

Figure 1.2.28. Two Section Torsion Lever System

1.2.12 REPAIR/ADJUST A MOTOR TRUCK SCALE

The first step in overhauling a motor truck scale (from here on abbreviated to M.T.S.) is to determine the ratio of each individual lever and the total multiple of the whole scale.

Most manufacturers have the ratio of each lever cast into the body of the lever. If such be the case, it is very simple to determine the total multiple by multiplying the ratio of the levers coupled in series, using one lever of each type.

If the levers are not marked, the specifications will have to be obtained from the manufacturer, or the ratio of each type of lever will have to be determined by either one of the following methods.

One way is to measure the pivot distances and divide the p_a with the l_a . This is sometimes very difficult and unreliable, because of the shape of the levers, the location of the pivots and also because of the worn down condition of the pivot edges. The other way is to suspend or mount the lever in question on a stand and couple it to the adjusting (sealing) beam.

The most dependable way to determine the ratio of a lever and also to adjust it, is by weight substitution. This method eliminates any possibility of an error caused by an incorrect beam multiple. The hookup is illustrated by Figure 1.2.29. The manner of mounting the lever and coupling the nose iron to the beam, varies with the type of lever construction.

The loop "a" of Figure 1.2.29 is a make-shift rig designed to hang on the load pivot of the lever. It should be easy to remove and should swing clear of the lever body. The shape and size depends on the formation of the lever. The loop "b" accommodates the power pivot or nose iron of the lever. It has a hook on the top and the bottom. One connects to the beam "d" and the weight pan is suspended on the other. Both "a" and "b" have hardened steel bearings to receive the pivots.

To describe the shapes of such rigs to fit the wide assortment of levers on the market would require a volume of its own, and for this reason the construction of such rigs will be left to the ingenuity of the mechanic.

To obtain the ratio of a lever prepared in the above manner, suspend a 500 lb. weight on rig "a" and balance the beam "d" with the aid of counterpoise weights and the balance ball. When balance is established, remove the 500 lb. weights from rig "a". Do not remove rig "a" from pivot. Place weights on the weight pan until beam balances again. Next, add up the amount of weights in the weight pan and divide 500 by the total. The result will be the ratio of the lever in question.

This method of getting the ratio (multiple) of a lever may be used not only on M.T. scales, but also on industrial scales; or as a matter of fact, any lever or beam with a questionable multiple.

If the result is 5.07 or 4.95, or something similarly near to 5.00, then it is safe to assume that the lever was meant to have a ratio of 5:1.

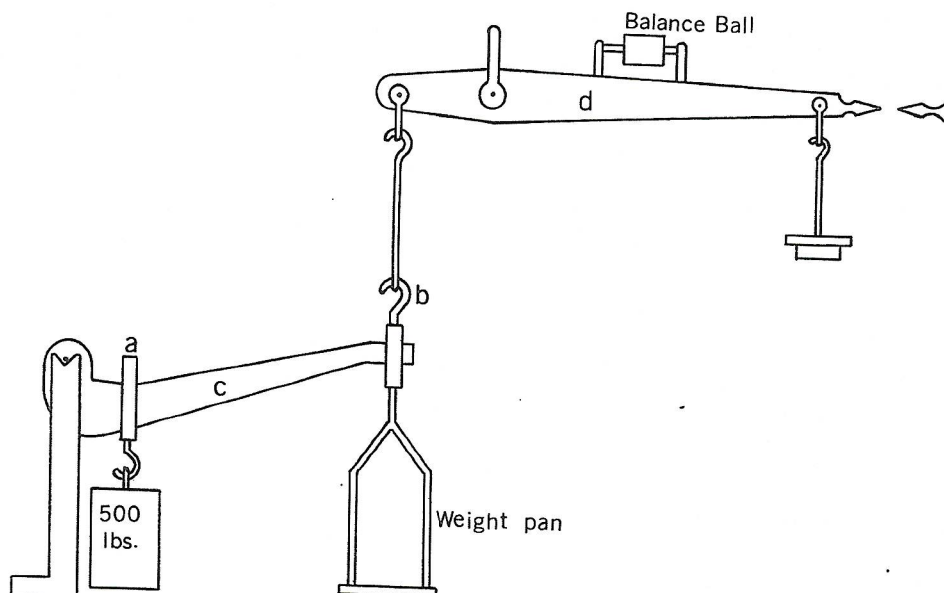


Figure 1.2.29. Hook-Up for Ratio & Adjustment

Remove lever from the rig. If the pivots are badly worn, replace them. First make an approximate fit, then harden and finish the fitting. The present day scales are manufactured with precisely machined pivots and pivot nests. When such is the case, the replacement is easy. The old types of scales require hand fitting. It is best to finish fitting after the pivot has been hardened, because of the possibility that it may acquire a slight curvature during the hardening process. The levers of beam scales should have a slight range. There should be no range in the levers of dial scales.

