

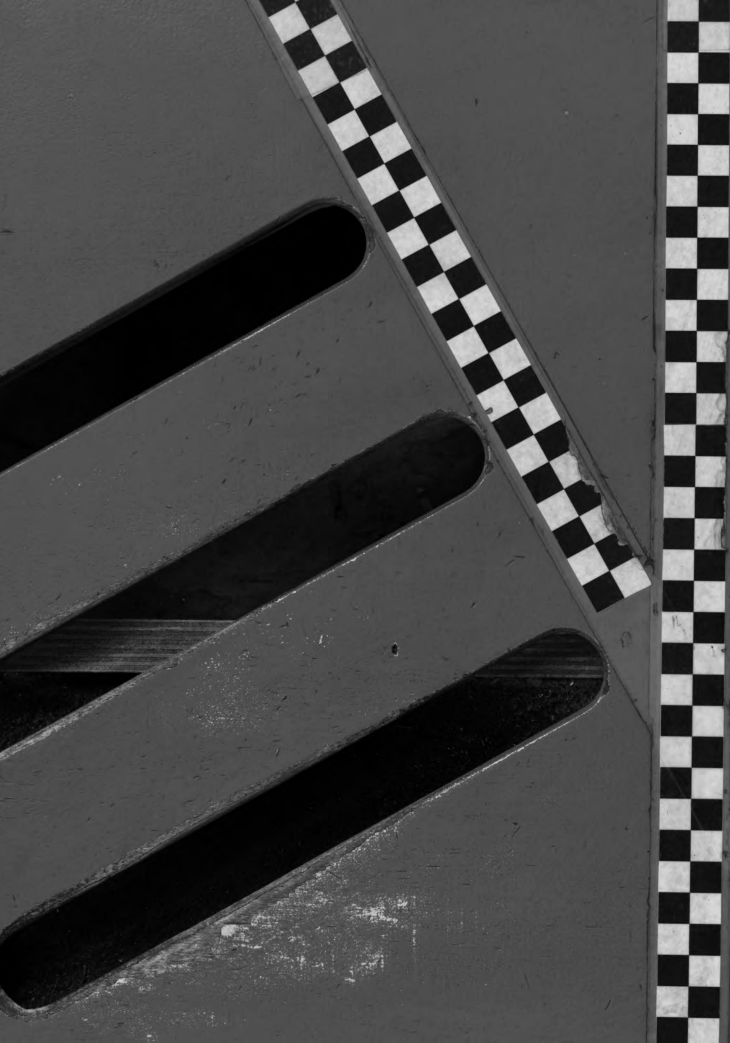


THE PRODUCTION OF QUALITY IN
MUTTON

Thesis for the Degree of B. S.

W. P. Snyder

1903





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T H E S I S

T H E P R O D U C T I O N O F Q U A L I T Y

I N M U T T O N .

By

W. P. S N Y D E R .

Michigan Agricultural College.

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THE PRODUCTION OF QUALITY IN MUTTON.

In reviewing the experiments in sheep feeding conducted during the last decade, I find only two that touch upon quality in mutton. All other sides of the subject have been investigated thoroughly and repeatedly, but this one feature seems not to have been considered. This is probably due to the fact that quality in meat has not received much attention in the markets till of recent years. Of the two experiments touching upon quality in mutton, one was conducted by Professor C. F. Curtiss at the Iowa Station, and the other by M. Maercker and A. Morgan in Germany. The former was an experiment comparing narrow with medium and with wide rations. The subject of quality received only passing mention. The opinion expressed was that the mutton of lambs fed on a narrow ration with no corn was "a little more juicy and tender than that of the corn fed lot." The experiment conducted on the continent had for its object, "to study the effect of various rations and factors on the result at slaughtering." This was quite an extensive experiment with sheep and oxen. The results, though not conclusive, indicated that the narrow ration gave the greater increase and the more valuable carcass, though the dressed percentage was not so great.

These two experiments point to the same conclusions as are drawn from the experiment described below.



