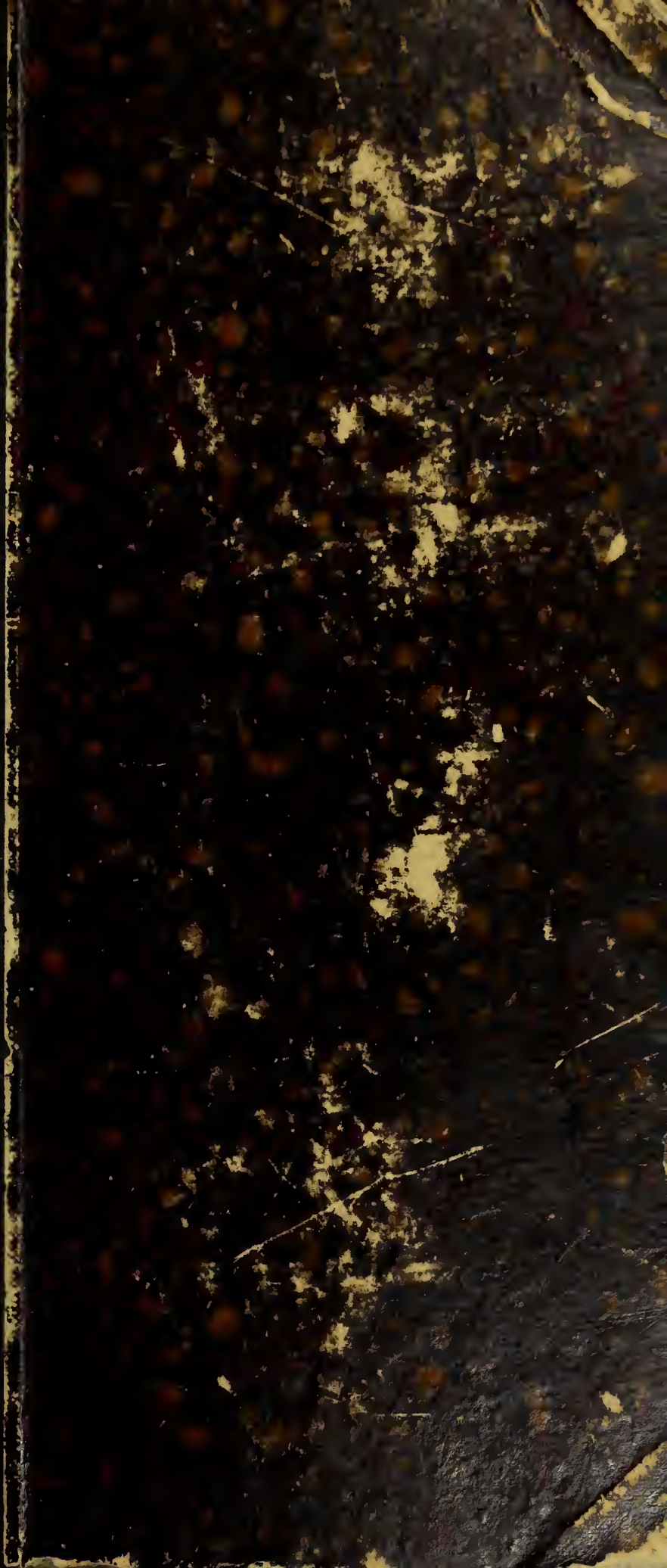
OCOCK

Draft Tests of Plows

Agriculture
B. S.
1904



DRAFT TESTS OF PLOWS

BY

CHARLES A. OCOCK.

THESIS FOR THE DEGREE OF B. S.

IN THE

COLLEGE OF AGRICULTURE

OF THE

UNIVERSITY OF ILLINOIS.

1904.

UNIVERSITY OF ILLINOIS

May 30, 1904

THIS IS TO CERTIFY THAT THE THESIS PREPARED UNDER MY SUPERVISION BY

Charles A. Ocock

ENTITLED "Draft Tests of Plows"

IS APPROVED BY ME AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE DEGREE

OF Bachelor of Science in Agriculture

Cyril G. Hopkins

HEAD OF DEPARTMENT OF Agronomy

Draft Tests of Plows.

This thesis is a test of the draft of plows and attempt is made to estimate the weight of the horses required to cut and turn furrows of different widths and depths.

The draft tests with dates when taken are given in separate series according to shape and width of moldboard.

All tests were made in the same ground.

Table 1 in each series was taken on the same day, when the ground was exceedingly dry and the soil turned up in chunks.

Table 2 in each series was taken one week later after a heavy rain fall, the ground being too wet for good plowing.

Table 3 in each series was taken (2 weeks from the first)and the soil turned nicely, such that all tests gave results which were considered entirely satisfactory on which to base conclusions.

Rules for taking drafts in the field.

1. The average draft over a distance of 100 feet.
2. Speed 2½ miles per.hr.
3. Measure depth and width of furrow every 10 feet and average.
4. Discard the highest and lowest test taken in five consecutive tests where conditions are satisfactory.
5. Find the average pull of the remaining.
6. Find the average pull per. sq.in. of earth turned.

The plows used in these series of tests were obtained from the Parlin, Orendorff Co., of Canton, Illinois.

They were three wheeled riding plows, the bottoms interchangable on the same frame, and are listed by this company as follows.

