FULCRUM

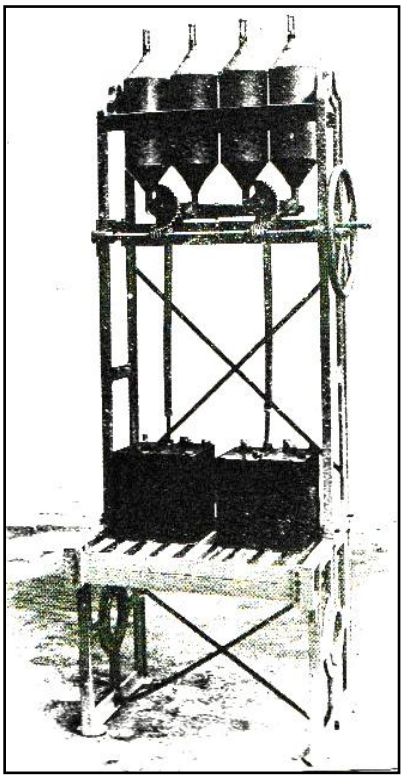


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Fulcrum is a newsletter for people interested in the history of weighing and measuring. It is published in February, May, August and November. Contributions are always welcome and can be sent to editor, John Knights

Can the Can

It would seem that the motor car was making an impact in the UK by the beginning of the 20th century. It therefore became necessary to have places where fuel and oil could be purchased. There were of course no such things as petrol stations with large amounts of fuel stored in underground tanks so fuel was supplied in 2 gallon cans from hardware stores and chemists where fuel was kept in tanks or barrels. To fulfil this trade various devices were produced, designed to fill the cans with petrol and a number of such instruments were built, approved and installed in the premises of fuel suppliers. It seemed that the two gallon can was seen as the method of supply to the motorist for a number of years as nobody came up with any alternative method for some while. The vehicle owner (or more likely the chauffeur) could fill up the car from the cans and carry some spare fuel on the vehicle in case a top up was required when there was no supplier nearby. It was however a fairly cumbersome system and eventually somebody must have thought that a better method might be available.



Various other measuring devices began to appear that were not dedicated to filling two gallon cans but were apparently made to perform various measuring tasks. Some of these were clearly intended to be used in the presence of the buyer so they were probably used to add fuel directly to the vehicle's tank.

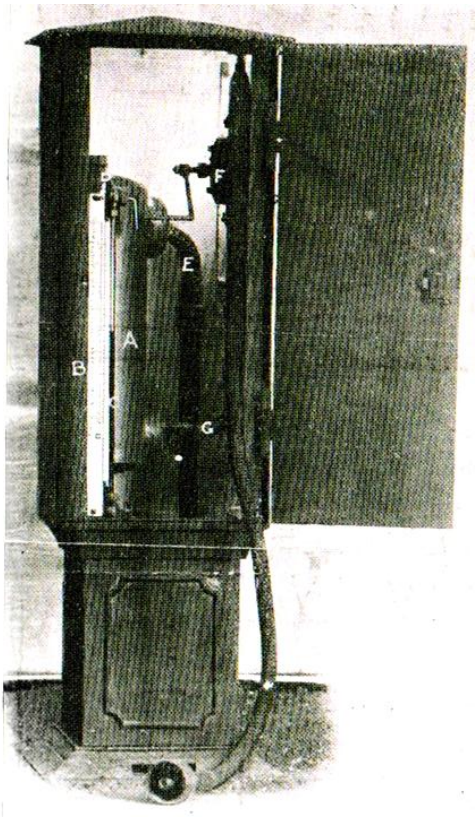
By the early 1920's instruments were being produced that were connected to underground tanks and we began to see piston pumps, sub-divided container and twin

container instruments that were to become the standard method of dispensing fuel over the next twenty years or so.