The object of this experiment was to produce carcasses possessed of quality rather than an excessive amount of fat. By quality in mutton we mean that character in a carcass that causes the carcass to cut out the largest per cent of palatable food. The prime carcass is evenly and thickly fleshed. The meat is tender and juicy. There is an absence of loose bunches of tallow and the waste is reduced to a minimum. The ratio of fat and flesh in immature animals may be influenced by the character of the food. The carbohydrate foods tend to produce fat and energy, while the protein foods tend to produce growth and flesh. It is flesh rather than excess of fat that the consumer desires. The markets are beginning to recognize this demand and to discriminate between the well fleshed and the overly fat animal. It was our purpose to produce carcasses that would meet the demand of the consumer. To accomplish this we fed rations that were high in their percentages of protein.

To carry on the experiment, fifty-one grade Shropshire lambs were divided into three lots of seventeen each and kept under the same conditions in the old grade cattle barn. They were put in the pens on Oct. 28th, 1902, and fed till Jan. 20th, 1903, a period of eighty-four days. They were given water, grain and hay at 7 A. M., and water, grain, roots and hay at 4 P. M. each day. Water was kept before them all the time. All the food and water was carefully weighed at each feeding time. The lambs made fairly even gains throughout the feeding period. None were off feed. They were slaughtered at the college by professional butchers and the live weight, dressed weight, weight of pelts and shrinkage, recorded. The



carcasses were sold in small lots to meat dealers in the larger cities throughout the state. We will leave our case, as to the quality of mutton produced, to these dealers.

The following tables present, in a condensed form, the results obtained throughout the experiment.

Table I. Rations.

Each lot was fed clover hay, roots and grain. The grain of the following mixtures.

Lot I. Corn 3#, Oats 1 #, Bran 1#, Oil Meal 1#.

Lot II. Corn 2#, Oats 1 #, Bran 1#, Oil Meal 1#, Barley 1#.

Lot III. Corn 2#, Oats 2 #, Bran 1#, Oil Meal 1#.

The nutritive ratios of the rations were,--

Lot I. 1 : 5.1

Lot II. 1 : 5.

Lot III. 1 : 4.9

Unfortunately no lot was fed on a wide ration, to be compared with these fed on the narrow rations. These rations did not differ sufficiently to lead one to anticipate a difference in the results. The results obtained can be compared only in a general way with the results of the common practice of feeding on a wide ration.

Table II.

Market Value of Feeds used.

Clover Hay,	\$4.00 per ton.
Bran,	14.25 per ton.
Oats,	32 cts. per bu.
Corn,	42 cts. per bu.
Barley,	40 cts. per bu.
Oil Meal,	\$30.00 per ton.
Roots,	\$2.50 per ton.



The valuation set on these feeds was that prevailing when the feeds were purchased, or in the case of those raised on the farm, when the experiment was carried on. The valuation placed on the clover hay may seem low but the hay was of a very poor quality, so that, in reality, this figure is high.

Preliminary Period. (11 days).

Table III.

Weights and Gains.

Lot.	Oct. 28.	Wt. of Lot.	Wt. per head.	Wt. of Lot.	Nov. 8.		
					Wt. per head	Gain per head	Gain per head per day
I.		1312	77.2	1355	79.7	2.5	.23
II.		1348	79.3	1409	82.8	3.5	.32
III.		1353	79.6	1403	82.5	2.9	.26

Table IV.

Feed and Cost.

Lot	Hay	Grain	Roots	Water	Total	Cost per
	# per head per day	# per head per day	# per head per day	# per head per day	cost per head	100# gain
I.	1.54	.80	.99	4.5	1.86	\$4.32
II.	1.56	.95	.99	4.6	1.92	3.13
III.	1.45	.89	.99	4.7	1.88	3.77
Ave.	1.51	.88	.99	4.6	1.88	3.74

The gains during these eleven days were rather below the results of successful feeding but the cost of production was also quite low. No conclusions can be based with assurance on the results of the first few days of a feeding trial. The



conditions surrounding the animals are changed, the food is changed and the animals are not weighed under the same conditions. The large gain of Lot I over Lot II and III, is probably due to inaccuracy in weights. Lot I may have been shrunk more at the first weighing, or better filled in the second weighing than the other two lots.

T E S T P R O P E R. (73 days)

Table V.
Weights and Gains.