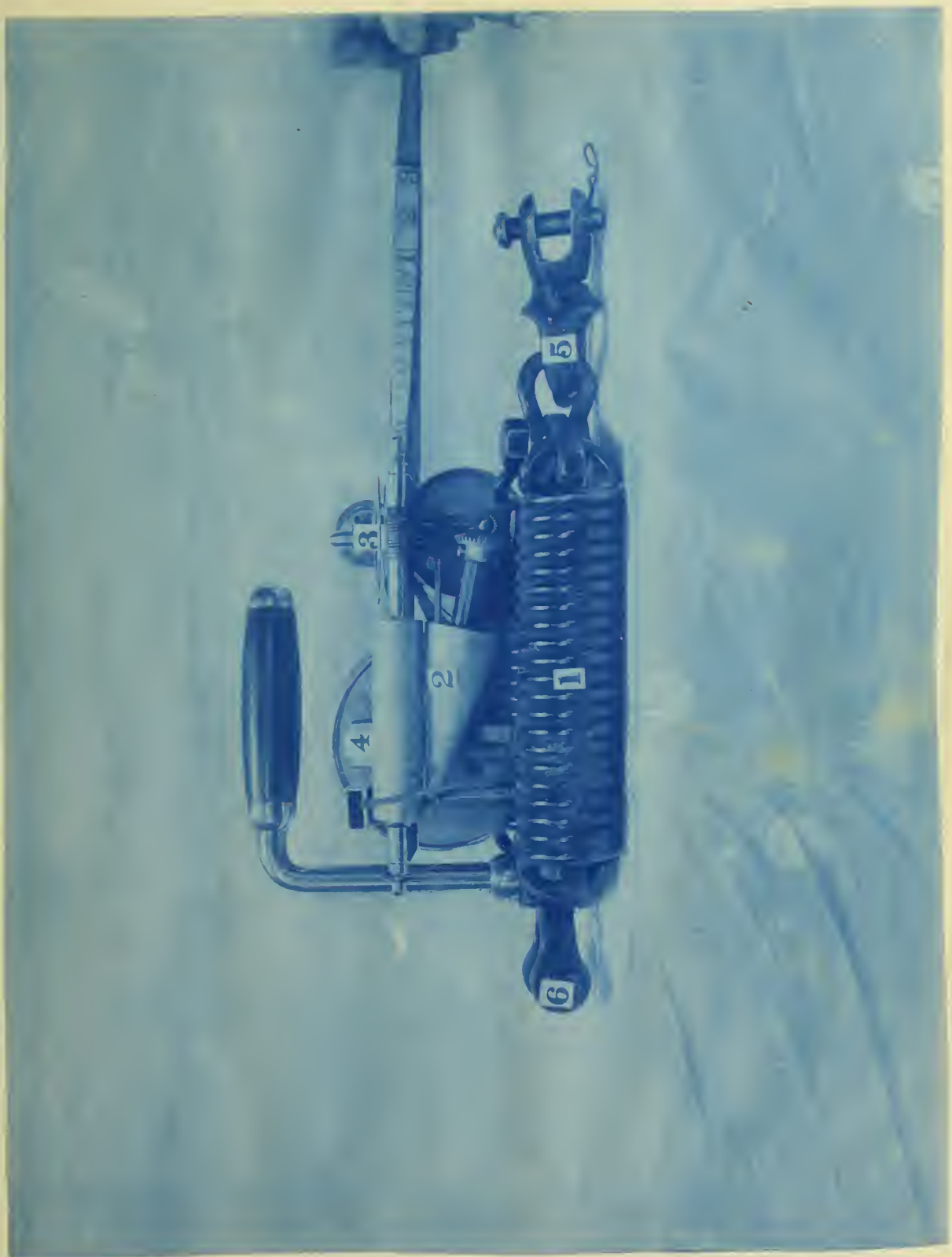
1.--14 inch Turf plow.
2.--14 " Stubble plow.
3.--16 " Turf plow.
4.--16 " Turf and Stubble plow.
5.--16 " Stubble plow.
6.--18 " Stubble plow.

How the drafts were taken.

The dynamometer used was made by the Eickemeyer and Osterheld M'f'g. Co., of Yonkers, New York.

Three horses were used to pull the plow in all tests.

The dynamometer is a combination of heavy coiled, tempered steel springs, a revolving six inch cone, a revolving dial to register the draft, and a one hundred foot tape line to control the speed of the registering dial. (1) coiled tempered steel springs, (2) revolving cone, (3) self registering dial, (4) tape line for controlling speed of dial, (5) plow clevis, (6) double-tree clevis.


1
2
3
4
5
6

14 in. Turf Moldboard Plow.

SERIES I.
Table No.1

Plow used; 14 in. Turf Moldboard. Test taken Saturday Oct. 3rd.

Test No.	Depth Inches	Sq.In. across furrow	Lbs. draft	Lbs. draft per Sq.In.
1	4	56	265	4.73
2	"	"	250	4.46
3	"	"	260	4.64
4	"	"	245	4.19
5	"	"	285	4.91
		Average	291?	4.61
6	5	70	275	3.92
7	"	"	315	4.50
8	"	"	315	4.50
9	"	"	330	4.71
10	"	"	325	4.64
		Average	318	4.54
11	6	84	315	3.75
12	"	"	320	3.80
13	"	"	350	4.16
14	"	"	320	3.80
15	"	"	400	4.76
		Average	318	3.78

SERIES I.
Table No.1

Plow used; 14 in. Turf Moldboard. Test taken Saturday Oct. 3rd.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
16	7	98	435	4.43
17	"	"	395	4.03
18	"	"	430	4.49
19	"	"	430	4.49
20	"	"	380	3.87
		Average	413	3.21
21	8	112	450	4.01
22	"	"	445	3.97
23	"	"	485	4.33
24	"	"	480	4.28
25	"	"	495	4.41
		Average	483	4.19

The low draft given in No. 5 of this table was due to the plowman not holding his team steady to the land, making a narrow furrow. In No.15 a corn stub caught on the point of the plow which made a variation.