If the pivots are not too bad, they may be sharpened on a grinding wheel. Sharpen fulcrum pivot first. Use straight edge on both sides of the edge. Next, remove the load pivot. Grind it the same way, but at the same time check to see that the edge runs parallel with the fulcrum pivot by using the gauge that has been set to the best pair of pivots. Both parallel and gauge parallel should be constantly checked while sharpening.

When the sharpening and gauging has been completed, the lever should be remounted on the rig. This time the test procedure should be reversed. If the ratio of the lever is 5:1, 100 lbs. should be placed on the weight pan. Balance beam "d". Remove the 100 lbs. Hang the 500 lb. weight on loop "a". If the beam balances, your ratio is correct.

If the beam rises above the balance position, remove the 500 lb. weight and the rig "a" and hone or grind the lp toward the fp to shorten the la. If the beam drops below the balance position, grind lp away from fp.

Replace rig "a". Place 100 lbs. on weight pan. Balance. Remove the 100 lbs. Hang 500 lbs. on rig "a" and check balance. Repeat until beam balances with both 100 and 500 lbs. When this happens, the lever will have a correct 5:1 ratio. Remove lever from the rig and readjust the gauge to the present corrected la.

Grind and gauge the pivots of all the levers of the same type with this gauge setting. This accomplished, the levers should be mounted one after the other on the adjusting rig and adjusted in the same manner as previously described.

Find the ratio and repair the other types of levers in the same manner. If the ratio is marked on the levers, or the specifications are available, then of course it is unnecessary to mount and check the levers before they are repaired.

By multiplying the ratios of the levers, using one of each type, in the manner described in the section dealing with multiples, we will get the total multiple of the understructure.

All set screws and adjusting screws should be properly cleaned and oiled. The freshly ground pivots should be greased and the levers painted.

In the case of torsion levers, one power arm serves two corners, or in other words, two load and two fulcrum pivots; thus forming a "T" shaped lever. When adjusting a lever of this type, first complete the adjustment of one corner and then the other. Before detaching the power arm for shipment it should be distinctly marked to identify it with the lever. This is to avoid mixing them at the time of installation. The same adjusting procedure may be used on industrial scale levers. The next step is to repair and adjust the beam.

1.2.13 REPAIR/ADJUST THE BEAM INDICATOR

Dismantle the beam completely. Clean, paint, and buff. Remove the pivots. If they are not too badly worn, they should be ground to a fine and straight edge. If badly worn, replace them.

On an ordinary beam scale the pivots of the beam should have a slight range. The beams of scales equipped with an auxiliary "Weightograph" should have no range.

Check and adjust the parallel and gauge parallel. Make sure that the pivots are tight. Swage if necessary. Check the notches on the main and tare beams. If the edges of the notches are worn as illustrated by Figure 1.2.30, the top of the beam should be filed down until the edges are sharp and clear cut; as illustrated by Figures 1.2.31 and 1.2.33.



Figure 1.2.30. Bad



Figure 1.2.31. Good

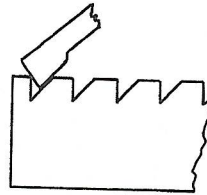


Figure 1.2.32. Flat Angle

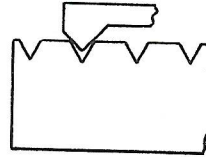


Figure 1.2.33. Obtuse Angle

On the capacity, or main beam, the poise moves on rollers. The notches are staggered. The side of the notch on the fp side is almost vertical, while the pp side is slanting.

The latch of the poise is activated by a spring. The angle of the latch should be such as to prevent its edge from touching the bottom of the notch. The front, or pp side of the latch, should lay flat on the surface of the notch, while the fp side should rest against the corner of the notch as illustrated by Figure 1.2.32.

The latch spring should be strong enough to pull the poise into position, but not so strong as to lift the roller off the track. If the rollers have flat spots, they should be replaced or turned on a lathe.