Nov. 8.				Nov. 15 (7 days)		
Lot	Wt. for lot	Aver gain per lamb		Wt. per lamb	Av. per lamb	Gain per lamb.
I.	1355	79.7		1406	82.6	2.9
II.	1409	82.8		1450	85.3	2.5
III.	1403	82.5		1451	85.3	2.8
Nov. 22, (7 days)				Dec. 13, (21 days)		
Lot	Wt. for Lot	Av. per lamb	Gain per Lamb	Wt. per lamb	Av. per lamb	Gain per lamb
I.	1427	83.9	1.3	1539	90.5	6.6
II.	1474	86.7	1.4	1591	93.5	6.8
III.	1453	85.4	.1	1563	91.9	6.5
Dec. 22 (9 days)				Dec. 27, (5 days)		
Lot	Wt. for Lot	Avr. per lamb	Gain per lamb	Wt. per lamb	avr. per lamb	Gain per lamb
I.	1541	90.6	.1	1557	91.2	.6
II.	1578	92.8	-.1	1597	94.0	1.2
III.	1562	91.9	.0	1598	94.0	2.1



Jan. 3, (7 days)

Jan. 10, (7 days)

Lot	Wt. for Lot	Aver. per lamb	Gain per lamb	Wt. per lamb	Avr. per lamb	Gain per lamb
I.	1602	94.2	3.0	1651	97.1	2.9
II.	1634	96.1	2.1	1671	98.3	2.2
III.	1622	95.4	1.4	1654	97.3	1.9

Jan. 19 and 20, (9 days)

Lot	Wt. for lot	Aver per lamb	Gain per lamb
I.	1726	101.5	4.4
II.	1752	103.0	4.7
III.	1767	104.0	6.7

The gains in this table show quite a variation from time to time and do not seem to be continuous. The irregularity is due largely, to the different conditions under which the lambs were weighed. On Dec. 22, they were weighed in the morning after resting over night without any feed or water. Usually the grain was supplied before weighing and water was kept in the pen during the night. They were dipped Dec. 22, This accounts for the small increase from Dec. 22 to Dec. 27. The weights on Jan. 19 and 20 were taken seven hours after the lambs had eaten the regular feed. It will be noticed that where a lot make a much smaller gain one week than the other lots it makes, in most cases, a larger gain the next week. This variation, from time to time, is most likely due to an



unequal shrinkage of the three lots. A draught of water would account for it in some instances.

Table VI.
Total gains. (73 days)

Lot.	Per lamb per period.	Per lamb per day.	% increase of gain
I.	22	.30	28.5
II.	20.4	.28	24.5
III.	21.4	.29	25.9
Average	21.3	.29	26.3

Table VI shows that the lambs made fair gains and that the three lots varied but little in the results secured. Lot I, which was fed the largest amount of corn, made the greatest increase. Lot III, fed on two parts of oats as against one part of oats and one part of barley fed to Lot II, made the larger gain. However, to say that the difference in the increase was due to the difference in the rations, would be drawing conclusions from insufficient data. The grain may have been the cause, but other influences may have entered in.

Table VII.

Food Consumed.

A. Hay.								
Lot.	Total # 'per lot	Total # 'per lamb	# per 'lamb 'per day	# per '1# gain	Total 'cost 'per #	Total 'cost 'per lb.	Cost '100# 'gain	% of 'waste 'in hay
I.	1501	88.3	1.21	4.03	\$3.00	\$0.18	\$.80	16.5
II.	1526	89.0	1.22	4.35	3.05	.178	.87	14.3
III.	1560	91.8	1.24	4.23	3.12	.182	.84	9.8
Aver!	1532	89.7	1.22	4.20	3.05	.18	.84	13.5

B. Grain

Lot	Total # 'per lot	Total # 'per lamb	# per 'lamb 'per day	# per '1# gain	Cost 'per 'lot	Cost per 'lamb	Cost per '100# gain
I.	2277	134	1.833	6.11	\$21.88	\$1.24	\$5.65
II.	2318	136.3	1.867	6.67	21.64	1.27	6.22
III.	2301	135.4	1.855	6.33	22.05	1.29	6.29
<u>Aver</u>	2298	135.4	1.85	6.37	21.59	1.26	6.05

C. Roots.

Lot	Total # 'per lot	Total # 'per lamb	# per 'lamb 'day	# per '1# gain	Cost 'per 'lot	Cost per 'lamb	Cost per '100# gain
I.	1917	112.76	1.545	5.15	\$2.39	0.14	\$0.64
II.	1915	112.60	1.543	5.51	2.39	0.14	0.68
III.	1992	117.17	1.604	5.47	2.49	0.147	0.68
<u>Aver</u>	1941	114.17	1.564	5.37	2.42	0.142	0.66 2/3

D. Water.

Lot	Total # 'per lamb	# per 'lamb 'day	# per '1# gain
I.	316.8	4.4	14.6
II.	314.6	4.3	16.1
III.	365.7	5.0	17.1
<u>Aver</u>	332.3	4.5	15.9

Table VIII.