SERIES I.
Table No.?

Plow used; 14 in. Turf Moldboard. Test taken Saturday Oct. 10th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	56	300	5.35
2	"	"	310	5.53
3	"	"	275	4.91
4	"	"	290	5.17
5	"	"	295	5.26
		Average	295	5.26
6	5	70	385	5.50
7	"	"	375	5.35
8	"	"	320	4.57
9	"	"	350	5.00
10	"	"	400	5.71
		Average	370	5.28
11	6	84	350	4.16
12	"	"	315	3.75
13	"	"	320	3.80
14	"	"	320	3.80
15	"	"	375	4.44
		Average	330	3.92

SERIES I.
Table No.2

Plow used; 14 in. Turf Moldboard. Test taken Saturday Oct. 10th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
16	7	9	425	4.33
17	"	"	435	4.43
18	"	"	410	4.18
19	"	"	420	4.28
20	"	"	425	4.33
		Average	423	4.31
21	8	112	475	4.24
22	"	"	505	4.50
23	"	"	470	4.19
24	"	"	490	4.37
25	"	"	460	4.10
		Average	478	4.28

Nothing of importance occurred in this table to cause variations more than irregularities of the ground, and a few old corn stubs hidden below the surface of the ground.

SERIES I.
Table No.3

Plow used; 14 in. Turf Moldboard. Test taken Saturday Oct. 17th.

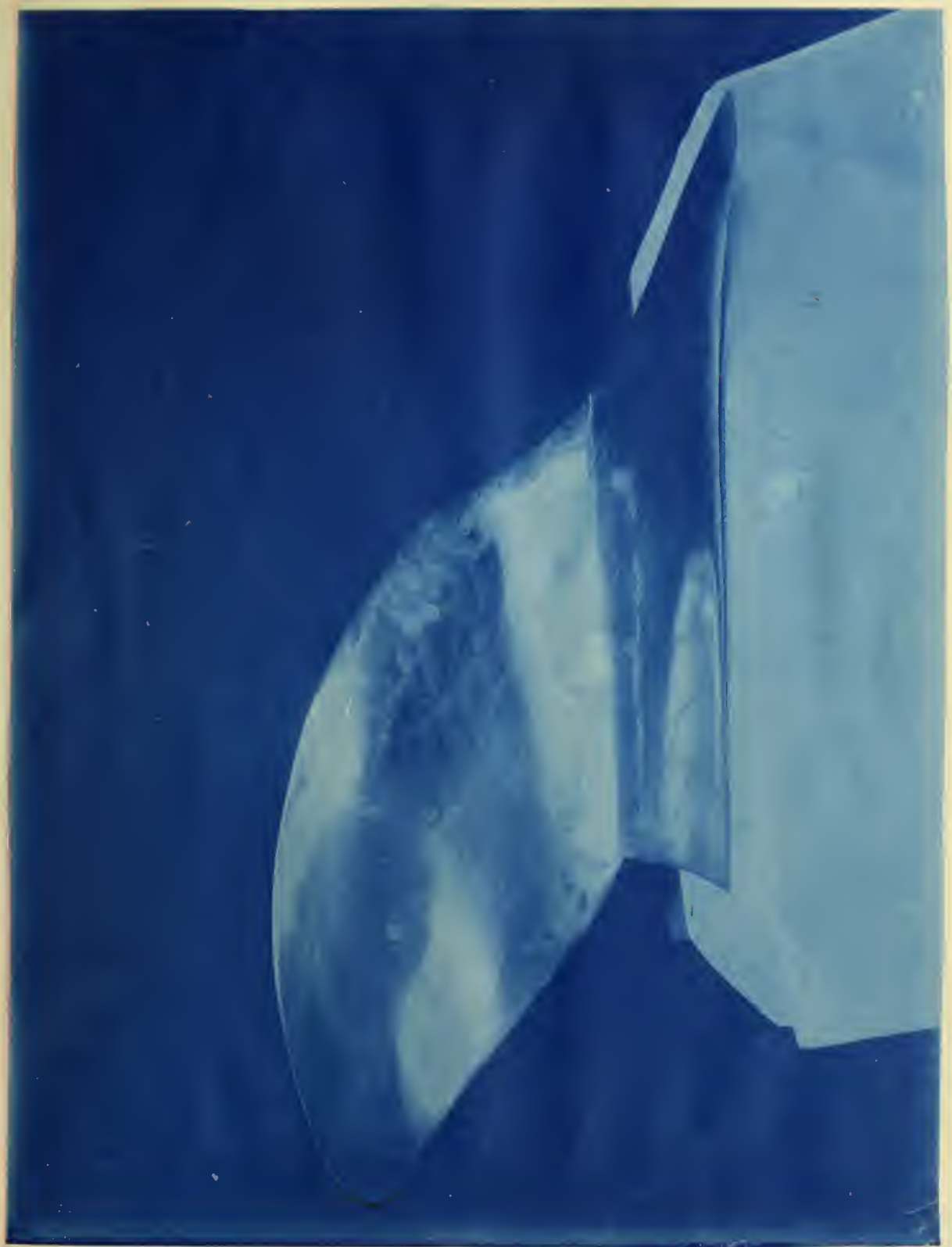
Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	56	245	4.37
2	"	"	255	4.55
3	"	"	230	4.10
4	"	"	250	4.46
5	"	"	225	4.01
		Average	241	4.31
6	5	70	300	4.28
7	"	"	290	4.14
8	"	"	295	4.21
9	"	"	300	4.28
10	"	"	305	4.35
		Average	298	4.26
11	6	84	355	4.22
12	"	"	365	4.29
13	"	"	340	4.04
14	"	"	360	4.28
15	"	"	345	4.10
		Average	353	4.20