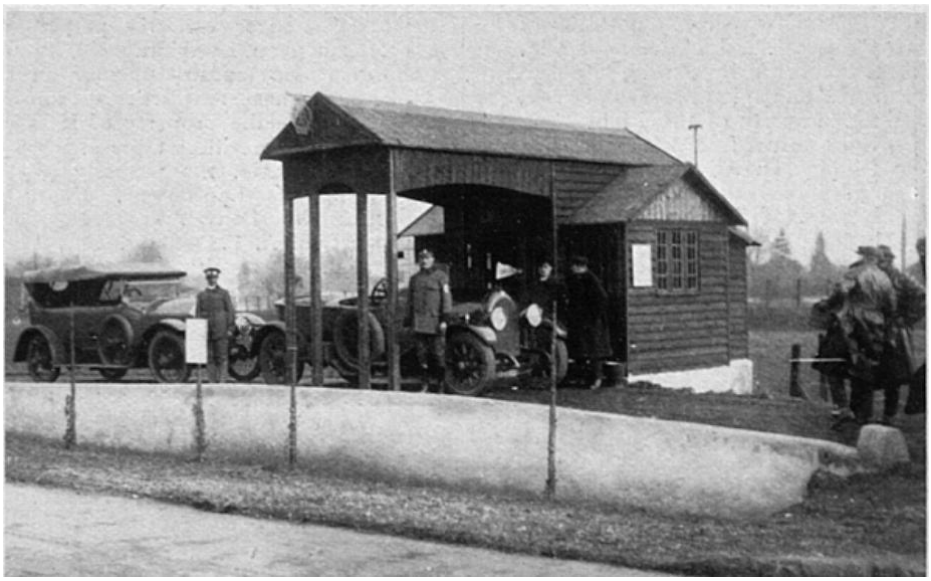
A lay-by on the A4, Bath Road, near Aldermaston is said to be the site of the first petrol station, as we would know it, in the UK. There is however nothing on the site to commemorate this fact or record its existence. The site was installed by the Automobile Association, in the hope and expectation that petrol companies would follow suit and a nationwide chain of sites could be achieved.



Britain's first petrol station, near Aldermaston. Opened in March 1920, it is difficult to see what type of measuring equipment is being used



A fuel measuring instrument from 1919. The liquid is held in a storage tank and pumped up into the graduated container part of the instrument. The fuel is dispensed through a hose into a container or even a vehicle tank. This is beginning to look like a container petrol pump.



Malt Measuring

In about 1863 a device was installed in the Truman's Brewery in Spitalfields London designed to measure the volume of granular

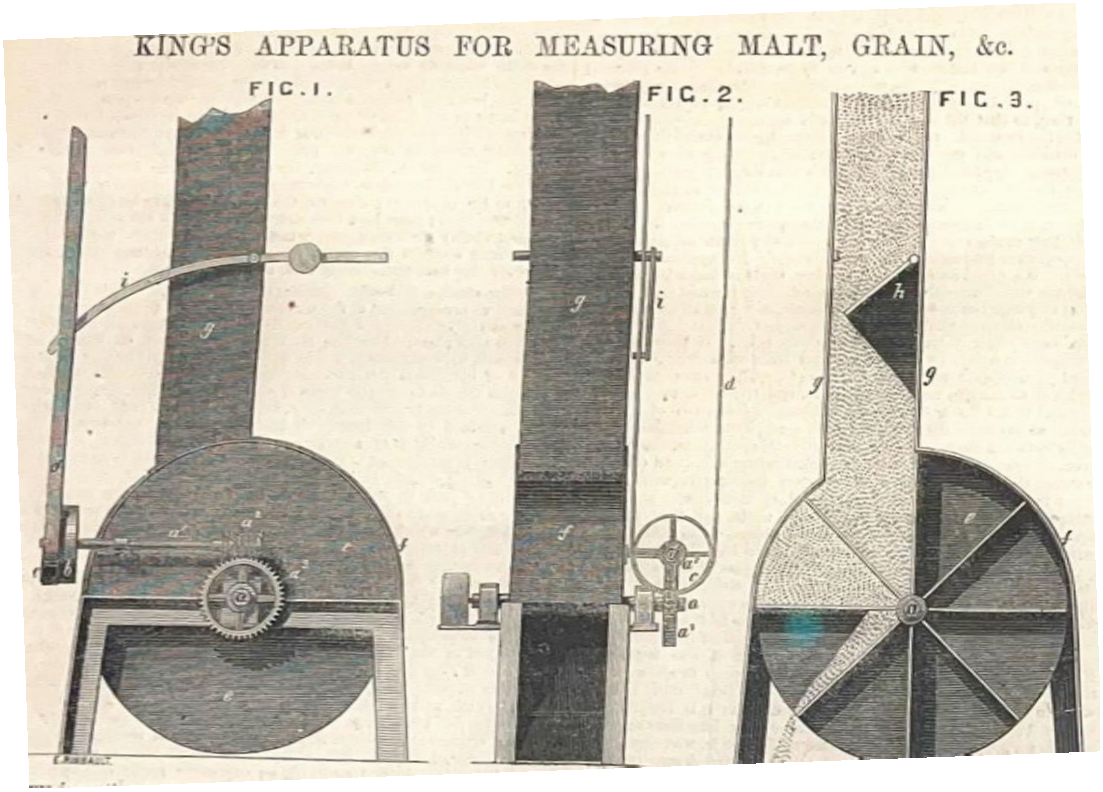
materials such as malt and barley.

