The experience of farming is thus far encouraging. If success crowns the efforts that are making to break down the deplorable monogamy of the foxes, all will go well.

Some figures relative to the capture made in the season of 1898-99 may here be given. The "season," be it remembered, lasts but a few days, during which the animals' fur is in the exact state desired by the furriers and the public. During that season, then, 231 blue male foxes were taken and killed, 21 blue males escaped otherwise, 18 white foxes of both sexes were taken and killed, 176 blue males and 389 blue females were taken and not fed.

P 6759

ON ANCIENT DESEMERS OR STEELYARDS.[1]

By HERRMANN SÖKELAND.

The Anthropological Society of Berlin has occasionally received descriptions and seen exhibitions of simple weighing instruments which were called, in German, desen, desemer, besemer, or besen. A discussion in the Folklore Society of Berlin resulted in deciding in favor of the form "desemer."[2]

I was thus led to inquire what was known about such balances. Two ways suggested themselves for prosecuting this inquiry—by testimonies and by monuments; that is to say, by reading what is recorded on the subject in books, and by directly comparing German desemers with more or less similar instruments of other peoples and ages which are to be found among the treasures of the different museums of Berlin.

Though there are many sterling works upon the construction of every conceivable description of balance, and an extensive literature of weights and measures, yet I have succeeded in finding nothing worth mention concerning the development of that which might well be suspected to have been the first device for weighing—the desemer. So crude a contrivance could have no interest for the artificer. Besides, the simple but imperfect instrument which is called in north Germany a desemer has become almost unknown to the present generation, and the consequence has been an increasingly frequent confusion between the desemer and the Roman steelyard. What we mean by a desemer, or, as it is called in the Altmark, an Uenzel, is something like a steelyard of wood or metal having its counterpoise fixedly attached to it, while the piece upon which it rests and turns can be shifted. The Roman balance, or what is usually understood by a steelyard, the German Pfünder, has, on the other hand, a fixed fulcrum and movable

[1]Translated from Verhandlungen der Berliner Gesellschaft für Ethnologie, etc., Berlin, 1900.

[2]It has been assumed that this word is the same as "besen," the English form of which is "besom." The "steelyard" is so called because it was first used on the left bank of the Thames, at a place where the Hanse merchants sold steel. It seems quite possible that the original form of the balance used there was the desemer.—Tr.

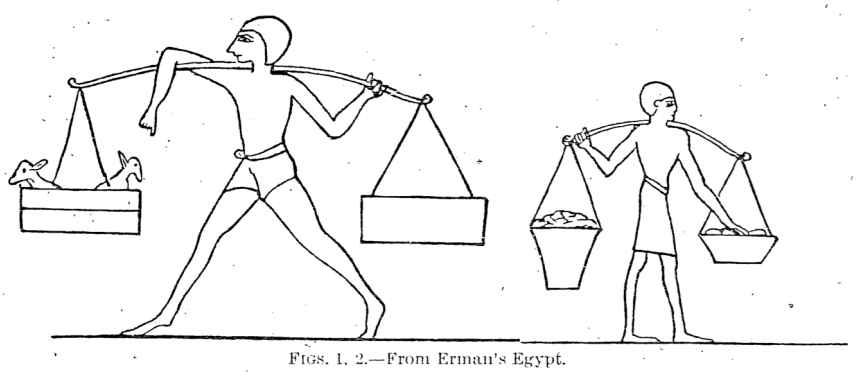
counterpoise, making three essentially separate pieces instead of the two of the desemer. We are to distinguish carefully, then, between

(1) The desemer, with fixed weight and shifting fulcrum, not necessarily having more than two separate pieces, and

(2) The Roman balance, or common steelyard, with shifting weight and fixed fulcrum, necessarily having three pieces at least.

Although the desemer is the subject of the present communication, yet in order to form some rational conjecture concerning the course of its evolution, to comprehend the relation between the three kinds of historical balances (the modern spring balances, aneroid balances, torsion balances, horizontal balances, hydrometer balances, etc., being left out of account), and to decide whether or not the two-pan balance can be considered as the first step toward the unequal-armed balances, it will be necessary to begin by studying the two-pan balance.

We shall be forced to rely, as I have said, almost exclusively upon comparisons between objects in the collections; and before going further it behooves me to express my grateful thanks to those who



FIGS. 1, 2.—From Erman's Egypt.

have them in charge for the assistance which they have generously extended to me, and without which I should have been unable to-day to collect and exhibit what I have to show you.

We shall have to admit both the two-pan balance and the desemer in its rudest form as the simplest and most primitive weighing apparatus. Indeed, it is probable that both inventions are primeval and that they were made by different peoples at different times. The invention was easy to make. Many occupations had made it clear that if a bar be in any way supported in the middle, both ends must be equally loaded in order to bring it into the horizontal position. The neck yoke or portage bar, so often seen on ancient Egyptian walls (figs. 1 and 2), or the plank resting on a narrow support, the delightful seesaw of children, called in America a "tilt," in Germany a "wippe," constitutes a ready-made equal-armed balance as soon as anybody thinks of putting it to that use.