SERIES I.
Table No.3

Plow used; 14 in. Turf Moldboard. Test taken Saturday Oct. 17th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
16	7	98	425	4.33
17	"	"	385	3.93
18	"	"	380	3.87
19	"	"	430	4.37
20	"	"	410	4.18
		Average	406	4.14
21	8	112	455	4.06
22	"	"	430	3.84
23	"	"	435	3.88
24	"	"	425	3.79
25	"	"	420	3.74
		Average	430	3.83

This table was obtained under favorable conditions and seemed to give most favorable results. The drafts were all comparatively even and irregularities was caused by uneven ground.



14 in. Stubble Moldboard Plow.

SERIES II
Table No. 1

Plow used; 14 in. Stubble Moldboard. Test taken Saturday Oct. 3rd.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	56	320	5.71
2	"	"	320	5.71
3	"	"	325	5.80
4	"	"	305	5.44
5	"	"	300	5.35
		Average	315	5.62
6	5	70	375	5.36
7	"	"	400	5.71
8	"	"	400	5.71
9	"	"	375	5.36
10	"	"	360	5.14
		Average	383	5.47

SERIES I
Table No.1

Plow used; 14 in. Stubble Moldboard. Test taken Saturday Oct. 3rd.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
11	6	84	590	7.08
12	"	"	540	6.42
13	"	"	540	6.42
14	"	"	555	6.61
15	"	"	555	6.61
		Average	555	6.54
16	7	98	530	5.40
17	"	"	590	6.02
18	"	"	620	6.32
19	"	"	600	6.12
20	"	"	600	6.12
		Average	596	6.08
21	8	112	575	5.13
22	"	"	575	5.13
23	"	"	595	5.32
24	"	"	600	5.35
25	"	"	575	5.13
		Average	548	5.19

SERIES II
Table No. 2

Plow used; 14 in. Stubble Moldboard. Test taken Staurday Oct. 10th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft	Lbs. draft per Sq.In.
1	4	56	300	5.35
2	"	"	275	4.92
3	"	"	250	4.46
4	"	"	300	5.35
5	"	"	280	5.00
		Average	285	5.09
6	5	70	325	4.64
7	"	"	325	4.64
8	"	"	315	4.50
9	"	"	320	4.57
10	"	"	315	4.50
		Average	330	4.57
11	6	84	330	3.93
12	"	"	320	3.81
13	"	"	410	4.88
14	"	"	450	5.36
15	"	"	400	4.77
		Average	380	4.52

SERIES II
Table No. 2

Plow used; 14 in. Stubble Moldboard. Test taken Saturday Oct. 10th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
16	7	98	450	4.59
17	"	"	400	4.08
18	"	"	460	4.69
19	"	"	425	4.34
20	"	"	430	4.39
		Average	435	4.44
21	8	112	500	4.46
22	"	"	510	4.56
23	"	"	490	4.37
24	"	"	520	4.66
25	"	"	515	4.59
		Average	508	4.53

SERIES II
Table No.3

Plow used; 14 in. Stubble Moldboard. Test taken Saturday Oct. 17th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	56	300	5.33
2	"	"	270	4.83
3	"	"	280	5.00
4	"	"	275	4.91
5	"	"	250	4.47
		Average	275	4.91
6	5	70	300	4.28
7	"	"	310	4.43
8	"	"	305	4.36
9	"	"	320	4.56
10	"	"	315	4.50
		Average	310	4.43
11	6	84	360	4.28
12	"	"	330	3.93
13	"	"	380	4.53
14	"	"	355	4.23
15	"	"	365	4.34
		Average	360	4.28

SERIES II
Table No.3

Plow used; 14 in. Stubble Moldboard. Test taken Saturday Oct. 17th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
16	7	98	420	4.29
17	"	"	400	4.06
18	"	"	410	4.19
19	"	"	430	4.39
20	"	"	400	4.06
		Average	410	4.18
21	8	112	430	3.84
22	"	"	450	4.03
23	"	"	455	4.06
24	"	"	470	4.20
25	"	"	450	4.03
		Average	450	4.02

16 in. Turf Moldboard Plow.