The notches, of beams having poises without rollers, are symmetrical as illustrated by Figure 1.2.33. The dog of such poise should have a blunter angle (more obtuse) than the notch, so as to prevent the edge of the dog from reaching the bottom of the notch. The dog should seat itself on the edges. The edges of the notches should be clear cut.

Remove cuts from the loops and bearings. If the cuts have been caused by soft surfaces, the bearings should be rehardened. Lap all "V" bearings for true alignment. Assemble beam. The beam is now ready to be adjusted.

Mount beam on the adjusting stand. Hang weight pan on the load loop. Balance beam with the aid of back balance weights hung on the back balance pivot loop and the balance ball.

Prepare a load chart for each individual notch in the following manner. Assuming that the total multiple of the understructure is 300 and capacity notch of the main poise is 30,000 lbs., then the load required to counter balance the poise at 30,000 lbs. would be 100 lbs., because 30,000 divided by the multiple of 300 equals 100.

If one notch represents 500 lbs., then the load necessary to counter balance the poise would be 500 divided by 300. The result is 1.66 lbs. The .66 lb. converted into ounces equals 10-1/2 with .06 ounces left over which may be overlooked. To convert .66 lb. into ounces simply multiply .66 by 16. The result is 10.56. The 10 before the decimal point represents ounces and the 56 after the decimal point, the fractions of ounces. Make up a chart as per the following sample.

Beam	Load Pan
500 lbs.	1.66 lbs., or 1 lb., 10-1/2 ozs.
1,000 lbs.	3.33 lbs., or 3 lb., 5-1/4 ozs.
1,500 lbs.	5 lbs.,
2,000 lbs.	6.66 lbs., or 6 lbs., 10-1/2 ozs.
2,500 lbs.	8.33 lbs., or 8 lbs., 5-1/4 ozs.
3,000 lbs.	10 lbs.

and so on.

If the smallest value on the capacity beam is 500 lbs., then the total capacity of the fractional bar and poise will be also 500 lbs. The fractional bar and poise are integral parts of the capacity poise. This fractional poise is to be adjusted first, because it is part of the capacity poise. If we were to adjust the capacity poise first, and the fractional poise next, then by this second adjustment we would spoil the first.

If the beam rises in the trip loop above the central balance position, it indicates a plus error and lead should be added to the poise. Place enough lead on top of the poise until it indicates approximately the same minus error. Remove load from pan and adjust balance. Replace load and check capacity again. Repeat until correct. Remove poise and fasten lead securely. Loose lead in the poise will shift and

cause inconsistency. Replace poise and check again. If the error is minus, remove lead from poise.

Next, while working with 500 lbs., it is a good idea to adjust the fractional poise of the tare beam in the same manner. After this, the capacity poise will have to be adjusted. Check each notch first. Select notch with highest plus error, and adjust poise by adding lead in the same manner as has been explained in the paragraph dealing with the fractional poise.

Now that the poise has been adjusted to the notch with the highest plus error, all the other notches will have a minus error, which can be corrected by filing the almost vertical fp side. To file the notches, use a three cornered file with one side ground smooth. If all the notches have identical errors, the indication is that only the zero notch is incorrect.

The reason for selecting the notch with the highest plus value is that the filing is much more effective on the fp side of the notch than on the pp side. Only the top corner of the notch will have to be filed. To make corrections on the pp side the whole surface of the notch would have to be filed considerably with the resultant unsightly enlargement of the same. When the notches are being filed, the balance should be checked frequently.

The last step is to adjust the capacity poise of the tare bar. This is done the same way with the exception that in the case of the poise it should be adjusted to the notch with the highest minus value. The reason for this is that when the notch is filed, the dog of the poise will sink deeper into the notch, causing the heavier and longer poise bottom to tilt toward the pp.

Correcting the highest minus error by removing lead from the poise will cause the other notches to have a plus error. These notches will have to be filed on the pp side. By doing this, we not only move the position of the poise in the right direction, but will be also assisted by the tilting poise bottom, because as has been already mentioned, the tilt will be in the same direction. On the other hand, if we tried to correct a minus error by filing the notch on the fp side, even though this would be the right direction, it would not be very effective, because the bottom of the poise would still tilt toward the pp; thereby, partially or completely defeating the result of the filing.

1.2.14 INSTALL/ADJUST MOTOR TRUCK SCALES

When the scale is installed in its final location, care should be taken to see that all the levers are level, that there is sufficient endplay for the levers, that there is enough clearance between moving and stationary parts, and finally, that all connecting rods, loops, shackles, and the steelyard rod are hanging plumb.

