THE MEATS WE EAT.

The recent rise in the cost of meat, which has affected the pocketbook very severely, has awakened considerable interest in the subject of meat slaughtering and meat packing. This is one of the most important industries in the country, and the total value of the products is well up toward the billion mark. The following table prepared by the Bureau of the Census gives the salient facts concerning this gigantic industry:

SLAUGHTERING AND MEAT PACKING—MATERIALS USED, BY KIND, QUANTITY, AND COST; AND PRODUCTS, BY KIND, QUANTITY, AND VALUE: 1905.

Materials used, total cost	$805,856,969
Beeves:	
Number	7,147,835
Gross weight on hoof, pounds	7,485,407,944
Net weight, dressed	4,066,264,877
Cost	$289,040,930
Sheep:	
Number	10,875,339
Gross weight on hoof, pounds	930,168,367
Net weight, dressed	464,872,621
Cost	$44,359,804
Hogs:	
Number	30,977,639
Gross weight on hoof, pounds	6,586,349,782
Net weight, dressed	5,048,832,850
Cost	$329,765,480
Calves:	
Number	1,568,130
Gross weight on hoof, pounds	261,683,572
Net weight, dressed	161,049,581
Cost	$12,665,557
Dressed meat, purchased fresh or partially cured (to be manufactured)	$53,114,957
All other materials	$76,848,336
Products, total value	$913,914,624
Beef:	
Sold fresh—	
Pounds	3,748,055,377
Value	$247,096,724
Canned—	
Pounds	98,663,931
Value	$7,697,815
Salted or cured—	
Pounds	136,896,697
Value	$8,107,952
Mutton, sold fresh:	
Pounds	460,754,244
Value	$36,880,455
Veal, sold fresh:	
Pounds	154,212,652
Value	$12,856,369
Pork:	
Sold fresh—	
Pounds	1,224,932,910
Value	$91,749,323
Salted—	
Pounds	1,558,886,256
Value	$116,626,710
Hams, smoked bacon, sides, and shoulders:	
Pounds	1,364,015,706
Value	$132,210,611
Sausage, fresh or cured:	
Pounds	324,416,039
Value	$25,056,331
All other meat, sold fresh:	
Pounds	124,307,081
Value	$9,579,718
Lard:	
Refined—	
Pounds	1,048,362,039
Value	$74,116,991
Neutral—	
Pounds	120,724,361
Value	$8,423,973
Oleomargarine oil:	
Gallons	19,454,799
Value	$10,201,911
Other oils:	
Gallons	4,893,133
Value	$2,595,951
Fertilizers:	
Tons	211,137
Value	$4,397,626
Hides:	
Number	8,039,204
Pounds	456,443,857
Value	$44,206,107
Wool:	
Pounds	16,377,333
Value	$5,229,521
All other products, including amount received for custom and contract work	$76,880,536

The figures are for the year 1905 (the last totals available) and we have attempted to show graphically, as we have already done with bread, etc., what this industry really means.

The composite beef, which is literally on the hoof, is only 1,236 feet long to the shoulder, and is only 927 feet high to the shoulder. This animal only weighs some 7,485,407,944 pounds as he stands on his hoofs, but cuts up with some loss of weight, the product being:

	Pounds.
Fresh beef	3,748,055,377
Canned	98,663,931
Salted or cured	136,896,697
	3,983,616,005

Showing an apparent loss of 3,501,791,939 pounds, but all that comes to the meat packer is in the nature of grist, and it is doubtful if the actual loss is very great. The hides, the horns, the hoofs, the bones, the blood, etc., all have to be reckoned with.

The fresh beef is represented by hind and fore quarters of beef, one 480 feet high, the other 504 feet, and 280 and 290 wide respectively. The beef that is salted would fill a barrel 220 feet high and 147 feet in diameter at its widest point. Canned beef makes a nice little seven and a half million dollar can, 145 feet high and 128 feet wide. That much-abused animal, the pig, also makes a good subject, for the total number of hogs slaughtered in 1905 was 30,977,639, weighing 6,586,349,782 pounds on the hoof, and 5,048,832,850 pounds, dressed, thus showing a comparatively smaller shrinkage. The cost was $329,765,480, and value of the product was much more. The height of the composite hog would be 785 feet, and the length "over all" would be 1,570 feet. The pork that is salted would fill a barrel 332 feet in diameter at its largest part, and 495 feet high. The lard would fill a tin pail 334 feet high and 295 feet in diameter. The smoked ham would be 499 feet high and 374 feet across at its widest part. The sausages placed end to end would make a continuous chain 151,714 miles long, or 6.1 times the circumference of the earth.

The sheep is the smallest of the trio, being only 666 feet long and 555 feet high to the shoulder. This animal is made up of 10,875,339 sheep, and weighs 930,168,367 pounds on the hoof, but the net weight is 464,872,621 pounds, showing quite a shrinkage. The amount of fresh mutton sold amounted to 460,754,244 pounds, valued at $36,880,458.

The total value of the material used was $805,856,969, and the total value of the products was $913,914,624, showing a difference of $108,057,659, certainly a tidy little sum for labor and profit. Such is in brief the slaughtering and meat packing industry.

Correspondence.