Wilkinson, in his Ancient Egyptians, gives a drawing of a goldsmith,

after the picture found at Beni-Hassan. It shows two men occupied in weighing gold rings. The figure of the balance seems to represent about the simplest possible equal-armed scales. Fig. 4, albeit a symbolical representation from the classical age of Greece, appears to corroborate the inference from fig. 3 that the primitive equal-armed balance was supported from below.[1] That arrangement, however, did

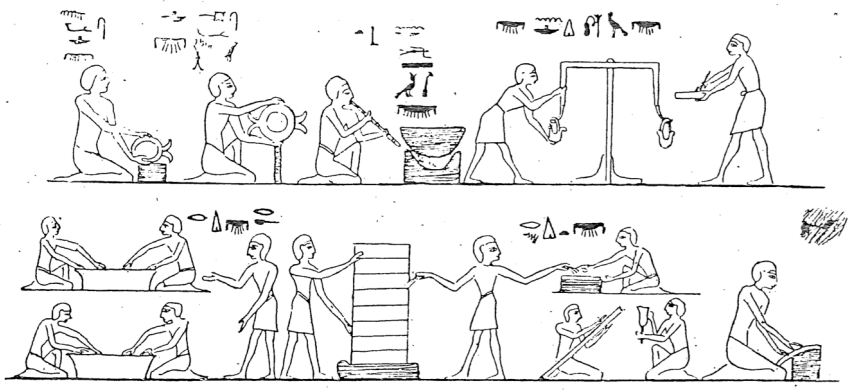


FIG. 3.—From Wilkinson's Ancient Egyptians.

not long prevail, for soon the beam begins to be suspended from a central axis. For a time there was no contrivance, such as a tongue, by which the horizontal position of the beam would be directly and unmistakably shown. On the great amphora of the Taleides (fig. 5), dating perhaps from the sixth century before Christ, such a balance is figured. Instead of a tongue there is a simple crosspiece serving to limit the motion of the beam. Equilibrium in weighing out a predetermined amount of goods would be shown by the beam beginning to swing freely, for the lowest part of the crosspiece is on the side of the goods pan, so that the weight pan would be prevented from sinking too much when it overbalanced the other.

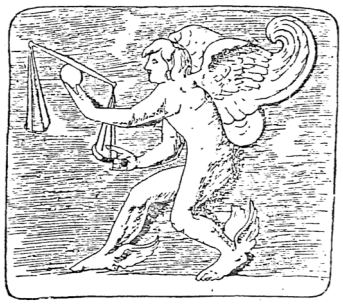


FIG. 4.—From Baumeister's Monuments of Classical Antiquity.

The same object was accomplished by the Egyptians more ingeniously (fig. 6). One arm of the balance passed loosely through a ring which hung upon a round rod above the beam and parallel to it. This rod was often in the form of the hind leg of a baboon that crowned the balance as an image of Thoth, the ordainer of weights and measures, and god of time. Below the ring hung a short plummet. When this plummet and ring were free the beam did not touch the ring, and the

[1] No. 3 is prevented from upsetting by elbows in the arms, and No. 4 by rolling on a cylinder.—Tr.

weight must be correct. This ring prevented either pan from sinking too far.

Neither of these arrangements allowed the beam more than a very limited play, and from this it may be inferred that they lacked one of the prime requisites of a good balance, namely, that the equilibrium should be stable, so that when unloaded or carrying equal loads the beam should tend to return to the horizontal position, however far it might have been displaced. A later improvement was to suspend the beam by a ring attached to its upper side in the middle, as is seen in fig. 7, from Egypt, and fig. 9, from Japan. The same mode of suspension was employed in the corresponding stage of development of the balance in ancient Greece and Rome.

FIG. 5.—From Baumeister's Monuments of Classical Antiquity.

Although the tongue is wanting, being replaced in Egypt by a somewhat differently constructed plummet, yet a fairly complete weighing apparatus has now been reached, since the two prime requisites of small friction and a position of the axis of rotation somewhat above the line of junction of the points of suspension of the pans are both present. That both these conditions must be fulfilled in order that the scales may work well, the reader need not be informed. But whether these important improvements may not have been adopted in the first instance without any clear anticipation of their advantages is at present left undecided. The monuments show that they were in fact adopted, and weighing could be performed very well upon such a balance, provided the weigher were able to judge when the beam was horizontal. In those days, however, as now, many persons were unable to do that, and therefore a further improvement was called for. This was soon supplied by the attachment of a finger or little stick at right angles to the beam, which, passing across a line of some kind, whether in front of it or behind it, or both, should point out any departure from the position of equilibrium. This is what we call the tongue. It is shown

in figs. 7 and 8.[1] The Egyptian contrivance taking the place of the tongue, which was constructed of a plumb bob and three strings, answered its purpose as perfectly as the more usual finger rigidly attached to the beam. Only in the horizontal position all the threads are equally taut, and the slightest tilting slackens two of them.

