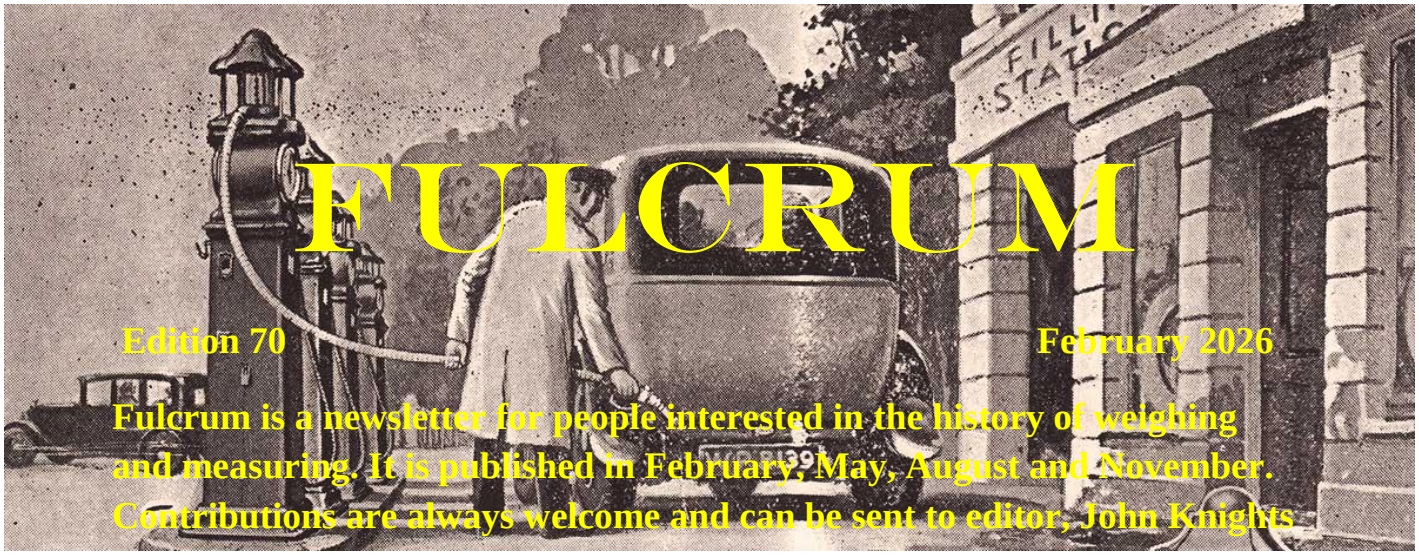


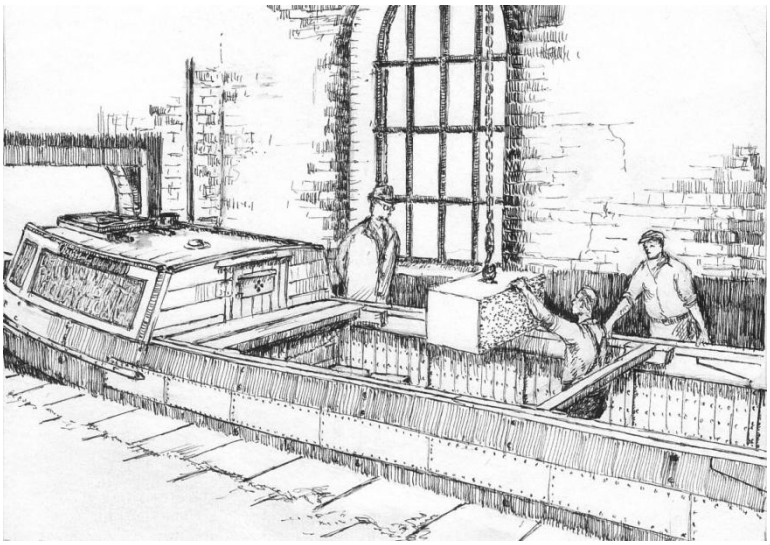
# FULCRUM

**Edition 70** **February 2026**

**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**

## Gauging and Barging

**Back in Edition 59 we looked at the metrology of the British canal system and how tolls were calculated. In most cases this was done by 'gauging' the boat when it was laden with its cargo and estimating the amount by reference to calibration tables produced when the boat was first put into service.**