Feed, Water, Dry Matter and Cost per 100# gain.

Lot	Hay	Grain	Roots	Water	Dry Matter	Cost.
I.	403	611	515	1460	933	\$7.07
II.	435	667	551	1610	1030	7.91
III.	423	633	547	1710	976	7.62
Aver.	420	637	537	1590	980	7.53

These figures show the cost of production to be very high. This is due to several factors that could be eliminated in most feeding tests. The clover hay was musty. The lambs did not relish it. This required a large proportion of grain in the ration. The tables show that the cost of the grain used in producing 100# increase was 7.2 times as much as the cost of the hay. We can see how the cost would have been materially lowered had the hay been of such a character that the lambs had eaten a larger amount of it and therefore a less amount of grain. Only a small per cent of the increase was made from the cheap roughage ration. By far the largest per cent of the increase came from the costly grain ration. This was due not only to the inferior quality of the hay, but also, to the rapidity with which the lambs were put on to the grain ration. Keeping the lambs in close confinement also raised the cost. Though the cost of production was very high, yet, we shall see, that they netted a considerable profit, largely because of the quality of the mutton produced.

The cost of the roots amounted to only a meager sum. Their influence in keeping the lamb's systems in tone, combined

with the nutrients supplied, was certainly worth a great deal more than their cost.

The lambs consumed 4 1/2 pints of water each, per day besides the 1 1/2 pints of water taken in the beets. The ratio of dry matter to water consumed was as 1 : 1.62 . Counting also the water contained in the feed, the ratio is as 1 : 2.1/4.

Table IX.

A. Fifteen sheep slaughtered six hours off feed.

Lot I.

Sex	Live Wt.	Dressed wt.	Dressed %	Wt. of Pelt.	Pelt %	% loss per day of carcass
E.	107.5	62.0	57.6	11.7		.64
E.	99.0	52.5	53.0	13.5		.56
W.	110.0	58.0	52.7	13.5		.00
E.	126.5	66.5	52.6	14.5		.37
W.	110.0	61.5	55.9	14.5		1.46
Aver	110.6	60.1	54.3	13.5	12.25	.609

Lot II.

W.	141.0	84.5	59.9	18.2		.59
W.	107.0	57.5	53.7	16.0		.43
W.	111.0	60.5	54.5	12.5		.61
W.	107.5	55.0	51.1	16.0		.00
E.	86.0	44.0	50.0	10.5		.00
Aver	110.5	60.3	53.8	14.6	13.2	.32

Lot III.

E.	118.0	64.5	54.6	16.2		.46
W.	107.0	59.0	55.1	13.0		.51
E.	93.0	48.0	51.6	13.5		.52
W.	101.0	52.0	51.4	13.0		.96
W.	112	59.0	53.2	15.5		1.60
Aver.	106.2	56.6	53.2	14.2	13.4	.87

B.

Six Sheep slaughtered, twelve hours off feed.

Lot I.

Sex	Live wt.	Dressed wt.	Dressed	Wt. of pelt.	% pelt.	% loss per day of carcass
W.	104.0	56	53.8	13.5	12.9	.0
E.	97.0	50	51.5	13.	13.4	.21
W.	116.5	58.5	50.2	18.	15.3	.0
E.	97.5	50.	51.2	15.	15.3	.0
Aver.	103.7	53.62	51.5	14.9	14.2	.05

Lot II.

W.	104.0	52.5	54.5	17.	16.3	.0
W.	120.0	65.5	54.5	17.	14.1	.0
Aver.	112	59.0	54.5	17.	15.2	.0

C.

Twelve sheep killed when eighteen hours off feed.

Lot I.