The introduction of the tongue was a great advance. In many cases

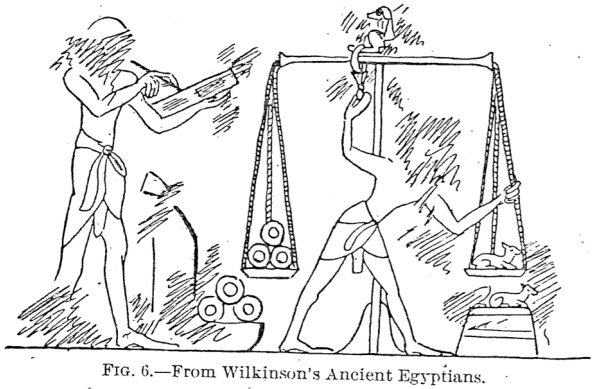


FIG. 6.—From Wilkinson's Ancient Egyptians.

it showed whether the balance maker understood the theory of the balance. Even if he paid little attention to the friction, yet if he put the axis of rotation in the right place he could weigh pretty well with his balance in spite of all its imperfection, as a balance from Bavaria belonging to the Museum of Costumes shows (fig. 10). It is composed entirely of wood. Even the axis of rotation is made, in the crudest

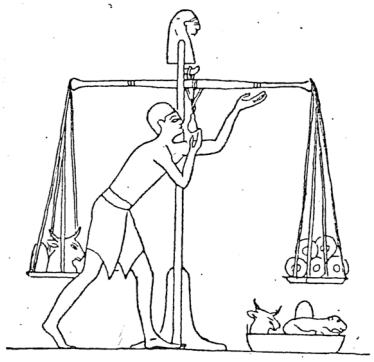


FIG. 7.—From Erman's Egypt.

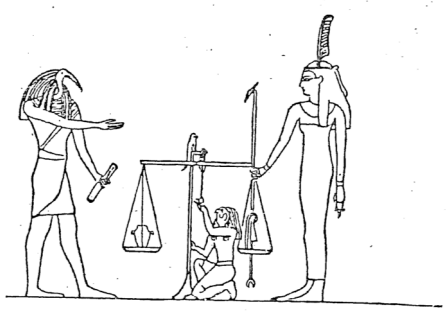


FIG. 8.—From Erman's Egypt.

way, of a round stick. Yet it will weigh light objects pretty well, because the axis of rotation is well placed. With 4 pounds in each pan

[1] So reads Sökeland's text, and certainly in fig. 7 the plumb bob seems to be hung by two strings, between which is a little tongue fixed to the beam. The plummet thus accomplishes the same purpose as the spirit level on a modern balance of precision, but more directly and neatly. A third cord to a plummet would be quite purposeless and un-Egyptian. The tongue between the two cords might be dispensed with, but the arrangement would be far more sensitive with it.—Tr.

(2 kilos) it needs fully one-third of an ounce (10 grams), or one two-hundredth, to turn it sensibly. The regulations of the Prussian standards office would require it to turn with 30 grains (2 grams), or one one-thousandth.

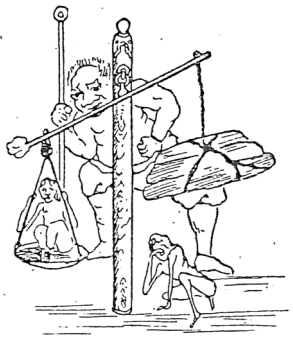


FIG. 9.—From Audsley's Ornamental Arts of Japan. London, 1882.

The giving of a tongue to the balance may be regarded as marking the substantial completion of the invention, and further improvements were confined to details, to diminution of friction, and the like. These last perfected the instrument, and we may now pass to the origination and perfecting of the simplest of the unequal-armed weighing machines, which is the desemer.

The same familiar experiences from which we drew a conjectural account of the first idea of an equal-armed balance suffice for a possible explanation of the origin of the desemer. In seesawing, as in using the porter's yoke, it could not but become well known that very unequal loads could be balanced by shifting the point of support. The idea would also be directly suggested by the use of levers to lift great loads. A desemer which should consist simply of a staff without any special counterpoise and without any graduation would be made as soon as it occurred to the person concerned to apply the otherwise familiar principle to this new purpose. I therefore figure the first desemer as an ordinary stick, with something fastened to the end of it to carry the thing to be weighed.

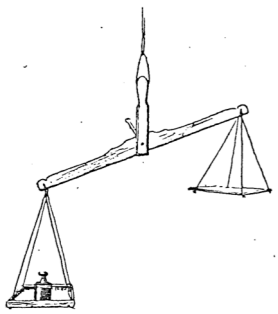


FIG. 10.—Berlin Museum of German Costumes.