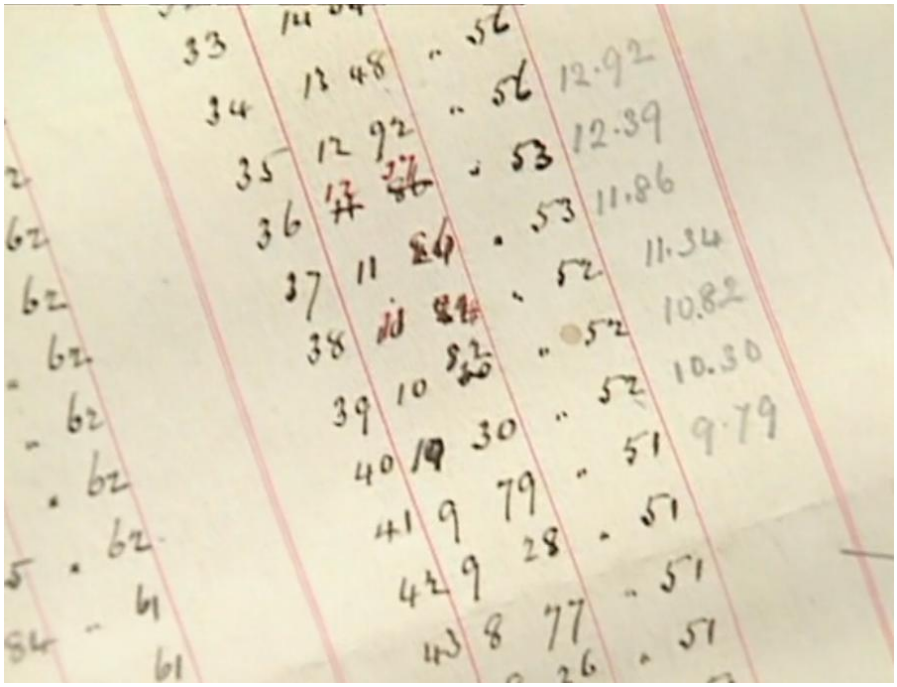
**Initially tolls were probably based on lading documents etc and it was really in the 19th century that the canal companies moved over to the gauging system. This method was convenient for the canal**