W.	99.0	57	57.5	14.0	14.1	.37
W.	90.00	51.	56.6	12.5	13.7	.98
E.	81.0	46	56.7	11.0	13.5	1.08
W.	98.5	57	59.6	17.5	18.3	.00
E.	114.0	61	53.5	13.0	11.4	.00
Aver	96.5	54.4	56.7	13.6	14.2	.56

Lot II.

E.	90.0	52.5	58.3	12.5	13.9	1.19
E.	96.0	49.0	51.0	12.5	13.0	1.79
W.	82.5	43.0	52.1	13.0	15.7	1.16
Aver.	89.5	48.1	53.8	12.6	14.2	1.38

Lot III.

Sex	Live wt.	Dressed wt.	Dressed	Wt. of pelt.	% pelt	% loss per day of carcass
W.	96.	54	56.2	12	12.5	1.85
E.	99	56	56.5	12	12.1	.33
E.	91	51	56.0	11	12.0	.98
W.	95	53	55.7	15.5	16.3	.66
Aver.	95.2	53.5	56.1	12.6	13.2	.95

D.

Twelve lambs slaughtered twenty-four hours off feed.

Lot I.

E.	86	48	55.8	13	15.1
W.	81	43	53.08	13.5	16.6
W.	86	46.5	54.07	12.5	14.5
W. Hampl	114.5	62.5	54.5	12.5	10.9
W "	83.5	42.5	50.6	10.	11.9
Aver.	90.2	48.5	53.61	12.75	13.8

Lot II.

W.	94.5	54.5	57.6	13.	13.7
E.	110.5	66.0	59.7	15.5	14.
W.	86.5	46.	53.2	9.5	10.9
W.	84.5	48	57.04	10.5	12.4
Aver.	94.0	53.6	56.9	12.1	12.75

Lot III.

E.	88	47	53.4	13	14.7
W.	108.5	61.	56.2	16	14.7
W.	90.5	49.5	54.6	14	15.4
Aver.	95.6	52.5	54.7	14.3	14.9

E. Summary of A. B. C. & D.

Fifteen lambs slaughtered six hours off feed.

Lot	Live wt.	Dressed wt.	Dressed %	Wt. of pelt.	% pelt.	% loss per day of carcass
I.	110.6	60.1	54.36	13.55	12.25	.609
II.	110.5	60.3	53.84	14.65	13.25	.328
III.	106.2	56.6	53.16	14.25	13.41	.827
Aver.	109.1	59.0	53.78	14.15	12.97	.588

Six lambs slaughtered twelve hours off feed.

I.	112.0	59.0	54.4	17.	14.2	0.0
II.	103.75	53.62	51.55	14.9	14.2	.05
Aver.	106.36	55.41	52.5	15.6	14.2	.033

Twelve lambs slaughtered eight en hours off feed.

I.	96.5	54.40	56.78	13.6	14.2	.566
II.	89.5	48.16	53.8	12.6	14.2	1.38
III.	95.2	53.50	56.1	12.6	13.2	.958
Aver	94.3	52.54	55.8	13.01	13.8	.9

Twelve lambs slaughtered twenty-four hours off feed.

I.	90.2	48.5	53.61	12.75	13.8	
II.	94.0	52.6	56.9	12.1	12.75	
III.	95.6	52.0	54.7	14.3	14.9	
Aver.	92.7	51.08	55.	12.92	13.7	
Aver.	100.41	54.68	54.4	13.7	13.3	.407

Ewes dressed 54.2%

Wethers " 54.6%

Table IX.

Results of Slaughtering Test.

- A. Fifteen lambs slaughtered when six hours off feed.
- B. Six " " " twelve hours off feed.
- C. Twelve " " " eighteen hours " "
- D. Twelve " " " twenty-four hours off feed.
- E. Summary of A., B., C. & D.

Table IX. gives the record of the slaughter test. The percentage of the dressed weight did not increase as the time off feed increased, as regularly as one would suspect, though there was a decided increase in the dressed per cent of those killed when eighteen and twenty-four hours off feed over those slaughtered when six hours off feed. The lack of a proportionate increase may be due to individual peculiarities, or to a difference in the extent of the shrinkage. The percentage dressed out was higher than the average, but this alone does not show the real superiority of the carcasses. They possessed the most desirable qualities. The waste was reduced to a minimum. The flesh was evenly placed over the whole carcass. A large percentage of the meat was placed on the most valuable cuts. The backs were thickly covered, the loins wide and thick, and the leg of mutton full. The meat showed that beautiful mixture denoting tenderness and choice flavor. There were no loose bunches of tallow. The fat was inter-mixed with the lean, adding to the quality of both.