The installation completed, balance scale and check for friction, consistency, and SR. There is not much sense in attempting to adjust a scale that is inconsistent. Shake platform and check. Drive a truck on and off a number of times. Check balance after each occasion. If there is a change in the balance, locate the cause and correct it.

The oscillation of the beam should be smooth and symmetrical. The oscillation graph is similar to the one explained in the section dealing with portable and dormant beam scales and is illustrated by Figure 1.2.18.

The SR of the scale may be improved by raising the balance ball. This may be accomplished by raising the bracket on which it is mounted. This, however, is not a sure cure. For instance, should there be an excessive closed range in the pivot line of the beam which may not show its effect on an empty scale, it may cause the scale to become unstable when it is loaded. On the other hand, raising the balance ball may not prove to be adequate to compensate for the ever increasing stabilizing effect of a low pivot line.

If upon the first trial the beam appears to be unstable, before attempting to make any adjustments, it is a good idea to make sure that this apparent instability is not caused by magnetism. There is an easy way to find out whether the scale is magnetized or not. Simply suspend an ordinary nail on a thin thread and move it slowly toward the trig loop or the beam. If the nail starts to swing suddenly toward the tested object, then it is magnetized.

One cure is to heat the trig loop to red hot. If the beam is also magnetized this will not work. Placing the beam and trig loop in a demagnetizer may or may not help. If the understructure is magnetized, the magnetism will seep through the steelyard rod and saturate the beam again. The best solution is to replace the

trig loop with one made of some non-ferrous metal like brass or aluminum.

Never unload or move any part of a scale with a magnetic crane. Magnetism in a scale may also be caused by close proximity to a strong magnetic field of some electrical apparatus.

1.2.15 ADJUSTMENT - STRAIGHT LEVER M. T. SCALE

The first step is to equalize the sections. To do this use a compact heavy load, preferably test weight. For example, let us assume that the scale in question has four sections as illustrated by Figure 1.2.25. Section No. 1 consists of levers 1, 2, and a. Section 2 is levers 3, 4, and b. Section 3 is levers 5, 6, and c. Section 4 is levers 7, 8, and d.

On Figure 1.2.26 the nose irons are identified by letters E, F, G, H, I, and J. Checking the scale with a 20,000 lb. load, we find that sections 1 and 2 have a 30 lb. plus error. Section 3 is correct and section 4 has a 40 lb. minus error. To correct the errors of sections 1 and 2, move the nose iron G away from the fulcrum pivot, or in other words lengthen the power arm. This adjustment will correct both sections. When making this adjustment, keep the bearing shackle plumb by moving the bottom bearings, which contact the load pivot of the transverse lever, in the same direction.

Section 3 has no error. There is nothing to adjust. Section 4 adjustment will be made on nose irons I and J. Move "J" toward the fulcrum pivot to shorten the power arm and move "I" away from the fulcrum pivot to lengthen the load arm of combination lever "C". Move both nose irons an equal amount in order to keep the bearing shackles plumb. This adjustment will not affect section 3.

Sometimes it is easier to equalize the sections to a plus or minus error depending on the pattern of error. For instance, we may find it easier to equalize the sections to a 30 lb. plus error. When such is the case, the final adjustment for accuracy should be made on the nose iron of the transverse lever. When the test load is increased, all further adjustments should be made on the nose iron of the transverse lever.

Once more check all loops, bearing shackles, connecting rods, and steelyard rods for plumb, particularly scales equipped with dials or Weightographs.

For example, should an attempt be made to correct the error of section 4 by making the adjustment on the nose iron "J" only, it would result in the effect illustrated by Figure 1.34 in Section 1. The travel would become shorter and would lose symmetry. The indicator travel is an enlarged picture of the scales travel; or in other words, its sensitivity. By moving only "J" we decrease travel. This means a minus error. As a result, although the nose iron adjustment was made in the right direction, the change in sensitivity will defeat the adjustment or in extreme cases increase the error instead of eliminating it.

The change in symmetry will require a cam adjustment. On many occasions mechanics have been baffled by this interesting effect.

Aside from the above mentioned effects, a scale adjusted with tilted connections will eventually change its adjustment, because the bearings will have a tendency to slide over to vertical position under the stress of the load, aided by the vibrations of the loading process; thus changing the acting power arm and the sensitivity factor.