**operators but did involve a degree of initial investment in infrastructure and effort to make it work.**

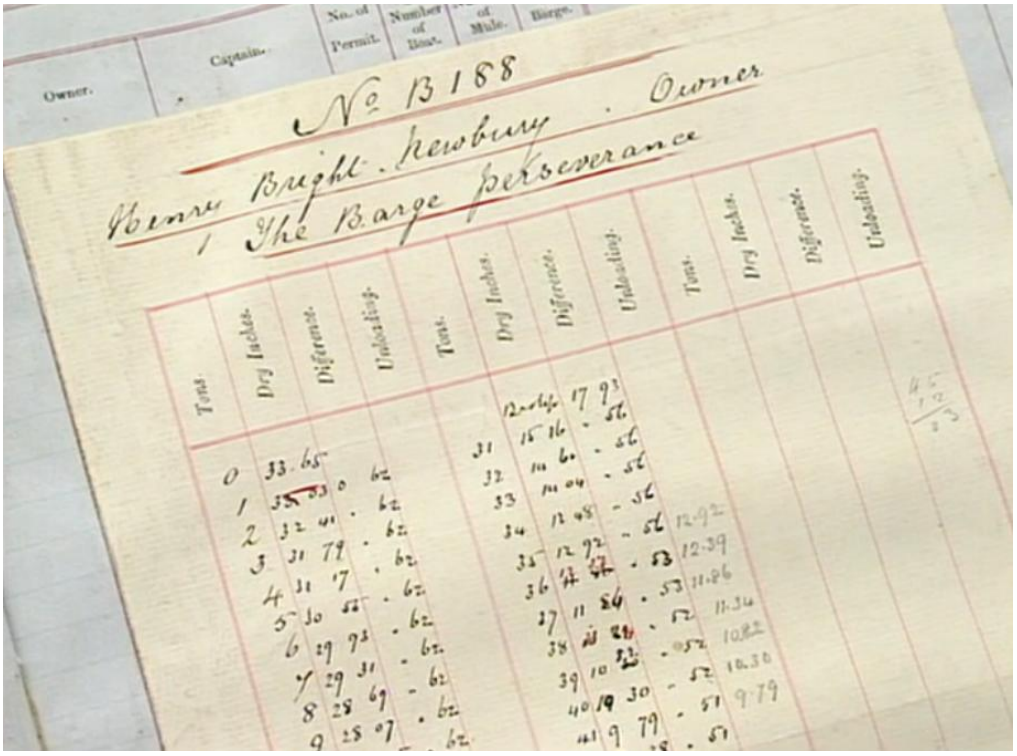
**This can be illustrated by reference to the notes of a meeting of the Committee of Proprietors of Canals and Navigations around the River Trent at the end of the 18th century. Here it was resolved that in order to ensure parity between the operators of the waterways and the vessel owners a system of 'weighing' and gauging would be implemented. To this end it was first necessary to 'calibrate' all the vessels using the waterway so that toll collectors could subsequently ascertain the quantity of cargo by use of the gauging rod.**

**To this end they undertook the construction of a 'Weigh House' near Nottingham with proper cranes and other equipment necessary to calibrate vessels. They also resolved to acquire 40 tons x 5cwt and 5 tons x 2.5 cwt of cast iron weights, a total of 200 weights (that's a lot of weights people) at a cost of £8.00 per ton.**

**Boats were then fitted with 4 iron plates, on the gunwale at places on the vessel to identify the gauging points. Weights were added to the boat as it floated in the water of the lock and at each ton, the gauging rod was applied at each of the four marked points. An average measurement of the 'dry inch' value was recorded along with its equivalent weight. This continued up to the maximum load for the vessel and the values were tabulated on a chart. The example shown was compiled for a boat on the Kennet and Avon canal which had its own Gauging Lock at Bradford on Avon. The Kennet and Avon seemed to be slightly less well equipped than the Trent. In place of their iron weights, the Kennet and Avon had rather rough and ready stone blocks, presumably calibrated to some degree of accuracy. A number of these blocks were to be found decorating the area around the lock back in 1990 as shown above.**