Table X.
Financial Statement.

Debit.

51 lambs @ \$3.50 per head,	\$178.50
Cost of feed,	86.78
Cost of butchering @ 15¢ per head,	<u>7.65</u>
	\$272.93

Credit.

51 carcasses, weighing 54.68# each, @ 10¢ per lb. \$278.86	
51 pelts @ \$1.05 each,	<u>53.55</u>
	\$332.41
	\$332.41
	<u>272.93</u>
Net profit,	\$59.48
Net profit per head,	1.66

Table XI.

Summary.

Length of test period-----	73 days.
Gain of lambs per day-----	.29#
Per cent increase in 73 days-----	26.3
Per cent dressed-----	54.4
Per cent dressed by wethers -----	54.6
Per cent dressed by ewes-----	54.2
Per cent of pelt-----	13.3
Shrinkage of carcass per day-----	.4
Hay consumed per 100# increase-----	420#
Grain " " " " " -----	637#
Roots " " " " " -----	537#
Water " " " " " -----	1590#, or about 199 gals.
Total water " " " " " -----	2200# " " 275 "
Total dry matter " " " " " -----	980#
Cost per 100# increase-----	\$7.53
Hay consumed per lamb per day-----	1.22#
Grain " " " " " -----	1.85#
Roots " " " " " -----	1.56#
Water " " " " " -----	4½ pints.
Net profit per lamb-----	\$1.16

Deductions.

1. The best quality of mutton can be produced by feeding a ration having a high percent of protein. A continuous access to water and a moderate supply of roots are valuable aids.

2. The cost may be too high for satisfactory returns where the lambs are put on a market that does not discriminate between a carcass of prime quality and one of excessive fatness.

3. The best quality of mutton was produced in this experiment as is proven by the photograph of an average lot of the carcasses and by the following letters which are a fair sample of those received from prominent dealers of the state.

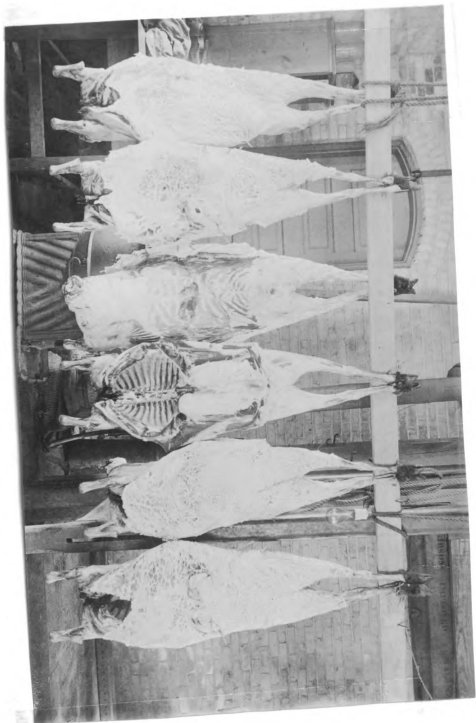
Hammond, Standish Co., Detroit, Mich.

"Regarding the lambs you shipped us Jan. 27th will say from personal experience and from the fact that our customers duplicated their orders, that the meat gave great satisfaction. From personal observation during cutting, will say that the flesh carried an unusual amount of lean in proportion to fat, which is a desirable factor from our standpoint. The lambs reached us in first class order, could not otherwise from the excellent manner in which they were packed. It is quality we want and these lambs were of that sort."

Dettenthaler's Market, Grand Rapids.

"Your shipment of lambs made us Feb. 27th arrived in the most excellent condition. We take great pleasure in saying that they are by far the best fed stock we ever had. The meat in the rib and loin chops was extra thick with a large amount of lean meat, and the flavor was like Spring Lambs. If you can induce the Michigan Sheep Raisers to produce stock such as you shipped us, it will be a great blessing to all mankind."