SERIES III
Table No.1

Plow used; 13 in. Turf Moldboard. Test taken Saturday Oct. 3rd.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	64	400	6.25
2	"	"	320	5.00
3	"	"	300	4.69
4	"	"	350	5.47
5	"	"	325	5.07
		Average	331	5.18
6	5	80	320	4.00
7	"	"	380	4.75
8	"	"	300	3.75
9	"	"	250	3.13
10	"	"	375	4.68
		Average	331	4.14
11	6	96	400	4.17
12	"	"	480	5.00
13	"	"	500	5.21
14	"	"	4.75	4.95
15	"	"	490	5.10
		Average	481	5.01

SERIES III
Table No.1

Plow used; 16 in. Turf Moldboard. Test taken Saturday Oct. 3rd.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft	Lbs. draft per Sq.In.
16	7	112	570	5.08
17	"	"	495	4.42
18	"	"	520	4.64
19	"	"	510	4.56
20	"	"	500	4.46
		Average	510	4.55
21	8	128	560	4.37
22	"	"	520	4.06
23	"	"	600	4.68
24	"	"	580	4.53
25	"	"	575	4.49
		Average	571	4.46

SPRING III
Table No.2

Plow used; 16 in. Turf Moldboard. Test taken Saturday Oct. 10th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	64	300	4.61
2	"	"	310	4.85
3	"	"	295	4.60
4	"	"	310	4.85
5	"	"	300	4.60
		Average	303	4.68
6	5	80	300	5.75
7	"	"	320	4.00
8	"	"	345	4.32
9	"	"	360	4.50
10	"	"	365	4.56
		Average	341	4.29
11	6	96	400	4.16
12	"	"	430	4.48
13	"	"	460	4.79
14	"	"	420	4.38
15	"	"	450	4.69
		Average	433	4.51

SHEDS III
Table No.2

Plow used; 16 in. Turf Moldboard. Test taken Saturday Oct. 10th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
16	7	112	480	4.28
17	"	"	500	4.46
18	"	"	500	4.46
19	"	"	470	4.19
20	"	"	475	4.24
		Average	485	4.33
21	8	128	525	4.10
22	"	"	535	4.18
23	"	"	495	3.86
24	"	"	510	3.98
25	"	"	550	4.29
		Average	523	4.09

SERIES III
Table No.3

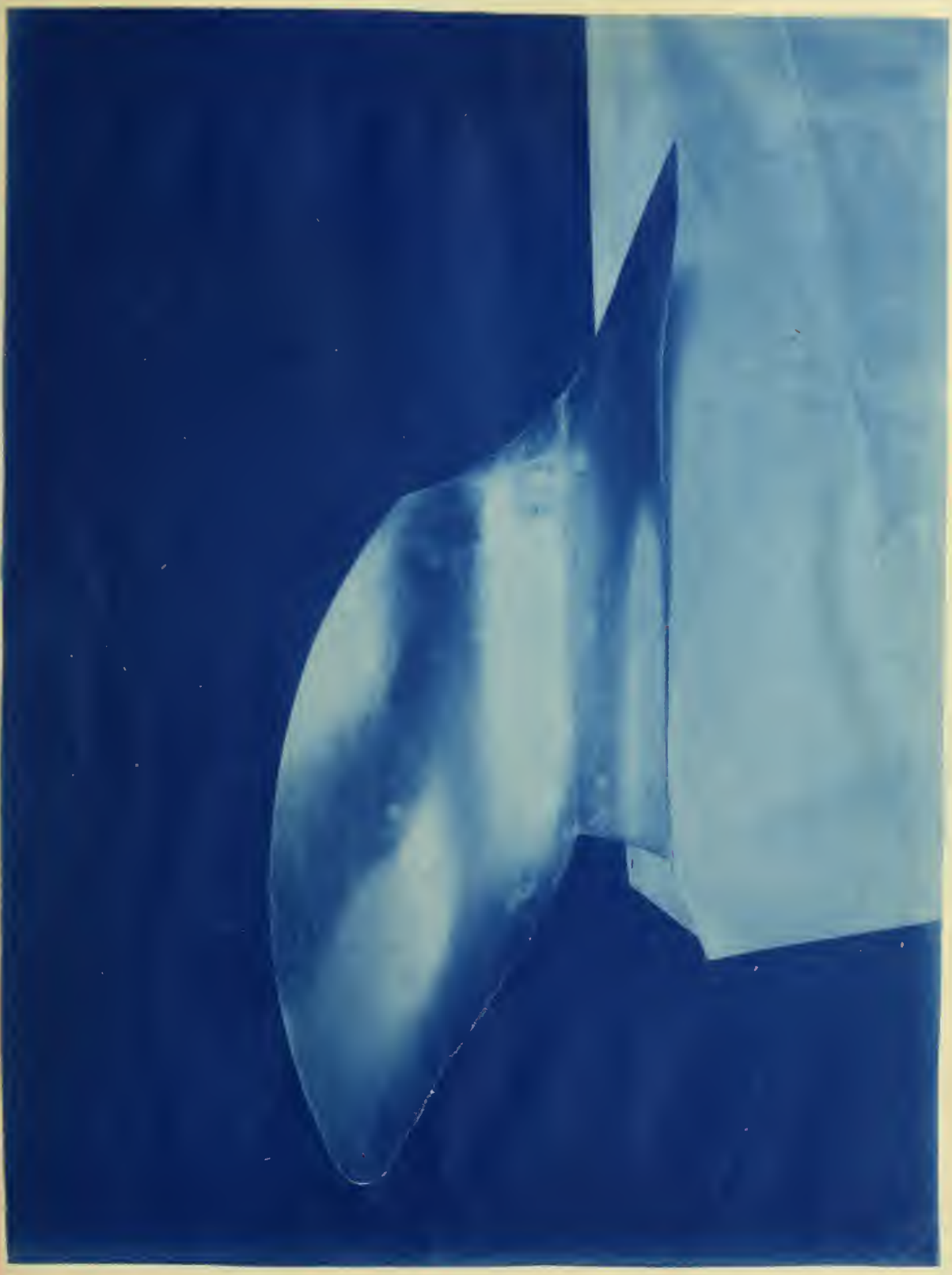
Plow used;13 in. Turf Moldboard. Test taken Saturday Oct. 17th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	64	300	4.69
2	"	"	280	4.37
3	"	"	295	4.57
4	"	"	300	4.69
5	"	"	310	4.85
		Average	298	4.65
6	5	80	355	4.44
7	"	"	340	4.25
8	"	"	365	4.56
9	"	"	365	4.56
10	"	"	360	4.50
		Average	360	4.50
11	6	96	400	4.17
12	"	"	420	4.38
13	"	"	415	4.33
14	"	"	420	4.38
15	"	"	430	4.47
		Average	418	4.36