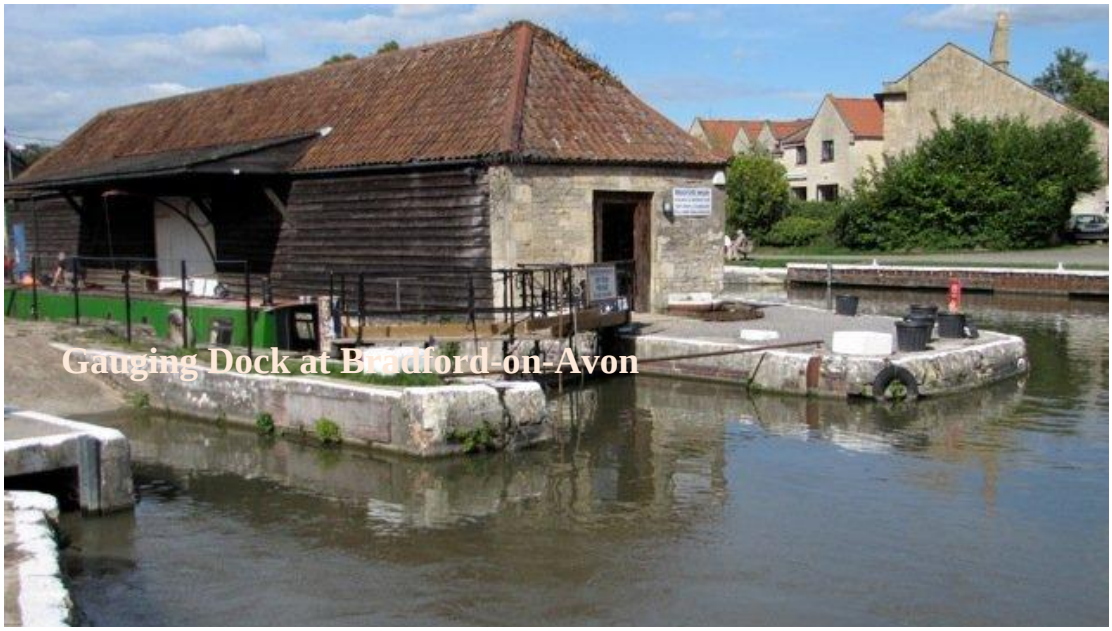


**Canal boats could carry large amounts of cargo, 30 or 40 tons, and so, to gauge a boat to its full capacity required a lot of weights, adequate lifting tackle and a purpose made gauging dock where the procedure of initial calibration could be carried out. The procedure would also be a lengthy one which would in itself be costly in time and resources. In the case of the Trent Navigation it seems they did not seek to charge the**




**vessel owners for the initial calibration and documentation of the vessels as, presumably it was very much in their interest to have all the vessels dealt with.**

**I do wonder whether all Gauging Docks would be as well equipped as that described for the Trent (who incidentally soon found the initial station, inadequate and went on to build another one). Having 40 tons of iron weights to hand is quite an onerous requirement. Even today when large capacity scales of 50 tonnes or so are being tested, it is quite normal to use about half the value in standard weights and rely on being able to substitute, 'loose material' in the form of vehicles, fork lift trucks etc to make up the full load. A similar method could have been used at the gauging dock .There is also the question of whether the test weights were regularly calibrated. I would imagine that the stone weights as found on the Kennet and Avon would suffer a significant degree of degradation in the course of their use. Calibration sheets, produced by the Kennet and Avon Company seem to show that a full complement of weights was available as there is no reference to any substitution. One interesting point is that the calibration sheet has columns for use when the vessel is being unloaded, but these do not seem to have been filled in. It is questionable whether it would have been worth doing the reverse test. It is always done on a modern scale to check for mechanical hysteresis or its electronic equivalent. It would certainly have increased the time taken for the test. On the sheet shown, the tester has clearly got into a bit of bother with his figures so has done his corrections in the 'Unloading' column.**



Gauging Dock at Bradford-on-Avon

## Eggs Down Under

**I was recently watching a programme about egg production in Australia in the 1950's (of course I was). It seemed appropriate, given that Australia has creatures laying eggs that really have no business doing so. I feel that when the Almighty created the world he must have done the top half first and populated it with all the sensible animals such as lions, tigers, zebras, rhinoceroses (not so sure about them) etc and by the time he got to the bottom bit he'd used up all the good ones. Hence we find all the weird, bizarre and outrageous creatures in the Southern hemisphere.**

**The programme concerned normal hens' eggs however and featured a section where eggs were being candled and graded for size (sole reason for watching).**

**I was pleased to see that the grading was being done with the rotary machine from Bristol Company of Brecknell, Munroe and Rogers, later Brecknell, Dolman and Rogers (BDR).**