1.2.16 INSTALL/ADJUST A TORSION LEVER MOTOR TRUCK SCALE

The same rules can be applied as on a straight lever scale. The platform balls should be properly centered in the ball cups. Adjustments are the same, with the exception that each section is independent of the others and has to be individually adjusted. The section connecting shackles can be kept plumb by sliding the top of the shackle in the desired direction on the load pivot of the transverse (backbone) lever.

1.2.17 AUTOMATIC WEIGHT INDICATION

Dial scales are semi-automatic scales, because, although the weight indication is automatic, the loading, unloading, and recording requires the attention of an operator.

This heading may be subdivided into two major groups; namely, the fan type dial scales which usually range from 30 to maximum 50 degrees. These scales are generally used in

commerce and industry, wherever low capacity weighing is required. They are used as computing scales, parcel post scales, and dynamometers. The "Weightograph" also comes under this classification, although its chart capacity occasionally ranges up to 50,000 lbs. The round faced dial scales indicator travel ranges from 345 to 360 degrees.

1.2.18 FAN TYPE DIAL SCALES

Fan type dial scales can be subdivided into two groups according to the methods by which their indicators are activated.

In the first category we may place the scales that have their pendulums and indicators activated by a load pivot and a connecting rod. The second group consists of those scales that have their pendulums and indicators activated by a steel tape winding on and off the surface of a cam.

The scales of the first category have unevenly graduated charts. The graduations are symmetrically diminishing in size toward the zero and full capacity graduations. The graduations are the widest at half capacity.

Figure 1.2.34 illustrates an even arm scale developed into a fan type dial scale with an improved overhead "Roberval" check system and pivot activated pendulum. This scale could be easily converted into a scale with an evenly graduated chart by simply replacing the pivot activated pendulum assembly by a cam activated assembly. The overhead check system is a vast improvement over the type that has its checks below the lever, because its check stems are much longer and as a result the creeping tendency of the bearings on the pivots is reduced. Shift adjustment can be made on the check studs which are located in the tower.

The lever must be rigid and the pivot line neutral. Distances "e" must equal "f", and "g" should be the same as "h". Distances "a, b, c, d" should be identical. The understructure should be adjusted like an even balance scale, using the zero position of the indicator to equalize the lever.

If the pendulum is activated by a pivot, the travel of the indicator will be uneven from zero to full capacity. The reason for this uneven travel is illustrated and explained by Figure 1.2.35.