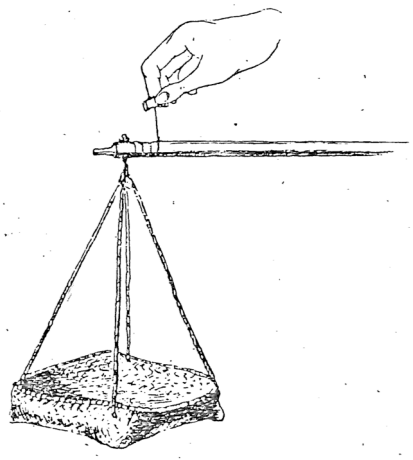


FIG. 11.—Royal Ethnological Museum of Berlin. One-eleventh natural size.

That only a few different weights could be distinguished by so rude an apparatus is evident. But an example from Assam (fig. 11) shows that just such simple apparatus was actually used.

The staff is unloaded, so that, long as it is, but few discriminations of weights could be made with it. But the beginning once made, the inventor had learned how to weigh with no instrument but a stick and a string. In practice it would soon be found that the stick was inconveniently long, and if

the object were simply to ascertain whether a mass was up to a standard weight or not, the apparatus could be made handier by simply thickening the free end of the stick, as shown by an example (fig. 12) from Bhutân. This instrument only shows whether a thing does or does not weigh as much as a pound (500 grams). A balance from Assam (fig. 13) is made in the same way. Although it is made of nothing but a cocoanut shell, a stick, and three strings, it is not without a certain elegance. Such simple apparatus could be adapted even to the weighing of gold and silver, as a balance (fig. 14) from the Himalayas shows. It will weigh 6 grams (93 grains) and 3 grams (46 grains). In spite of the unsuitable shape of the staff, we here first find two different weights marked. The use of such a balance would be sure to suggest the making of an instrument for discriminating a greater range of weights. To do that, however, the conical shape of the staff would have to be abandoned because of the tendency of the suspensory thread to slip upon it. Yet it would not do to give up the counterpoising effect of the thickened staff, so that a knob at the end of a cylindrical stick would force itself upon the maker, as in the balance of fig. 17, which comes from Thibet and is said to be a fish scales. By means of the notches cut upon it to mark places for the suspensory thread it will weigh $1\frac{1}{3}$ ounces ($37\frac{1}{2}$ grams), $2\frac{2}{3}$ ounces (75 grams), $12\frac{1}{3}$ ounces (350 grams), $17\frac{2}{3}$ ounces (500 grams), 23 ounces (650 grams).

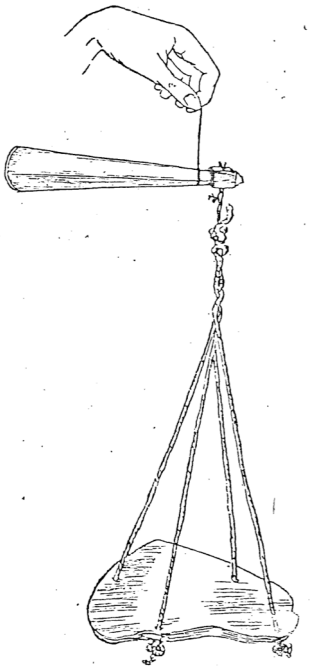


FIG. 12.—Royal Ethnological Museum of Berlin. One-sixth natural size.

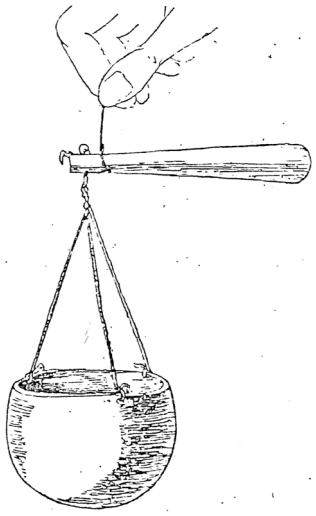


FIG. 13.—Royal Ethnological Museum of Berlin.

This is a practical instrument, for the principle of the form and dimensions of a good desemer is followed; but the highest weight that can be ascertained is small. This fault, however, could easily be rectified by loading the knob with lead, iron, sand, or something, as our German desemer (fig. 16) shows. This will weigh up to 30 pounds, first at intervals of 1 pound and for higher weights of 2 and 3 pounds. Simple bras pegs, as everybody knows, running to the end of the staff, show the weights with tolerable

accuracy. With this stage of development a handy instrument, sufficient for ordinary purposes, was reached. How very simple such a balance may be is shown by an example (fig. 17) from White Russia, the property of Mr. Bartels. It consists of a stick with a natural knob as counterpoise, and will weigh up to 30 pounds and more in about twenty distinct quantities.