**Back in the day these instruments were part of my testing duties and were a joy to get one's hands on.**

**Graders were made in two basic sorts, named, after much consideration, Type A and Type B. The A patterns had a number of pre-set pivoted weight arms, each one equivalent to one of the prescribed grades. A reciprocating mechanism passed each egg from receptor to receptor until the weight was sufficient to tip the lever and deposit the egg in the appropriate tray.**

**The B type was altogether more exciting, not to mention hazardous. Here we were faced with a large rotating wheel which spewed out eggs into the appropriate trays. Within were a number of receptors attached to pivoted levers with a counterpoise at the rear. As the wheel turned, small incremental, weighted levers dropped, each time increasing the turning moment of the main lever. When the combined weight of egg and additional load was sufficient the lever tipped and deposited the egg into its tray.**

**Testing the Type A machines was quite simple. The test poises were simply loaded onto the feed belt so they were placed, in turn on the first egg receptor. If sufficient to tip the**

**lever the poise was dropped into the grade tray or if not, it was passed to the next receptor by the reciprocating transfer mechanism and either dropped or transferred, until all the poises had been used. The trays were then checked to see that the poises had been deposited correctly and the results recorded. The tests would be repeated the requisite number of times until a decision could be made as to the accuracy of the machine.**

**The Type B machine was a different prospect altogether. In this machine each unit on the wheel, assessed all of the grades so each one had to be tested separately. The feed belt could not therefore be used in this case. Each poise had to be deposited, in turn by hand into the unit under test. When that unit had been fully tested the process was repeated on the next one until the whole machine had been assessed.**

**Thus we had the situation where there was a large wheel, the guard to which had been removed, over which the inspector was leaning( they all wore dangly ties in those days, 'because they were all men') and on which he was placing his test poises by hand as it spun round at quite a rate of knots. What could possibly go wrong? As I recall, the process was approached with a totally blasé attitude and it was never considered that this was in any way hazardous. We had, after all 'always done it this way' and the method was even illustrated in an official guide (see below).**

**Poises** **Here we see a set of 'Classic' 1960's UK egg poises as used up until the UK joined the EEC in 1973 and grading of eggs became a whole lot more complicated, verging on the ridiculous.**

**At this time, eggs were graded as Large, Standard, Medium and Small, with rejected Small eggs going into an Extra Small tray at the end. The machines were tested with an eight poise set of metal eggs designed to test the discrimination and sensitivity of the machine. The Large egg nominally weighed $2\frac{3}{16}$ oz (2oz 3dr or 957gr). The Standard egg weighed less than $2\frac{3}{16}$ oz and not less than $1\frac{7}{8}$ oz (1oz 14dr or 820.3gr). The grader therefore had to distinguish between an egg weighing $2\frac{3}{16}$oz or more and one weighing slightly less. The practical solution was to adjust the poise to $+\frac{1}{2}$ dr (AA or A accept) and $-\frac{1}{2}$dr (AR or A reject) of the nominal weight. Any weight between those values could be graded either way. The same system applied at the other sizes as shown in the table. When graded correctly, the same coloured poises ended up in the same tray.**

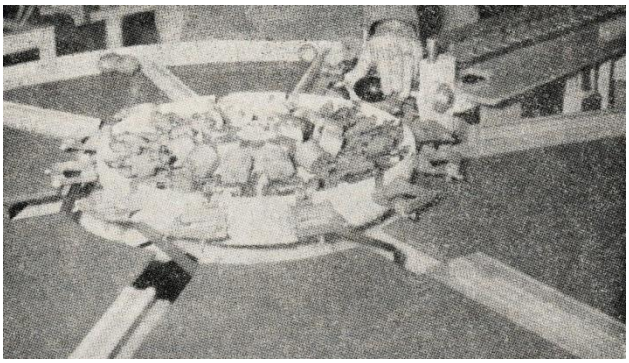
| | | | |
|---|---|---|---|
| **AA** | **$2^3/_{16}$ oz** | **+¼ dr** | **RED** |
| **AR** | **$2^3/_{16}$ oz** | **-¼ dr** | **BLACK** |
| **BA** | **$1^7/_8$ oz** | **+¼ dr** | **BLACK** |
| **BR** | **$1^7/_8$ oz** | **-¼ dr** | **GREEN** |
| **CA** | **$1^5/_8$ oz** | **+¼ dr** | **GREEN** |
| **CR** | **$1^5/_8$ oz** | **-¼ dr** | **BLUE** |
| **DA** | **$1^1/_2$ oz** | **+¼ dr** | **BLUE** |
| **DR** | **$1^1/_2$ oz** | **-¼ dr** | **BROWN** |