SERIES III
Table No.3

Plow used; 16 in. Turf Moldboard. Test taken Saturday Oct. 17th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft	Lbs. draft per Sq.In.
16	7	112	475	4.24
17	"	"	465	4.15
18	"	"	470	4.19
19	"	"	460	4.11
20	"	"	470	4.19
		Average	468	4.17
21	8	128	510	3.98
22	"	"	520	4.06
23	"	"	515	4.02
24	"	"	525	4.10
25	"	"	520	4.06
		Average	518	4.04



16 in. Turf and Stubble Moldboard Plow.

SERIES IV
Table No.1

Plow used; 16 in. Turf and Stubble Moldboard.
Test taken Saturday Oct. 3rd.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	64	375	5.85
2	"	"	325	5.07
3	"	"	275	4.29
4	"	"	275	4.29
5	"	"	355	5.54
		Average	318	4.96
6	5	80	425	5.31
7	"	"	375	4.68
8	"	"	400	5.00
9	"	"	400	5.00
10	"	"	380	4.75
		Average	393	4.91
11	6	96	395	4.11
12	"	"	450	4.68
13	"	"	500	5.20
14	"	"	450	4.68
15	"	"	440	4.58
		Average	446	4.31

SERIES IV
Table No.1

Plow used; 16 in. Turf and Stubble Moldboard.
Test taken Saturday Oct. 3rd.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
16	7	112	520	4.64
17	"	"	485	4.33
18	"	"	495	4.41
19	"	"	520	4.64
20	"	"	495	4.41
		Average	503	4.48
21	8	128	540	4.15
22	"	"	570	4.45
23	"	"	590	4.60
24	"	"	560	4.37
25	"	"	580	4.53
		Average	570	4.45

SERIES IV
Table No.2

Plow used; 16 in. Turf and Stubble Moldboard.
Test taken Saturday Oct. 10th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft	Lbs. draft per Sq.In.
1	4	64	350	5.46
2	"	"	375	5.85
3	"	"	280	4.37
4	"	"	360	5.78
5	"	"	355	5.54
		Average	355	5.59
6	5	80	400	5.00
7	"	"	370	4.62
8	"	"	480	6.00
9	"	"	400	5.00
10	"	"	380	4.75
		Average	393	4.91
11	6	96	395	4.11
12	"	"	400	4.16
13	"	"	400	4.16
14	"	"	450	4.68
15	"	"	445	4.83
		Average	415	4.38

SERIES IV
Table No.2

Plow used; 16 in. Turf and Stubble Moldboard.
Test taken Staurday Oct. 10th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
16	7	112	500	4.46
17	"	"	480	4.29
18	"	"	470	4.19
19	"	"	500	4.46
20	"	"	470	4.19
		Average	483	4.31
21	8	128	535	4.19
22	"	"	550	4.29
23	"	"	530	4.14
24	"	"	560	4.37
25	"	"	555	4.33
		Average	546	4.24

The low draft in No.3 of the 4 in. depth was caused by the plow running shallow in the ground.

The high draft in No.8 of the 5 in. depth was caused by the plow striking a stone.