It would seem that the device was only used within the brewery as it was never submitted for approval as a trade machine, and there is little evidence that machines to measure the volume of grain etc were ever much used within the UK.

It must be assumed therefore that it was used as part of the manufacturing process.

The device was known as King's Apparatus, after its inventor Thomas King, who worked for Truman's Brewery.

Th mechanism consisted of a number of chambers which rotated within a circular casing. The material to be measured was fed into the chambers down a tube. The volume was assessed by counting the number of chambers filled.



With this type of device the material is moved through the machine by the rotation of the chambers which are driven by a motor. This is unlike a liquid flowmeter in which the pressure of the liquid provides the motive power. It is therefore necessary to ensure that if the flow of material is interrupted the machine recognises the absence of product and does not incorrectly include a void as part of the total.

In this device a valve flap (h) is inserted in the feed tube and the flap is held open by the weight of material passing down the tube into the measuring component of the device. As long as the valve is in the open position, ie material is passing through the tube, the

drive from the motor is transmitted through the belt and pulley system, the measuring chambers continue to turn and the amount of granular material is registered.

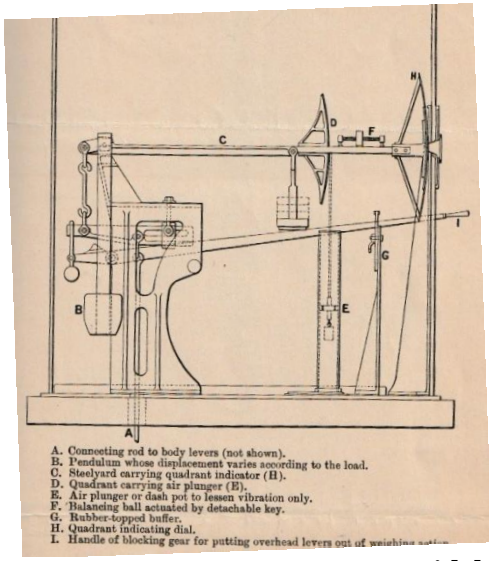
In the event that there is a lack of material in the tube, the valve flap moves upwards as there is no weight acting upon it. This operates a lever which moves the drive belt onto an idling pulley wheel that causes the measuring chamber to stop turning. Only when the valve flap drops again, under the weight of material, is the drive belt returned to the active pulley which begins to drive the measuring chamber again and register the throughput.

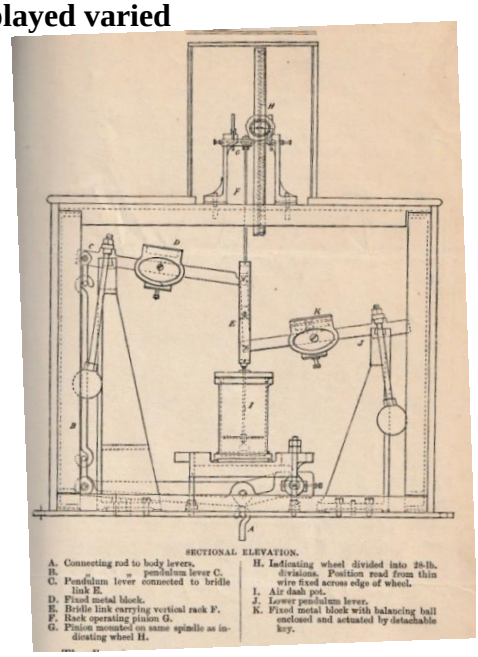
Devices to measure the volume of 'dry' materials, such as grain were little used in the UK, and the likes of bushel measures were all that were really used for the purpose. Even when boats or carts were having their loads discharged some poor soul had to fill and empty a bushel measure, and importantly, keep an accurate tally to determine the total contained in the consignment. Clearly the King's mechanism could only have been used within a purpose built facility, even if it had ever been used in a trade context.