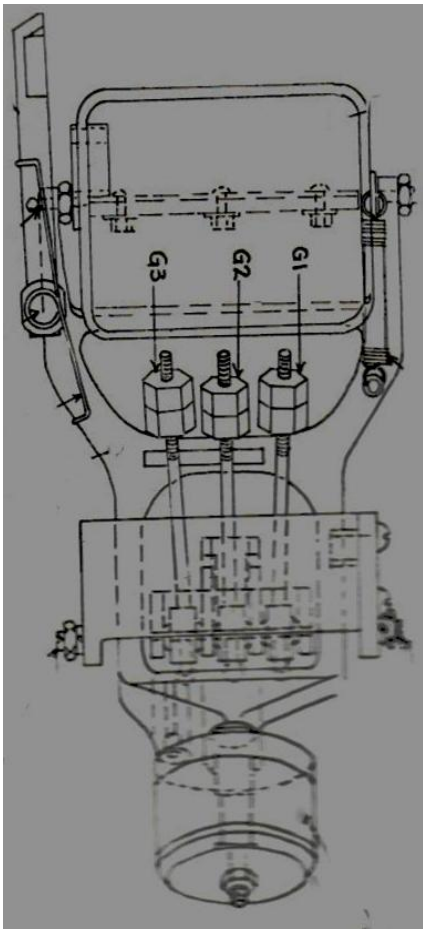
**In the 1970's the law was changed and egg grading was assessed by a reference test method, whereby a sample of eggs was taken and weighed, to ensure they had been correctly graded. This duty was carried out by inspectors from the Ministry of Agriculture and there was no longer any need to test the graders. In the 1950's film about the Australian egg producer we see somebody testing the weights on a little manual egg scale, presumably as a check on the output of the grader.**

## Whoops

**When testing a Type B machine it could be quite difficult to keep track of the unit being assessed as the whole wheel spun round at some speed. To distinguish it therefore, it was normal to disable the other 11 or 19 units, not being tested by lifting the little supplementary grading arms (G1-3) leaving only the unit under test operational.**

