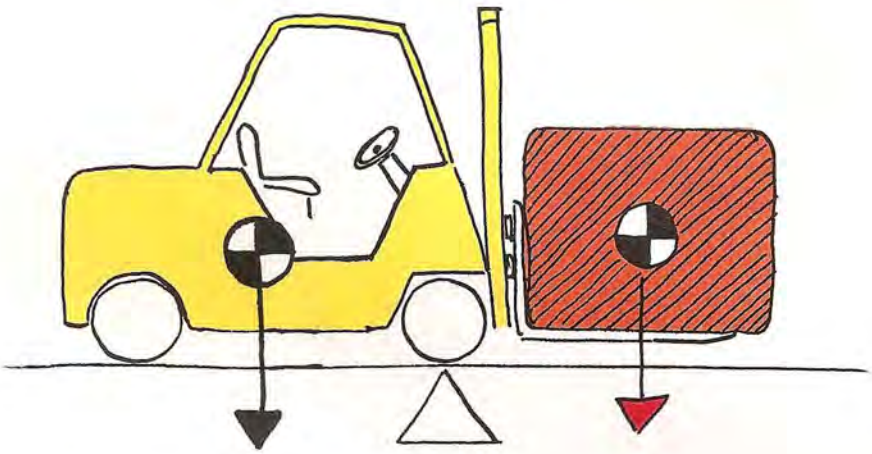


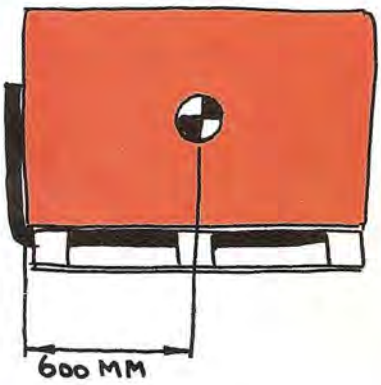
It is not necessary that the entire bearing surface of an object touches the ground. A car, for example, is supported at four points, the four wheels. If these points are joined by lines we get the bearing surface, a rectangle.

The Principles of Stability in Trucks

COUNTERBALANCED TRUCKS

The counterbalanced truck can be compared with see-saw. The front axle is the pivotal point of the truck. On one side of the pivot we have the truck and on the other side we have the load. The rear of the truck must be heavy if the truck is to handle heavy loads. This weight is provided by the engine, or the battery on electric trucks, and a cast iron ballast weight behind the rear axle.





LOAD CENTRE DISTANCE

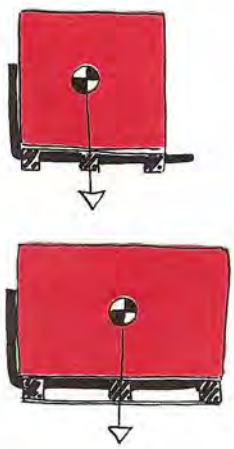
On usuall uses the expression load centre distance instead of referring to the distance from the centre of gravity of the load to the front axle of the truck.

The load centre is the distance between the centre of gravity of the load and the heels of the forks, when the forks of the truck are fully inserted under the load.

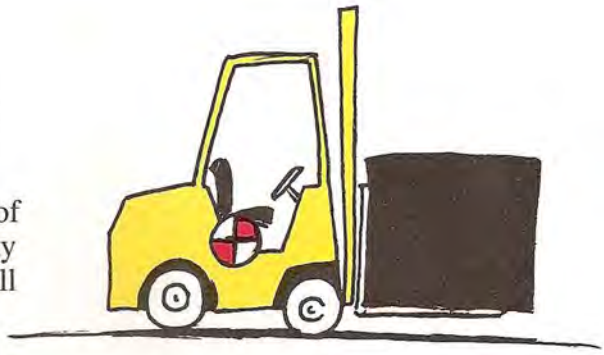
THE CENTRES OF GRAVITY OF THE TRUCK AND LOAD

The centre of gravity of the truck, itself is always the same distance from the front axle. The distance between the centre of gravity of the load and the front axle can vary depending on the size of the load. If you handle a pallet from the short side you get a longer load centre than if you handle it from the long side.

Therefore, the balance of the truck is affected both by the weight of the load and its load centre.