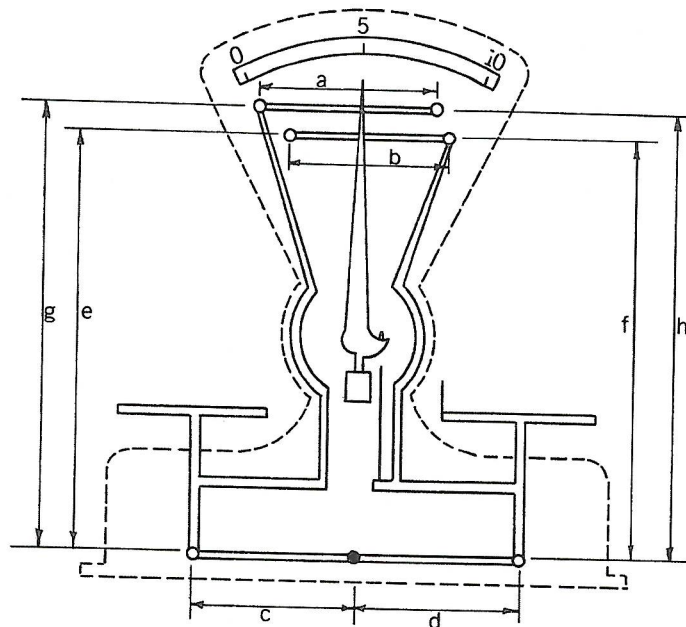


Figure 1.2.34. Fan Type Dial Scale

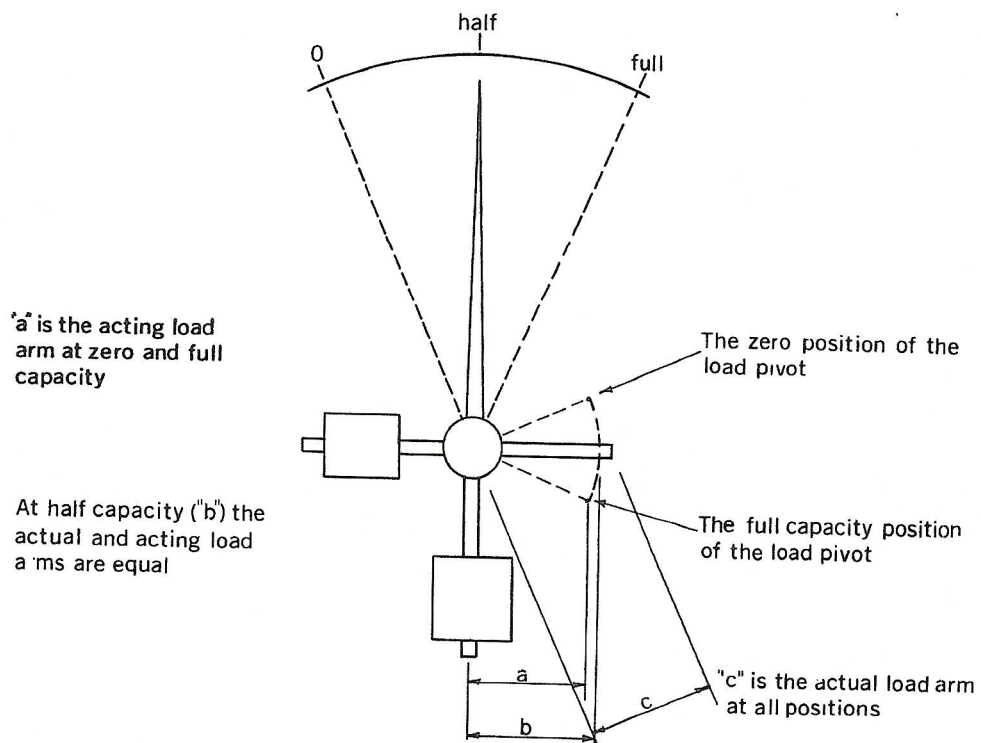


Figure 1.2.35. Uneven Travel

The construction of an unevenly graduated chart is illustrated by Figure 1.2.36.

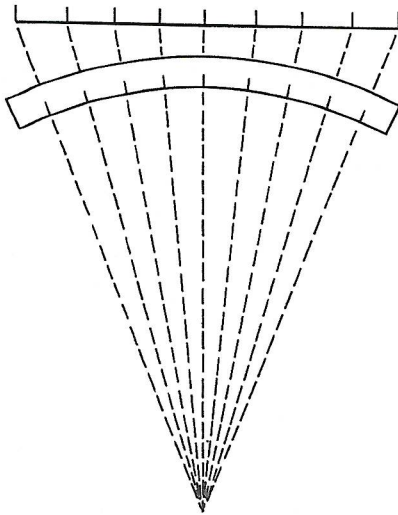


Figure 1.2.36. Unevenly Graduated Chart

The acting load arm of the pendulum assembly is shorter than the actual load arm at zero and full capacity. As a result, the turning force of the applied load is less at these points than at half capacity. As the indicator leaves the zero graduation, the acting load arm and the indicator travel gradually lengthens up to half capacity. At half capacity the acting and the actual load arms are equal, and the turning force of the load is the greatest. Leaving the half capacity point, the acting load arm and the indicator travel gradually diminishes, until it becomes equal in length with the zero position at full capacity. In other words, the length of the indicator travel symmetrically decreases from half capacity to zero and full capacity.

The construction of the chart is very simple. The graduations are merely projections of an evenly graduated straight line, as illustrated by Figure 1.2.36. It is the enlarged picture of the load pivot travel.

If it were possible to connect the load pivot of the pendulum assembly to the lever of the scale at a point that is at the same distance from the fulcrum pivot of the lever, as the actual load arm of the pendulum assembly, then the chart described above would be the exact picture of the scale travel. However, if we were to do this, the lever would have to travel 45 degrees also. This would mean that the load and power

plates riding on an 8" arm would travel approximately 3-1/2" up and down. This obviously is too much. The only way to eliminate the necessity of such excessive travel is to attach an extension arm on the load and connect the connecting rod to this arm, as illustrated on Figure 1.2.2. By doing this, the connecting point of the rod will move on a vastly, greater radius than the load pivot of the pendulum assembly, with the resultant connecting rod angularity. The connecting rod will have a varying departure from the absolute vertical in the course of its travel. This angularity disrupts the travel symmetry of the indicator.