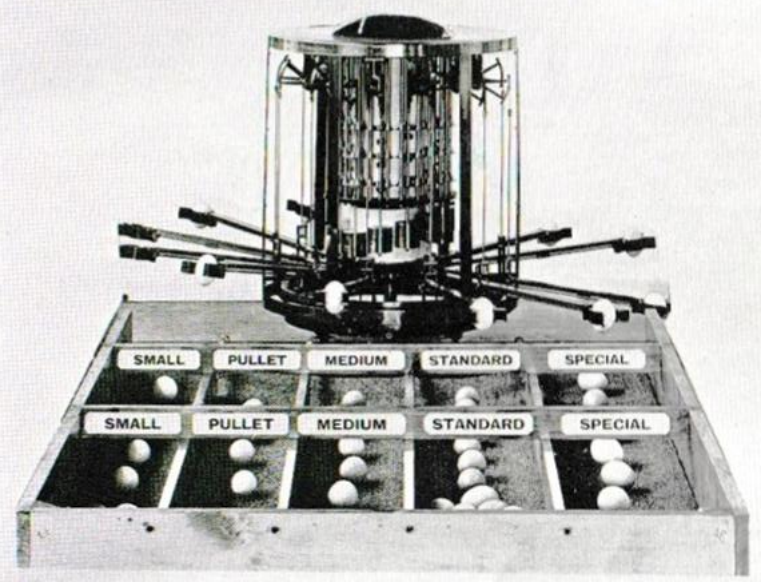
**In the early days of my so called career in the Weights and Measures game, as a lowly bag carrier, I accompanied the inspector, carrying my lowly bag, and the set of egg poises to carry out tests upon some graders. We found ourselves in a small town in the very Southern part of our area, which happened to have two egg packing stations nearby. We went to the first premise and found a rotary BDR machine which the inspector proceeded to prepare for test. The guard was removed and the three grading arms were lifted on all the receptors except the first one to be tested. He started the machine and placed the first poise in the cup before it reached the point when it was released and began grading. I wrote all the results down as he proceeded through all the poises and all the receptors in turn. These tests took quite a long time but eventually he was happy with the result and we prepared to leave. He replaced the guard on the rotating wheel, had a quick word with the manager and we left to go to the next premises. There we began the process all over again. Suddenly someone came in and said there was a telephone call for the inspector, from the other packing station. He took the call and came hastily back in saying we had to return to the first premise. When they started the machine again they found that all their eggs were coming out as either Large or Extra Small, nothing in between! Of course, he had forgotten to drop the little grading arms (G1-3) back in their proper places before putting the guard back on, thus rendering the whole machine inoperable. We had to return therefore offering profuse apologies. They took it in good part fortunately although I'm sure it did not improve our reputation for competence. Whenever I checked a machine in my own right later on, I always double checked.**






**Above**
**Testing a Type B machine by placing the poises by hand on the unit as it passes the 'start' position.**

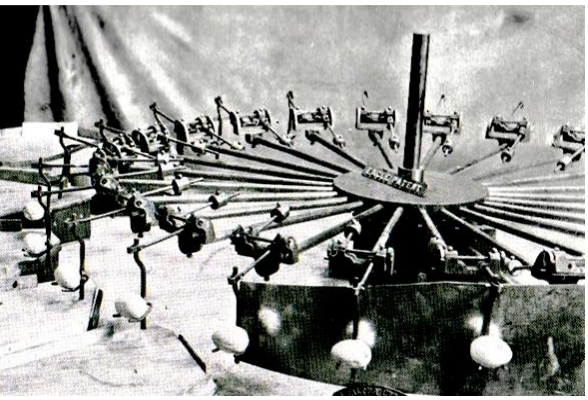
**Left**
**A grading unit from a BDR, Type B, egg grader. These machines were fitted with either 12 or 20 such units.**




## Type B or not Type B

**Modern egg graders still work on the same principles as their predecessors but with a few more bells and whistles. The Type B's have been supplanted however, by the Type A's which now have multiple lanes and grade at an enormous rate.**

**I only ever came across the BDR Type B machines which were found in many grading stations up until the 1970's. I suspect the EEC grading regime saw them off plus the Health and Safety issues alluded to earlier, although I had no further contact with the sector after that.**



**There were at least two other Type B models approved in the 1930's but I don't think they found much favour among packers. The top picture shows a machine made by Joseph T Robin Ltd of Streatham Vale in London. It works on a similar principle to the BDR in that supplementary weights are added at each new grade. It was however much more complex and, I suspect more liable to go wrong. It also had to be fed by hand, one egg at a time which would be far less convenient than having a feed belt as in the BDR.**

**The other machine was made by Walter Frost of the Eagle Iron Works in Rochdale. It was a simpler machine than the Robin device and relied on the inclination of the counterpoised grading arms to make the selection, a rather more 'analogue' approach. Again the eggs had to be loaded singly by hand which would be slow and less efficient than using feed belt as in the Brecknell, Dolman and Rogers' machine.**

**A modern Type A Egg Grading machine made by the Italian firm of Sime-Tek.**

**A somewhat more grandiose affair than the machines of the past but still operating on the same basic principles**