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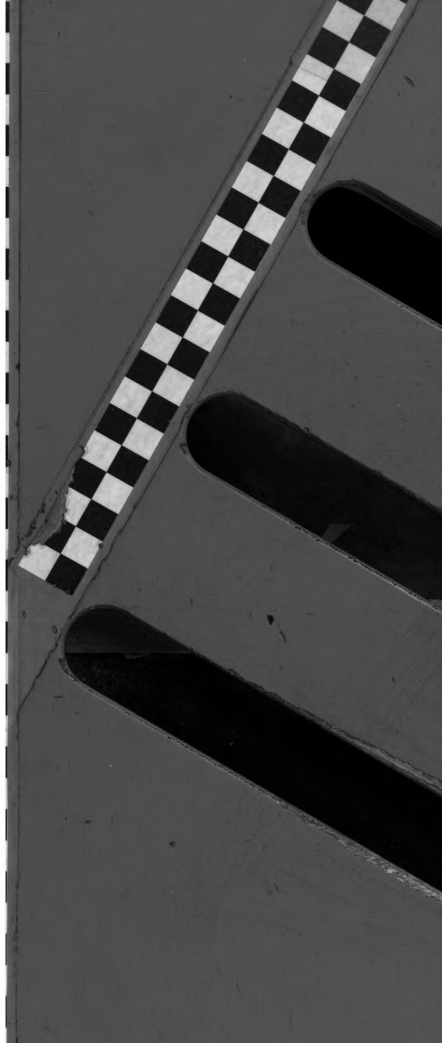
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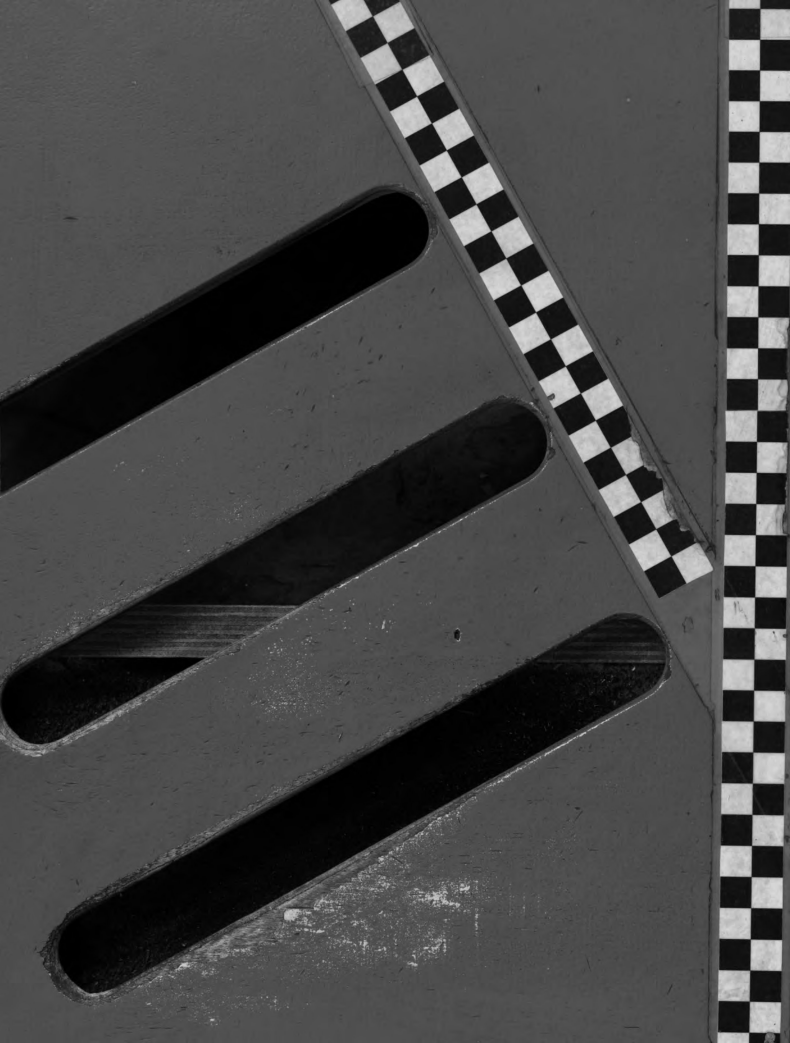


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