For this reason, when the chart is being constructed, it is advisable to draw the lines lightly with a pencil at first. After the chart is mounted on a well made scale, it should be corrected, if and where necessary, according to the indications of an actual load test. This corrected and properly finished chart may now serve as a master model for all similarly constructed scales.

1.2.19 ADJUSTMENTS

After the understructure has been properly adjusted in the same manner as an even arm scale, using the zero graduation for indication, the travel of the indicator should be checked. The travel of the indicator is correct, when it corresponds with the reading on the chart and the unit of weight placed on the load plate; or in other words, when 1 lb. is placed on the load plate the indicator should point to the 1 lb. graduation of the chart.

The easiest way to adjust scale with pivot activated pendulums is to work from half capacity. If the capacity of the chart is 2 lbs., then half capacity would be 1 lb. Place a 1 lb. weight on the load plate and balance scale until indicator points to the 1 lb. graduation. Next remove the 1 lb. weight and note reading.

Let us assume that we have a one graduation plus error. Now place 2 lbs. on the load plate. Should it so happen, that we have a one graduation minus error, then the adjustment is very simple. Raise the pendulum until indicator points to the 2 lb. graduation. This will correct the error at zero, also.

If the pendulum is mounted on an angle, that is to say that it is vertical when the indicator points to zero, then the adjustment should

be started at zero position. In this case any adjustment to the pendulum will not affect the zero position.

Now let's assume that the zero and half capacity is correct, but we have a graduation minus error at capacity. This indicates that the indicator and the pivot line do not form a 90 degree angle. Most scales have indicator angle adjusting screws. On some scales the screws that hold the indicator have to be slightly loosened and the indicator twisted. The idea is to move the indicator in the direction of the error; that is to say, the error has to be doubled. In this case, the indicator should point to two graduation minus. Further pendulum adjustments will be necessary. Repeat until correct.

We are ready to test the scale beyond chart capacity. Place 2 lbs. on each plate. If the understructure has been properly adjusted, the indicator will point to zero. Now place two more pounds on the load plate. If the indicator goes beyond the capacity graduation, then there is a range in the pivot line of the lever and should be eliminated. The fulcrum pivot should be raised if the error is minus.

On scales that are equipped with a cam, the adjustment of the chart capacity (indicator travel) is somewhat different. The pendulum is almost vertical when the indicator points to zero. It is not absolutely vertical in order to keep the steel tape taut. As a result, a pendulum adjustment will affect the zero position, although the effect will not be as pronounced as at capacity.

When the scale has been properly leveled and the understructure adjusted in the same manner as an even arm scale, the next step is to adjust the chart capacity.

Zero the indicator. Place a one pound weight on the load plate - if the chart capacity is two pounds. Let's assume that there is a one graduation minus error. Next, place two pounds on the load plate. This time we find a two graduation minus error. The adjustment is very simple, because the error is multiplying; or in other words, doubling. Raise the pendulum until the indicator shows about a half graduation plus error. The amount of over adjustment varies with the type of construction. Remove load and adjust zero indication. Check load again. Repeat until correct on all three points.

Now, let's assume that the half capacity is correct, but there is a one graduation minus error at capacity. A cam adjustment will be necessary. The cam should be turned in the direction that will increase the acting load arm of the cam at capacity. It would be rather difficult to point out and name the set screws that have to be loosened and tightened to correct this error, unless a certain make and type of scale was chosen for this purpose. There is such a great variety of construction that it is almost impossible to describe each in detail. A thorough understanding of the cam action will help to determine at a glance the direction of the cam adjustment. The cam adjustment, in this case, should create an approximately two graduation plus error, at capacity. This should be followed by lowering the pendulum. Remove the load and zero scale. Repeat adjustment until the scale is correct.

Next, place a two pound weight on both plates. If the indicator should point to zero, place two more pounds on the load plate. The indicator should now point to two pounds. If there is a minus error, then the height of the main lever fulcrum pivot should be increased. Decrease height if the error is plus. This change in the pivot line will, of course, affect the first travel of the indicator also and it should be readjusted.

1.2.20 FAN TYPE RATIO COUNTING SCALES

The scale illustrated by Figure 1.2.37 is a fan type counting scale. It has only a load plate and the main lever is second class. Its chart has only a zero indication. The indicator serves merely as an over and under indicator. Very often two weigh beams of identical capacity are attached to the main lever "c". The graduations of the weigh beams give the correct weight of the load when the indicator points to zero. The counting ratio of these scales is fixed. They are made in 99:1 and 9:1 ratios with the possible recent addition of lever "a" with a 999:1 and 1,000:1. By removing the lever "A", the highest counting range becomes 99:1 or 100:1, whichever the case may be. On a 1,000:1 scale, one piece of any uniform product placed in pan "d" will counter balance 1,000 pieces placed on the load plate. One piece placed into pan "f" will counter balance 100 pieces and one piece in pan "e" 10 pieces.