THE COMBINED CENTRE OF GRAVITY

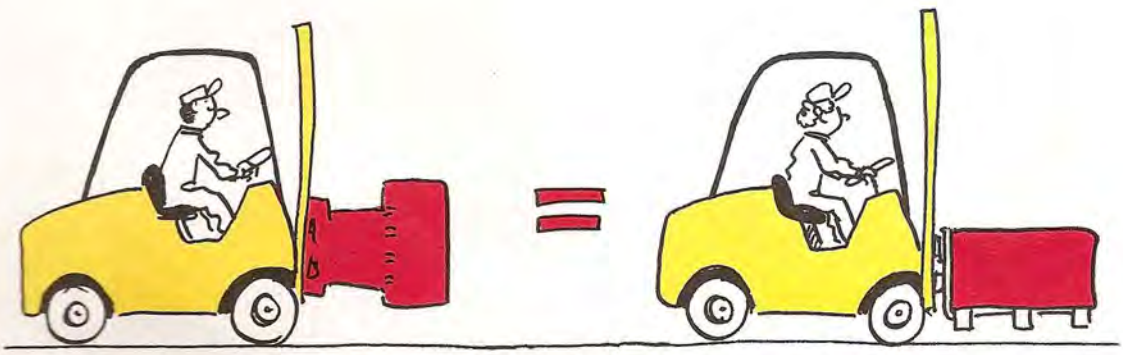


Up to now we have treated the centres of gravity of the truck and load separately. However, when the truck is loaded we can view the truck plus load as a single entity having a combined centre of gravity. So long as this combined centre of gravity remains behind the front wheel axle, the truck will not tip forward.
We refer to this combined centre of gravity (red symbol) as the common centre of gravity.

When you drive a truck which is heavily loaded (the common centre of gravity lies close to the front axle), it can easily tip forward if you brake violently. The higher up the load, the greater the risk.

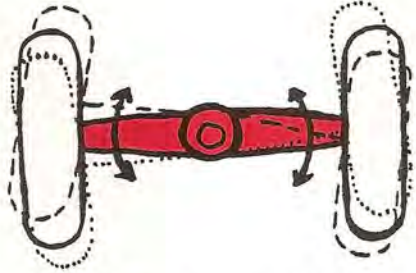
ATTACHMENTS REDUCE LIFTING CAPACITY

If your truck is fitted with some type of attachment, it can be said that your truck is always, "loaded". This is because the attachment has its own weight, and therefore your truck has a lower lifting capacity, than a similar truck **not** fitted with an attachment. Most attachments increase the distance from the truck's front axle to the centre of gravity of the load. This further reduces the lifting capacity of your truck.

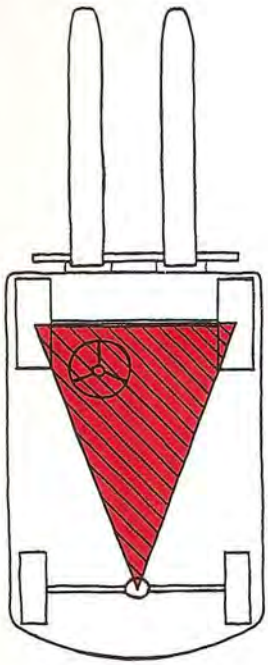


PIVOTED BACK AXLE

The front axle of a counterbalanced truck is rigid where as the back axle is pivoted, i.e. suspended at the centre. The pivoting makes it easier to steer and allows the truck to travel over uneven surfaces.



Back axle — pivoted

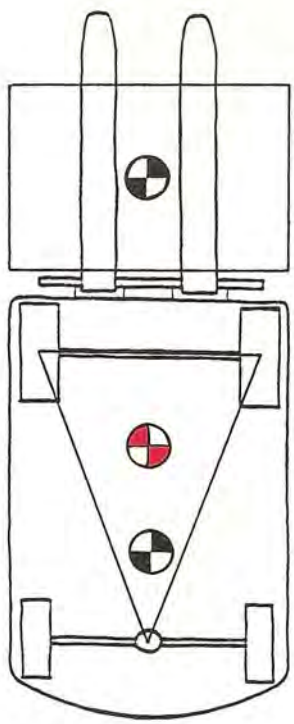


COUNTERBALANCED TRUCK

A counterblanced truck having a pivoted back axle is only supported at three points: the two front wheels and the pivot of the back axle. When these three points are joined we can see that the bearing surface of the truck is in effect a triangle.

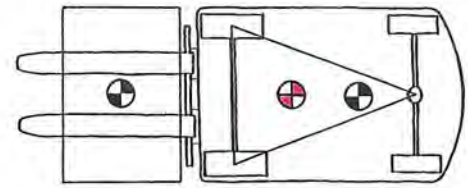
CENTRES OF GRAVITY IN THE BEARING SURFACE

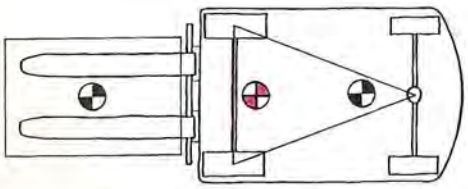
If we mark the centres of the truck and of the load in the bearing surface as well as their common centre of gravity we have a situation somewhat like that shown in the illustration. The common centre of gravity (the red mark) can, as mentioned earlier, have a different position depending on the load being handled. This positioning depends on the weight and the load centre. The truck tips over, as the box did, if the common centre of gravity falls outside the bearing surface.