SERIES IV
Table No.3

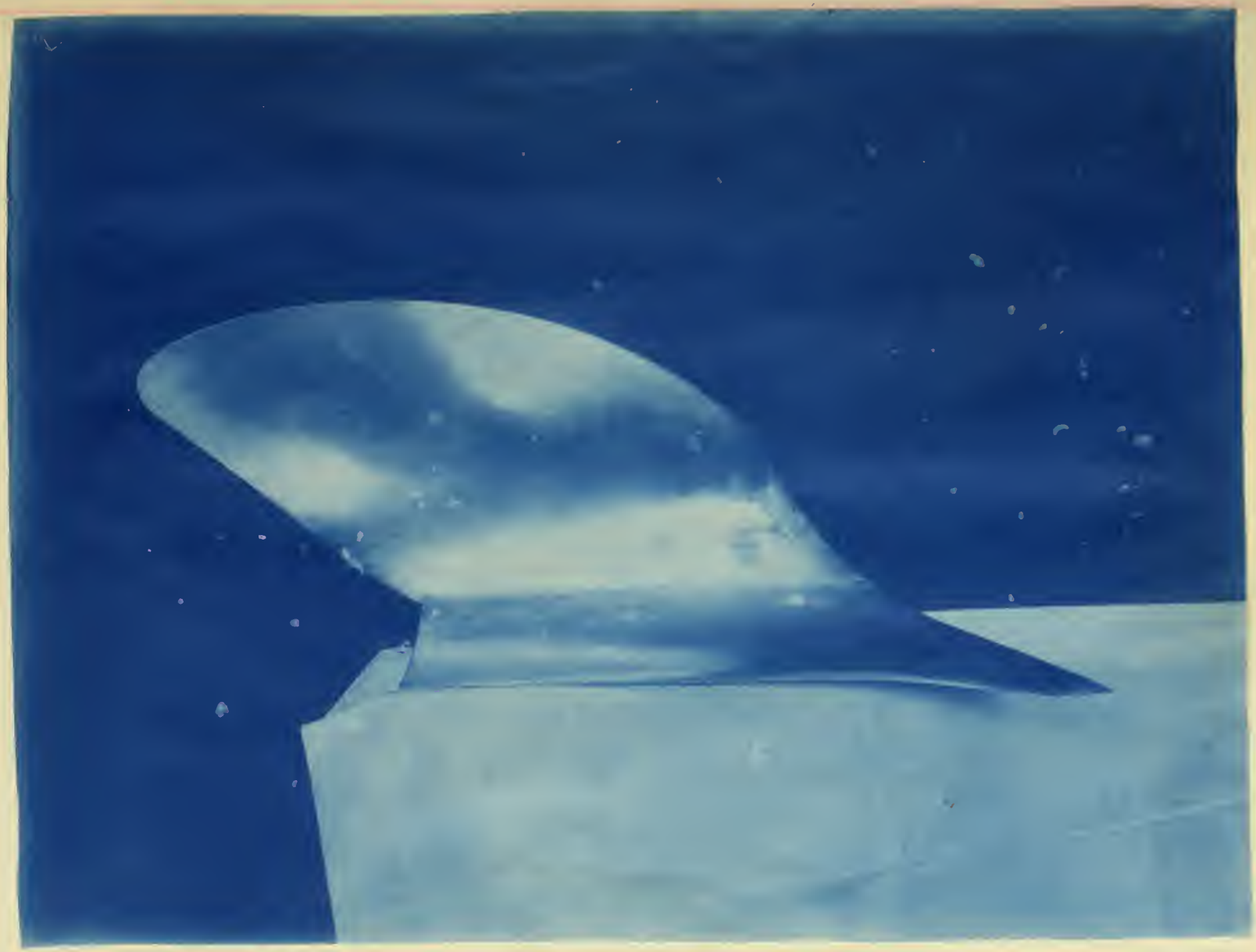
Plow used; 16 in. Turf and Stubble Moldboard.
Test taken Saturday Oct. 17th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	64	300	4.69
2	"	"	290	4.53
3	"	"	310	4.84
4	"	"	290	4.53
5	"	"	315	4.92
		Average	300	4.69
6	5	80	380	4.75
7	"	"	375	4.68
8	"	"	375	4.68
9	"	"	360	4.50
10	"	"	355	4.43
		Average	370	4.62
11	6	96	440	4.57
12	"	"	430	4.47
13	"	"	445	4.63
14	"	"	435	4.53
15	"	"	430	4.63
		Average	435	4.53

SERIES IV
Table No.3

Plow used; 14 in. Turf and Stubble Moldboard.
Test taken Saturday Oct.17th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft	Lbs. draft per Sq.In.
16	7	112	450	4.01
17	"	"	470	4.19
18	"	"	470	4.19
19	"	"	475	4.24
20	"	"	455	4.06
		Average	463	4.11
21	8	128	505	3.94
22	"	"	525	4.10
23	"	"	525	4.10
24	"	"	525	4.10
25	"	"	525	4.10
		Average	525	4.09



16 in. Stubble Moldboard Plow.

SERIES V
Table No.1

Plow used; 16 in. Stubble Moldboard. Test taken Saturday Oct. 3rd.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	64	370	5.78
2	"	"	380	5.93
3	"	"	400	6.25
4	"	"	375	5.89
5	"	"	395	6.17
		Average	383	5.99
6	5	80	375	4.69
7	"	"	405	5.06
8	"	"	380	4.75
9	"	"	375	4.68
10	"	"	405	5.06
		Average	383	4.83
11	6	96	600	6.25
12	"	"	625	6.51
13	"	"	600	6.25
14	"	"	550	5.72
15	"	"	550	5.72
		Average	583	6.07

SERIES V
Table No.1

Plow used; 16 in. Stubble Moldboard. Test taken Saturday Oct. 3rd.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft	Lbs. draft per Sq.In.
16	7	112	695	6.24
17	"	"	695	6.24
18	"	"	640	5.71
19	"	"	630	5.62
20	"	"	630	5.62
		Average	655	5.85
21	8	128	690	5.39
22	"	"	695	5.42
23	"	"	680	5.31
24	"	"	670	5.23
25	"	"	680	5.31
		Average	683	5.33

In the five inch depth of this table the variation was caused by the tape line not working properly in the dynamometer thus giving a general average pull no greater than that of the four inch depth.

The drafts given in this table have too great a range of variation to be considered reliable.

SERIES V
Table No.2

Plow used; 1 in. Stubble Moldboard. Test taken Saturday Oct.10th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	64	375	5.85
2	"	"	325	5.04
3	"	"	275	4.29
4	"	"	275	4.29
5	"	"	355	5.54
		Average	318	4.95
6	5	80	395	4.93
7	"	"	375	4.68
8	"	"	420	5.25
9	"	"	400	5.00
10	"	"	425	5.31
		Averahe	405	5.06
11	6	96	520	5.41
12	"	"	520	5.41
13	"	"	525	5.46
14	"	"	550	5.72
15	"	"	500	5.20
		Average	521	5.42

SERIES V
Table No.2

Plow used; 16 in. Stubble Moldboard. Test taken Staurday Oct.10th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs draft per Sq.In.
16	7	112	550	4.90
17	"	"	545	4.86
18	"	"	560	5.00
19	"	"	550	4.90
20	"	"	560	5.00
		Average	553	4.93
21	8	128	595	4.64
22	"	"	580	4.44
23	"	"	620	4.86
24	"	"	600	4.68
25	"	"	575	4.49
		Average	592	4.5

Numbers 3 and 4 in the 4 in. depth of this table will be found exceedingly low and was caused by slipping of the cone and roller of the dynamometer caused by an old corn stalk.