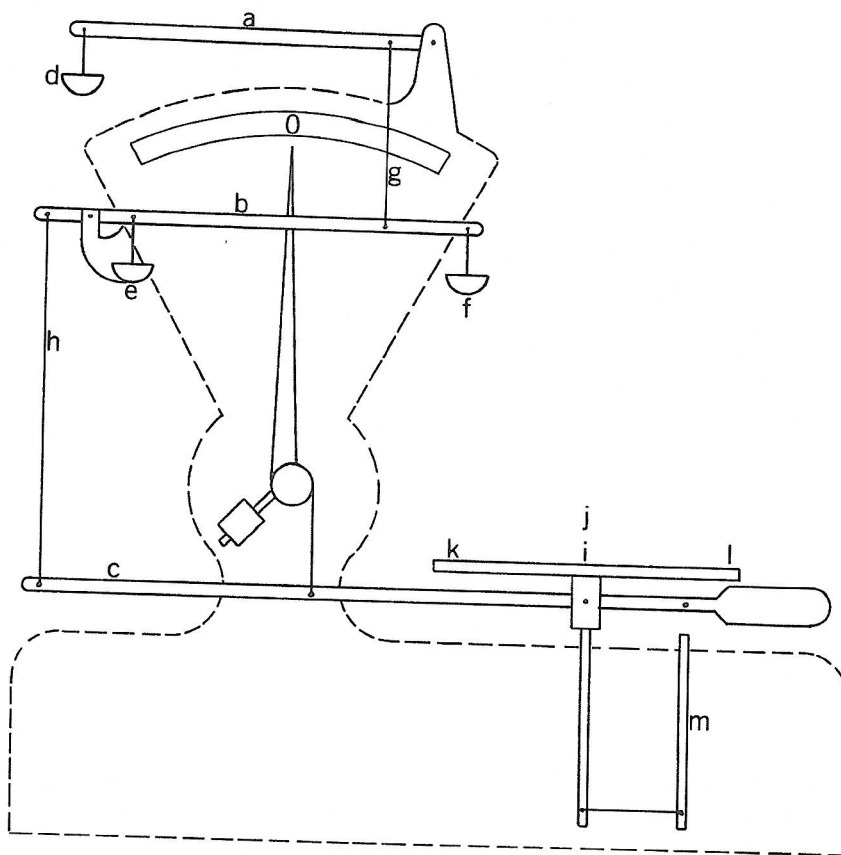


Figure 1.2.37. Fan Type Counting Scale

1.2.21 ADJUSTMENTS

The connecting rod "g" has an upward thrust. Connecting rod "h" has a normal downward pull. First, adjust the four extreme positions on the load plate, marked by "I, J, K, L". Positions "I" and "J" should be equalized first. The parallelogram adjustment is usually on the check stud. The methods used in raising or lowering the stud vary. The check stud that is referred to is marked with "m". When the test weight is placed on the position marked with "L", and the scales indicates a plus error, the check stud should be lifted. When the load placed on point "L" indicates a plus error, then the same weight placed on point "K" will indicate an equal minus error. By correcting position "L", "K" will also be corrected automatically, unless the "V" bearings are not sharp enough, or the check is loose.

The next step is to adjust the various counting ratios. Each counting ratio can be adjusted independently of the others. It would be a needless repetition to go into detailed

description on which way to move or turn each pivot. A thorough understanding of leverage makes it very simple.

When the counting ratios are correct, the tare and capacity beam should be adjusted by adding or removing lead from the poises.

The counting accuracy of these scales is also dependent on sensitivity. If the material to be counted is so light, that one piece placed on the load plate will not move the indicator, it stands to reason that there is a possibility of a miscount of at least one piece. If ten pieces are needed to produce a noticeable indicator movement, the plus-minus error in the count may be anywhere between one and ten. The sensitivity may be increased by raising the pendulum. Scales of this type, if well made, will give an accurate count on products weighing not less than an eighth of an ounce taking it for granted that the pieces have a uniform weight. The percentage of error will increase if the weight tolerances between the individual is great. Cam adjustment should be made only if the lack of