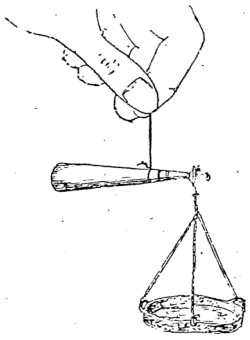


FIG. 14.—Royal Ethnological Museum of Berlin. One-fourth natural size.

In many places such simple contrivances are used even in the shops. But it must soon be found that the state of dryness or moisture of the wooden knob affects the weight, so that the scale is deranged. In order to meet this difficulty desemers were made with hollow counterpoises, which could be filled with sand or pieces of iron (fig. 18), and thus the balance could easily be corrected. It is also possible that this arrangement served the cheat. On the frontiers desemers were in use which, like that of fig. 19, had two scales, for German and Russian units.

All the desemers so far considered are wooden. But desemers were also made of iron, as one from the province of Brandenburg (fig. 20) and one from Tibet prove (fig. 21). This German instrument is only for heavy goods, while the Tibetan runs from 1 ounce (30 grams) to 5½ pounds (2½ kilos). This balance can only have been used for weighing gold, since its tiny pan would not hold such a weight of other material.

We have now made the acquaintance of an entire series of desemers, and have seen that they can be used to weigh from 30 pounds down to a drachm—but not with any one example. The German desemers are confined to large weights; the Thibetan to small ones. The limitations were not, however, universal; for the Romans had desemers, which, in addition to an essential advantage which they share with those of Tibet, also embraced a much more extended series of weights.

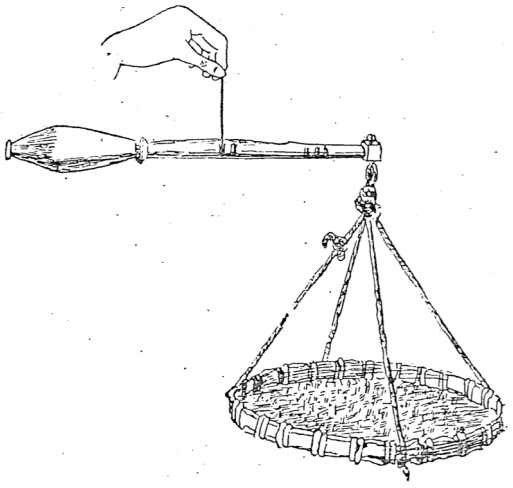


FIG. 15.—Royal Ethnological Museum of Berlin. One-seventh natural size.

Three Roman balances of this description have been brought to light, of which only two, so far as is known, still exist. The finer of these two, shown in fig. 22, is supposed to have come from Chinsi

(Chesium). Although of a peculiar form, it is a regular desemer, having the distinctive characteristics of a fixed counterpoise and movable fulcrum and consisting essentially of two pieces. Shortly after its purchase it was made the subject of communications to the Berlin Archeological Society by Messrs. Robert and Lehmann.[1] This bronze instrument is in the form of a pillar whose capital and base are cut into steps. Springing from the under side of the base is the

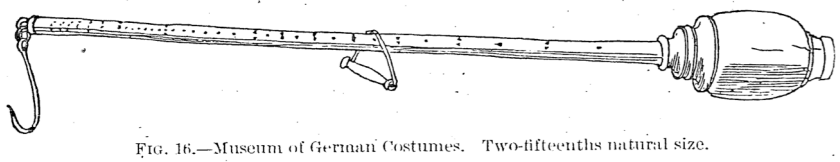


FIG. 16.—Museum of German Costumes. Two-fifteenths natural size.

front half of a panther, finely worked. This is the counterpoise. At the head of the pillar there is an eyelet from which hang three hooks, each terminating in a swan's head. Parallel to the pillar and above it (when the balance is in use) is a straight bridge, flat in the vertical plane, which carries a scale of numbers. For every number there is a notch in the under side of the bridge. Instead of the usual suspen-

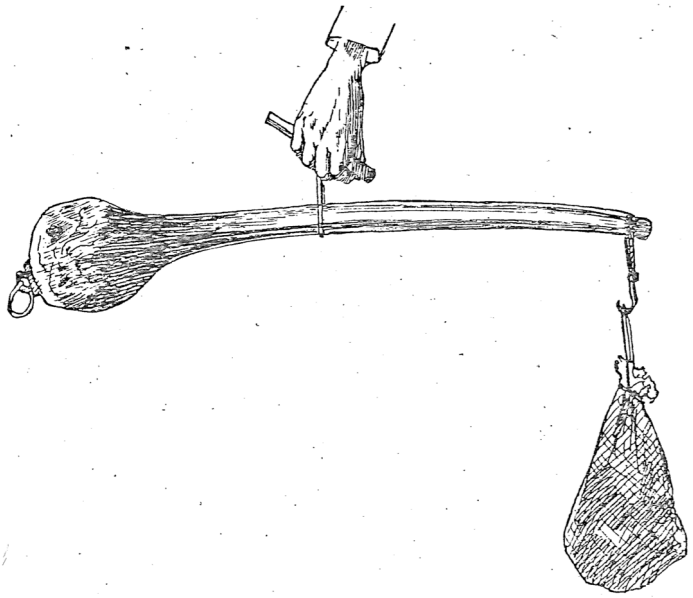


FIG. 17.—Two-fifteenths natural size.

sory thread there is a bronze handle, in which a slit or oblong hole incloses the bridge. The lower part of the handle is in the form of a plate, and the lower edge of the hole in it, which edge is horizontal, is sharp enough to enter loosely in the notches in the bridge.