DIFFERENT TYPES OF HANDLING – DIFFERENT CENTRE OF GRAVITY POSITIONS

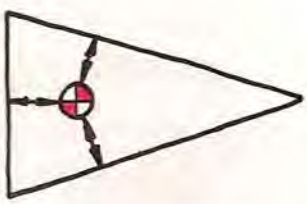
Sometimes you can handle a load having sides of different lengths from both the long side and the short side. If you take a load from the long side you get the common centre of gravity further back then if you had taken it from the short side.





COUNTERBALANCED TRUCK, WHEN IT IS MOST STABLE

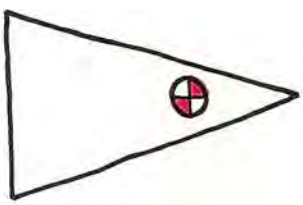
A counterbalanced truck is most stable when it is loaded so that the distance from the common centre of gravity to the boundary of the bearing surface is the same in all directions. With the load at low level the truck has good lateral stability (sideways) and is also less likely to tip forwards. (There is a great distance between the centre of gravity and the front axle.)



Most stable truck

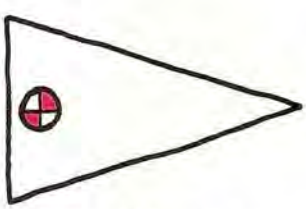
COUNTERBALANCED TRUCK, WHEN IT IS LEAST STABLE

When the centre of gravity is far to the back (unloaded truck), the distance from the centre of gravity to the bearing surface boundary is relatively short. It is easier for the truck to tip over. Therefore, it is more dangerous to drive an unloaded counterbalanced truck quickly round sharp corners than a loaded one.



Unloaded truck

If you have a large and heavy load, the centre of gravity is then far forward, and the truck can easily tip forward. On the other hand, the truck has great lateral stability now. (The distance from the other side of the bearing surface to the centre of gravity are long.)



Truck with max. load

COUNTERBALANCED TRUCKS
PALLET TRUCK

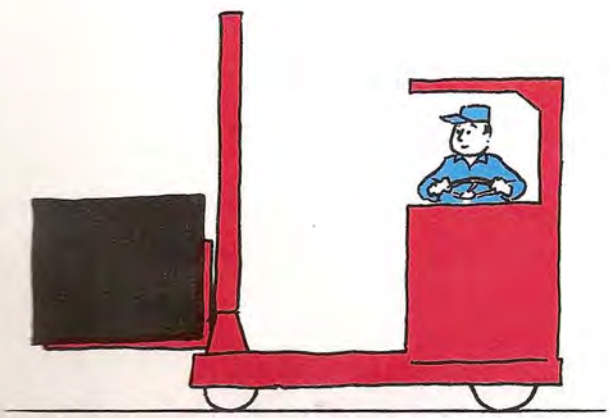
The counterbalanced truck carries the load forward of the front axle and balances the load with its own weight.

STACKER TRUCKS

The stacker trucks carries the load between the wheel axles and therefore has no need of a counterweight to balance it.

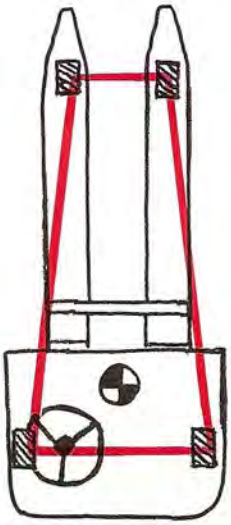
REACH TRUCKS

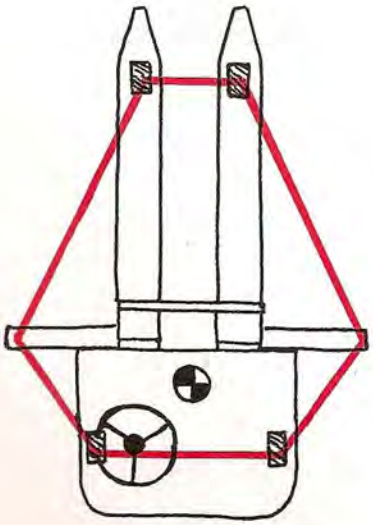
The mast of the reach truck can be moved forward in the longitudinal direction of the truck. With the mast in the forward position - when loading and unloading - it works like a counter-balanced truck. With the mast retracted it works like a stacker-truck.



THE STACKER TRUCK BEARING SURFACE

As a rule the wheels of a stacker are always separately mounted in the truck, which is way each wheel is a support. The illustration shows the most common shape of the bearing surface and the position of centre of gravity when the truck is unloaded.





If the truck is fitted with support castor wheels or lateral stabilisers then the bearing surface is considerably increased. This means that there are greater possibilities of stacking of greater heights whilst still retaining good stability. The illustration shows a truck with stabilisers, the bearing surface and centre of gravity.