The Capsized Lighthouse Caisson.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of December 15, 1906, I notice an article relating to the lighthouse in Chesapeake Bay which tipped over during construction some two years ago. As I made a personal examination of this lighthouse at the time, and also made plans for its restoration, I thought it might be of some interest to your readers to know these conditions, as the field is a broad one, and the same principle might apply to the salvage of vessels to a limited extent.

In carrying out the plans for building the lighthouse, a wooden caisson was constructed on shore in Baltimore, and then launched and towed to the site of the proposed lighthouse, after having placed the first ring of cast-iron segments on the deck. When it was towed to the site, this cast-iron shell stuck up above the water, as the line of flotation was somewhere near the top of the caisson. As soon as the caisson reached the site, additional rings were put on and then some concrete was placed in the shell, causing the caisson to settle down in the mud. Owing to the fact that there was a little more concrete on one side than on the other, the caisson settled unevenly, one side being about 2 feet lower than the other. The cast-iron shell at this time was 25 feet high, and divided by two bulkheads into three sections of equal width but unequal areas. The two outside sections were to be filled with concrete, and the center section with stone and sand. The section on the low side had about 120 tons of concrete in it, and the other side considerably less.

It was at this point that it was decided to level up the caisson by putting on an excess of concrete on the high side, and it was this excess load on one side which tipped the structure over. Concrete was placed in the section on the high side until the caisson began to settle on that side, and the more it settled the greater the overturning effect of the excess load, which was about 150 tons, became. The movement continued until the structure lay on its side, almost in a horizontal position. The slight storm which occurred at this time had no effect whatsoever. The material at the point where the caisson landed is very soft mud for a depth of 30 or 40 feet. As a matter of fact, the mud is so soft that it is very difficult to determine with a sounding lead just where the mud actually begins. This being the case, the caisson was landed in a material which was almost as fluid as the water, and it was almost as difficult to maintain the equilibrium of the structure as if it had been entirely afloat. The mud was so soft that when the structure tipped over, it sank in the mud for a distance of 20 feet. This, coupled with the fact that the wood, which was light and tended to float, was on the bottom of the structure, and the cast iron and concrete, which were heavy, were on top, makes it apparent that this structure was most unstable at best; and as the construction progressed the instability increased, so that it would seem practically impossible to have constructed this lighthouse without a very strong pile structure around it to hold it straight, when as a matter of fact there was nothing whatsoever to fasten to except the barges, which were simply anchored.

There can be no question but that the uneven loading led to the wrecking of this structure, and it seems incomprehensible that any contractor would undertake a construction of this kind without a thoroughly substantial pile structure to support the work, and it is also surprising that the government engineers would permit the work to proceed without such a structure.

With regard to the problem of righting the structure, there was only one of two things to do, but there were several ways of doing the work along either one of these lines. First, the cast-iron segments and concrete could be removed, and it would be a simple matter to handle the caisson, which was of wood. The other method was to straighten the structure up as a whole. With regard to removing the concrete and cast iron, it might be blown off with dynamite, but the objection to this was the destruction of the cast-iron segments and the probable damage to the wood in the caisson. The five shafts which ran through the concrete into the caisson also added to the difficulty of using this method. An attempt was finally made, I believe, to remove the cast-iron segments by the use of divers; this attempt was apparently a failure, and it left as the only feasible method the straightening up of the structure as a whole.

This involved the handling of something over a thousand tons of weight in addition to whatever mud may have gotten into the structure, owing to the fact that it was 20 feet deep in the mud, this weight being somewhat reduced by the displacement of the submerged parts; but it meant that a structure must be rigged for lifting at least a thousand tons, in order to be sure that there would be sufficient power to do the work. One of the problems involved in this method was the question as to whether the timber structure of the caisson, which was simply fastened with drift bolts, would not pull apart just below the deck when sufficient strain was put on it to lift the structure. The weight which it was necessary to lift was too much for any floating derrick, and a permanent pile structure was necessary, with rigging of a very substantial nature, arranged in such a way as to completely right the structure. This important point seems to have been overlooked in the rig described in your paper, as it seems that it only raised the structure to an angle of 45 deg. and could not get it any further. The method proposed at the time involved the construction of the two pile platforms as described in the article in your paper, but instead of using the derrick as shown, it was proposed to build this pile structure to a height sufficient to allow the caisson to swing clear in revolving upward. On top of the pile platforms it was proposed to erect a heavy timber cribbing, and on top of this cribbing to place steel plate girders spanning the space over the caisson. These girders were to be made so that they could take the load at any point. On top of the girders it was proposed to place eight 200-ton hydraulic jacks with a stroke of 2 feet. Over the top of these jacks would be passed a 2-inch plow steel wire cable, which would be passed around the cast-iron shell so as to make one full turn, with the ropes crossing each other on the bottom of the caisson, and returning back over the top of the jacks, the ropes being fastened together where they crossed on the bottom. The ropes would be cut into short pieces with sockets fastened on the end of each piece, and the pieces fastened together through the sockets, so that the short pieces could be removed as the caisson was lifted. There being eight jacks altogether, it was calculated that four jacks would be enough to hold the caisson in position while the other four were being changed. It was also proposed to use two girders, in order to enable the shifting of the position of the girders if necessary as the caisson rose. It would also be necessary to shift the position of the jacks toward the center of the girder as the caisson rose. This was all provided for, and while this is practically the same principle as was actually used in straightening up the structure, it was designed for considerably heavier work than that which was used, and was intended to completely right the structure.

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