In 1898, Assistant Director Pernice subjected the balance to an

[1] Archäologischer Anzeiger, 1889, S. 117; 1891, S. 138.

exact examination and communicated his results to the Archeological Society.[1] Direct weighings showed Pernice that the three hooks must have carried a pan weighing 14 ounces avoirdupois (400 grams, or a Roman pound and a quarter), for this makes the weights agree with the numbers engraved above the notches. The letter A marks the zero, and the pan must balance when the fulcrum is placed there. The scale begins with a Roman ounce (0.96 ounce avoirdupois, 27.288 grams; and the pound of a part of Etruria was, according to Hultsch,

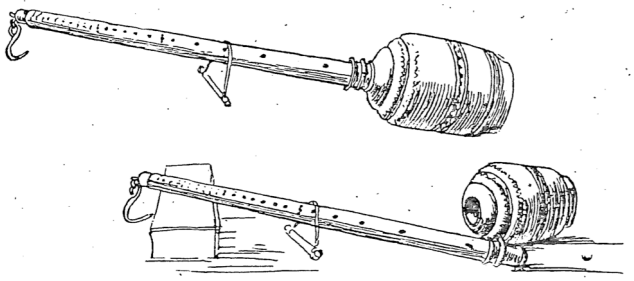


FIG. 18.—Museum of German Costumes. Two-fifteenths natural size.

the same as the Roman pound). Then follow 2, 3, 4, 5, 6, 7, 8, 9, 10, 12 ounces, or 1 Roman pound. The differences now begin to be greater; for the numbers run 1, $1\frac{1}{6}$, $1\frac{1}{3}$, $1\frac{1}{2}$, $1\frac{2}{3}$, 2, $2\frac{1}{4}$, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, 5, 6, 7, 8, 9, 10, 12, 15, 20, 25, 30, 40 pounds.

The second Roman desemer is now, as Mr. Pernice shows, in Palermo.[2] Except that it is provided with a bridge, it resembles the iron desemer of Brandenburg (fig. 20). But its scale showed that it gave

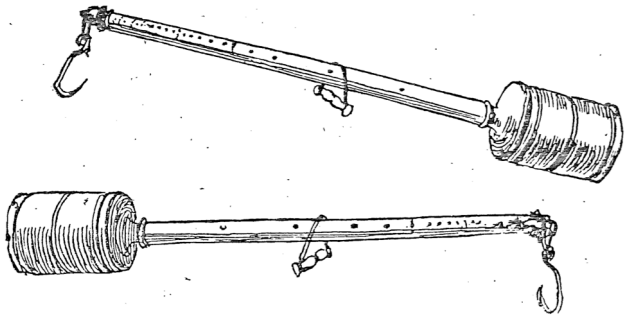


FIG. 19.—Museum of German Costumes. Two-fifteenths natural size.

weights even more exactly than the Clusium balance. As before letter A marks the zero, placing the fulcrum at which before weighing, equilibrium must be produced before the goods to be weighed are attached. The scale then proceeds from 1 ounce by single ounces to 2 pounds, and then as follows: $2\frac{1}{4}$, $2\frac{1}{2}$, $2\frac{3}{4}$, 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, 5, 6, 7, 8, 10, 12, 15 pounds.

The third Roman desemer is known only from a figure in a Paris MS.

[1] Jahrbuch des Kaiserl. archäolog. Institutes, Vol. XIII, 1898, 2d part.

[2] A figure of this desemer is to be seen in the Annali for 1889, Tavola L.

It was quite similar to the other two, but weighed more exactly than the Clusium balance and ran up to 40 pounds. But both this and the Palermo balance are far inferior in finish. The Clusium balance probably dates from the third or fourth century before Christ.

Pernice's description of this balance on the archeological and metrological sides is exhaustive. But as a member of the developmental series of those balances called desemers, it then appears that a great technical advance is made over the instruments previously considered.

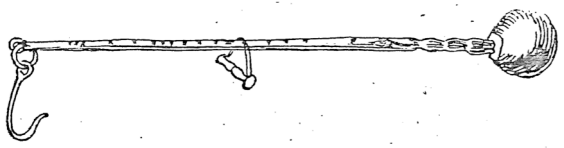


FIG. 20.—Museum of German Costumes, etc. Two-fifteenths natural size.