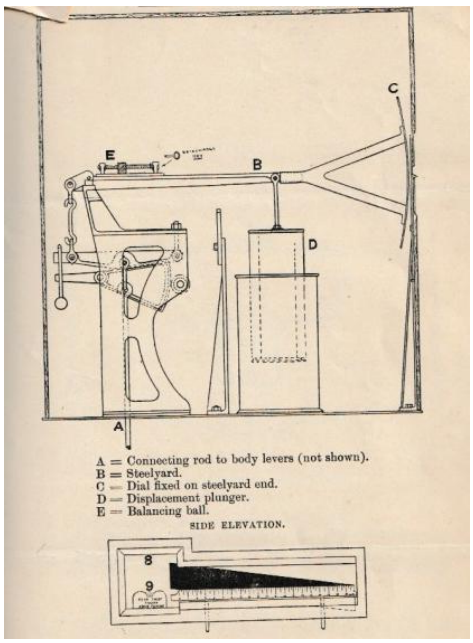
Self Indication

People using scales, soon got fed up with messing about with loose weights, poises etc and began to demand machines that indicated the weight automatically and displayed it to the user. Thus, at the beginning of the 20th century machines began to appear with various forms of self indicating mechanisms incorporated.

Looking at what was appearing it is interesting to note that the degree of sophistication and mechanical elegance displayed varied widely.







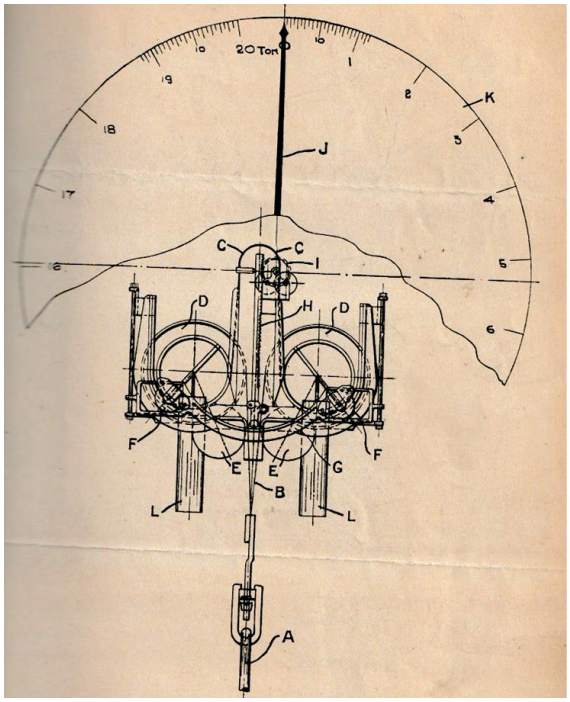
Some mechanisms would be seen as rather crude and from a previous era whereas others displayed a degree of elegance which would still look good many years down the line.

Most of the new devices used pendulum or spring resistants, which became, very much the norm, in later devices as the technology developed, although to ensure evenly spaced digits on the dials, later versions incorporated cam and steel riband mechanisms instead of levers and knife edge bearings.

One technology that was attempted was the use of displacement bodies, submerged in tanks of water. As the load increased, the displacement body was lifted from the water, increasing the effective pull on the resistant, until equilibrium was achieved. It appeared the Board of Trade was not over enamoured by this principle, but one or two devices, incorporating the principle were approved in the early days. One is shown above, in the far right illustration of an early and rather crude looking weighbridge headwork, which was approved in 1908. It would appear that the manufacturers were not really happy with the device, as in 1917, they redesigned the whole thing, using a single pendulum instead. The redesigned version is shown above on the left. It is not altogether clear why the displacement device failed but it never really caught on. Large tanks of water near precision equipment doesn't really sound like a good idea given the propensity for metal to rust. Evaporation could also have been a problem as the correct liquid levels would have to be maintained.

The other device, shown above (centre) is from the same era. It is also a headwork for a weighbridge and relies on a pendulum mechanism to provide the resistant. In this case however, there are two pendulums, as became normal in many later more sophisticated devices.