I refer to the raising of the bridge above the staff which carries the load and counterpoise. Nothing like this has been seen in any of the desemers previously examined. Why did the Roman deface his elegant instrument with this unbeautiful bridge? At first sight one might be inclined to suppose that it was simply to make the numbers show better. But that hypothesis will not answer. The bridge, with the scale, might just as well have carried the load and counterpoise too. There must have been some other reason, and a good reason there is.

The two prime requisites of a good balance are, as is well known, that the friction shall be as small as possible and that the equilibrium shall be stable whether the balance is loaded or not. The center of gravity must, for that purpose, be below the point of support.[1]

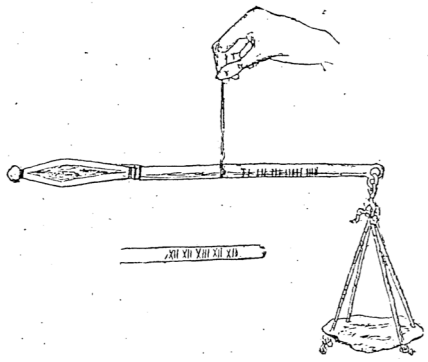


FIG. 21.—Royal Ethnological Museum of Berlin. One-sixth natural size.

Now German desemers, as we know by experience, remain still when in equilibrium without oscillating. They can not oscillate, for the moment the departure from equilibrium is sufficient to overcome friction they turn, with no tendency to return, and slide down on one side or the other, because the point of support is below the center of gravity. If a pound is in equilibrium on the desemer, and one side or other is pressed down,

[1] If it is too far below, the balance will not be sensitive enough; that is, its position of equilibrium will be too little changed by a small change of the weight in one pan. If the center of gravity is too close below the point of support, the oscillations and with them the whole operation of weighing will become slow and tedious. In fact, as long as the friction remains the same the excess of weight in one pan required to overcome

instead of tending to restore itself (as an oscillating balance will), it tends to go farther, so that the side pressed down appears to grow heavier. Such behavior (called "upsetting" in English) is a grave fault, for, in order to weigh, it is necessary not only to shift the fulcrum back and forth, but, all the while, to take care that the bar is horizontal.

The Romans perfectly understood this fault. In saying this it is assumed that the balance of Clusium does not represent the first invented form. It must, surely, have had its forerunners, which doubt-

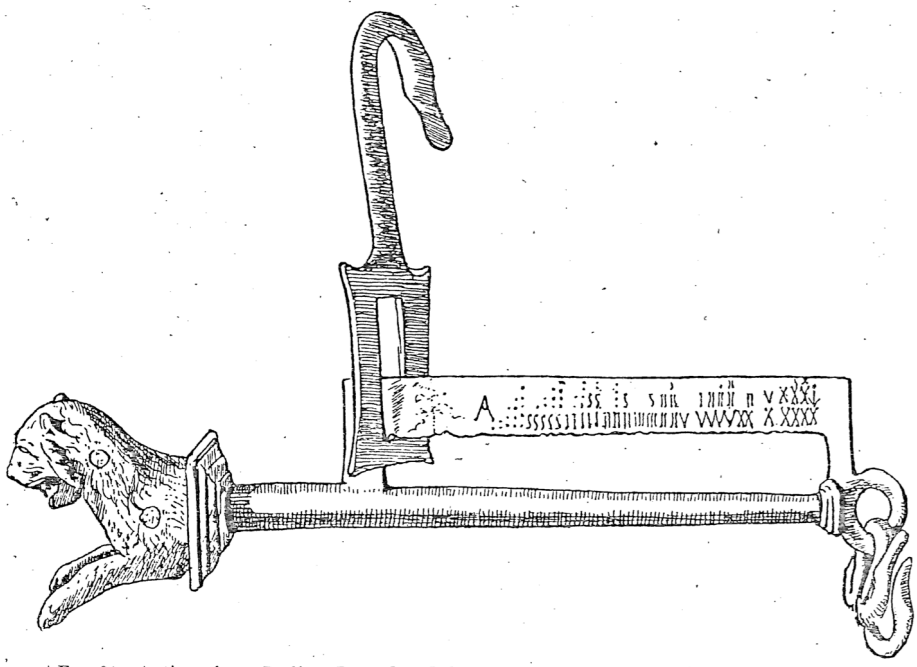


FIG. 22.—Antiquarium, Berlin. Reproduced from Yearbook of German Imperial Archeological Institute, Vol. XIII, 1898. One-third natural size.

less resembled the German desemers in respect to the position of their point of support, and therefore shared their inconvenience. In order to use such a balance in retail trade it was necessary to have one which would come back to the position of equilibrium. It is one thing to weigh a given thing or collection of things, which is almost all that our

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the friction remains just the same whatever the height of the fulcrum; for though the weight acts more nearly at right angles to the radius from the center of rotation to the center of gravity when they are closer together, yet the leverage is smaller in the same proportion. It is, therefore, generally better to rely upon optical means, such as a very long tongue, to show small departures from equilibrium, rather than to bring the center of gravity so near the axis of rotation that the friction can arrest the balance in any sensibly oblique position. But the most intolerable fault is to have the center of gravity above the axis of rotation, so that there is a tendency to "upset."—Tr.

German desemers are used for, and quite another to weigh out a desired quantity of any commodity, which is the common problem of the retailer. If it is desired to weigh a goose, or several fish in a net, it can be done with a common desemer, with the requisite skill. But to weigh out 5 pounds of pease with a desemer is a difficult task, indeed, for none can be taken out or put in while the balance is in action, because it does not oscillate at all, but simply "upsets" as soon as the departure from equilibrium is sufficient to overcome the friction. Now, since it was the custom in ancient Rome to use balances on the principle of our desemers in shops, as the Clusium balance proves, it follows that men were directly required to think out improvements whereby the desemers, when loaded, should oscillate. Now the two-pan balances made by the Romans were constructed essentially right. The position of the axis of rotation was correct, which is the essential condition for the oscillation of the balance. In order to make their desemers oscillate, and so make them practicable for shopkeepers, the Romans introduced the bridge above the pillar. The lower end of the bronze handle from which the other piece hangs is quite above the center of gravity of the latter, so that a fine oscillation and return from every oblique position must have resulted. You can see how the bridge works by simply attaching one made of wire to the common German desemer, when you see how much better it works and how well it oscillates. The ancient Romans, doubtless, attached that ugly bridge to their beautiful balance just to cure it of that quite intolerable fault. It looks like an excrescence upon the original design.

If you ask why desemers so seldom are furnished with such bridges, the answer is it is not the only requirement that a balance should oscillate; it must also be sensitive. It has already been remarked that a good balance ought to have its point of support only a little above the common center of gravity of the beam, the load (placed where attached), and the counterpoise. The higher the point of support the more the sensibility is lost.[1] For example, this German desemer leaves the horizontal position with an overload of one-fifth or one-sixth of an ounce (5 or 6 grams), but, with the bridge, it needs about half an ounce (15 grams) to give a perceptible turning. So it is with the Clusium balance; it needs a third of an ounce to turn it perceptibly, so that it never could have answered for fine weighing. In point of sensibility, therefore, this balance left much to be desired.

Whether the Romans ever improved any further upon this type of balance, or passed directly to the steelyard with the running weight, or to this latter through the two-pan balance with a rider, such as has been found in Pompeii, remains undecided. The sensibility of the Clusium balance certainly might have been greatly increased without

[1] Fig. 17 shows a desemer which must combine sensibility with rapid weighing and which certainly would not upset, but would oscillate.—Fr.

spoiling the oscillations. Thus the sensibility might easily have been made four times as great, only doubling the period of oscillation. The Thibetan desemers show this. That of fig. 15, for example, has a general resemblance to the German desemers, except for having a pan. But the mode of suspension by the string is altogether different. Our desemers are balanced on the string, which is stretched straight by the handle, while the Thibetan string forms a sling which closes upon the staff. This alone would suffice to raise the axis of rotation to about the middle of the staff; but, in addition, grooves are cut in the staff of such a form as to raise the turning axis still higher. The result is that the Thibetan desemers oscillate; and, in fact, their sensibility is quite high, considering the simplicity of their construction. We have seen that they would show distinctly the effects of very small weights. Even our German desemer, hung in the same way, will show a departure from equilibrium of only one-seventh to one-tenth of an ounce (3 or 4 grams). I hardly need say that cutting the grooves involves the displacement of the scale. It will now be placed on the side of the staff, where it can be read off during the operation of weighing. It is not necessary, as with our desemers, to turn the thing over and look on the under side. (The desemer of fig. 17 certainly would not upset.)

We now come to the puzzling question, how it can be that the German desemers are so much ruder than those of Thibet. As far as I can see there can be no mistake about the fact, though it is so astounding as to raise doubt at first. I have examined about fifty desemers, of which thirty were our property and were in actual use at the time we acquired them. The mode of weighing on strings is the same in all, and the scale is always on the under side. Indeed, the wooden handle for the string can not be managed in any other way. The Russian desemers were used in the same way.[1] Why did not we, like the Thibetan mountaineers, discover this simple improvement? My opinion is that it was because we were not forced to it.

In conclusion, let me call attention to one thing more about the Clusium balance. We have seen that this weighs down to a single ounce. Now, in the Altmark, the desemer is called "uenzel." Before the discovery of the Clusium balance no satisfactory explanation of this name had ever been suggested. No German desemers capable of weighing to an ounce are known. But perhaps it is now permissible to infer that in the Altmark, which is very rich in Roman remains, balances were formerly in use which, like that of Clusium, weighed to ounces, and that, as the steelyard is called in German a "pfunder," so the name of these balances passed over to the ordinary desemers and has been retained to this day.

[1] But not that of fig. 17, which must oscillate and has a string.—Tr.