The early part of the 20th century, saw the development of scale mechanisms, such as those show above which by any measure would not be seen as cutting edge technology, but at the same time other mechanisms were being created which appeared to be from a different time or even a different planet.



A good example of this is the 'Aerostat' mechanism, which was the ancestor of all the subsequent mechanisms with double pendulums and rolling fulcra.

It was introduced in 1906, by Mr Stickig, a Swedish inventor. Although it was a good mechanism there were certain shortcomings in the design. The firm of Toledo undertook certain improvements to the device which made it more useable. Other makers, such as Avery later adopted the Toledo mechanism and used it in their weighbridges etc.

The headwork has, so called, rolling fulcra, which involves steel rollers with pendulum weights attached. As the load increases the rollers ride up on steel ribands, and the pendulums turn outwards until equilibrium is achieved. The motion is transmitted by a rack and pinion to the pointer on the dial. The whole indication mechanism is damped by an oil filled dashpot which speeds up the weighing.

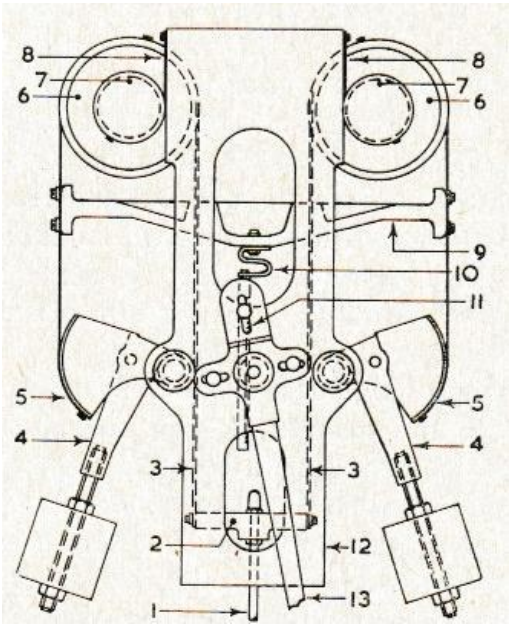


As previously mentioned, at the same time as the medieval monstrosities shown above were being submitted for use, other more elegant machines were also being produced.

On the left is a counter machine, from 1909 that, were it fitted in a white stove enamel casing instead of the gilded livery in the illustration would be pretty similar to machines produced in the 1920's and later.

The scale has a pendulum resistant, operated by a flexible steel riband, fitted with a cam to allow for equal sized sub-divisions and a comprehensive price computing chart.

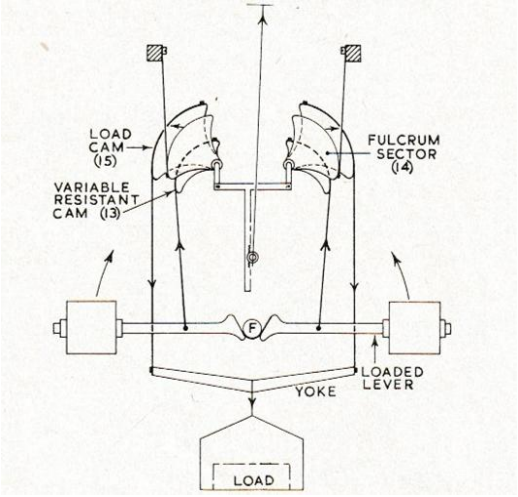




Sons of Stathmos

As previously mentioned, the Aerostat (originally called 'Stathmos' by its inventor) did have certain shortcomings and it required a certain amount of tinkering by subsequent users before a wholly satisfactory design was achieved. Nevertheless variations of the design were eventually used by every major manufacturer in weighbridge headworks and large platform machines. All the mechanisms had in common the double pendulum resistant, with cams, rollers and flexible steel ribands.

Above we see a Berkel platform machine on the left, which still appears to be in use, and on the right a diagram of the Ashworth Ross mechanism, introduced in the 1930's which remained in use until the end of mechanical systems.



On the left we see a simplified diagram of the Avery version which uses three sets of cams and they also changed the original design which used vertical pendulums to the, so called ' loaded lever ' system. This replaced the pendulums with horizontally oriented levers with adjustable pendulous weights on the ends.