Calling attention to the 6 in. depth of this table No's 14 and 15 would say that the high results were produced by old corn stubs in the ground, which caught the point of the plow near the end of the 100 feet.

SERIES V
Table No.3

Plow used; 16 in. Stubble Moldboard. Test taken Saturday Oct.17th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	64	325	4.92
2	"	"	355	5.54
3	"	"	340	5.31
4	"	"	355	5.54
5	"	"	325	4.92
		Average	340	5.25
6	5	80	420	5.25
7	"	"	425	5.31
8	"	"	425	5.31
9	"	"	415	5.18
10	"	"	415	5.18
		Average	420	5.24
11	6	96	495	5.15
12	"	"	500	5.20
13	"	"	505	5.26
14	"	"	495	5.15
15	"	"	505	5.26
		Average	500	5.20

SERIES V
Table No.3

Plow used; 16 in. Stubble Moldboard. Test taken Saturday Oct.17th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
16	7	112	550	4.90
17	"	"	560	5.00
18	"	"	565	5.04
19	"	"	550	4.90
20	"	"	550	4.90
		Average	553	4.93
21	8	128	595	4.64
22	"	"	600	4.68
23	"	"	595	4.64
24	"	"	580	4.53
25	"	"	620	4.84
		Average	596	4.65

18 in. Stubble Moldboard Plow.

SERIES VI
Table No.1

Plow used; 18 in. Stubble Moldboard. Test taken Saturday Oct. 3rd.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	72	410	5.69
2	"	"	405	5.62
3	"	"	400	5.55
4	"	"	395	5.48
5	"	"	390	5.41
		Average	400	5.55
6	5	90	465	5.16
7	"	"	475	5.20
8	"	"	430	4.07
9	"	"	470	5.22
10	"	"	460	5.11
		Average	465	5.16
11	6	108	500	4.82
12	"	"	515	4.76
13	"	"	510	4.50
14	"	"	520	4.81
15	"	"	525	4.86
		Average	515	4.73

SERIES VI
Table No.1

Plow used; 18 in. Stubble Moldboard. Test taken Saturday Oct. 3rd.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
16	7	126	570	4.52
17	"	"	565	4.49
18	"	"	560	4.44
19	"	"	570	4.52
20	"	"	555	4.40
		Average	565	4.48
21	8	144	625	4.34
22	"	"	630	4.37
23	"	"	620	4.30
24	"	"	635	4.27
25	"	"	615	4.40
		Average	625	4.33

The dynamometer gave some trouble while taking this set of tables, caused by a strong wind and a shower which with the wind caused a slipping of the tape. The drafts are therefore lower as compared with table No.1 in the previous series.

SERIES VI
Table No.2

Plow used; 1[illegible] in. Stubble Moldboard. Test taken Saturday Oct.loth.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	72	365	5.06
2	"	"	340	4.72
3	"	"	400	5.55
4	"	"	370	5.13
5	"	"	400	5.55
		Average	378	5.24
6	5	90	445	4.94
7	"	"	470	5.22
8	"	"	450	5.00
9	"	"	430	4.77
10	"	"	440	4.88
		Average	445	4.94
11	6	108	535	4.95
12	"	"	520	4.81
13	"	"	500	4.62
14	"	"	495	4.58
15	"	"	475	4.39
		Average	505	4.67

SERIES VI
Table No.2

Plow used; 18 in. Stubble Moldboard. Test taken Saturday Oct.loth.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
16	7	126	565	4.48
17	"	"	530	4.19
18	"	"	540	4.28
19	"	"	560	4.44
20	"	"	520	4.12
		Average	543	4.30
21	8	144	595	4.13
22	"	"	600	4.17
23	"	"	605	4.20
24	"	"	590	4.09
25	"	"	580	4.02
		Average	595	4.13

SERIES VI
Table No.3

Plow used; 1° in. Stubble Moldboard. Test taken Saturday Oct.17th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
1	4	72	450	6.25
2	"	"	500	6.80
3	"	"	475	6.59
4	"	"	460	6.38
5	"	"	500	6.80
		Average	480	6.59
6	5	90	595	6.61
7	"	"	580	6.44
8	"	"	560	6.22
9	"	"	570	6.33
10	"	"	565	6.27
		Average	571	6.34
11	6	108	590	5.46
12	"	"	600	5.48
13	"	"	595	5.50
14	"	"	620	5.74
15	"	"	550	5.09
		Average	598	5.48

SERIES VI
Table No.3

Plow used; 18 in. Stubble Moldboard. Test taken Saturday Oct.17th.

Test No.	Depth inches	Sq.In. across furrow	Lbs. draft.	Lbs. draft per Sq.In.
16	7	126	600	4.76
17	"	"	650	5.15
18	"	"	680	5.39
19	"	"	670	5.31
20	"	"	650	5.15
		Average	656	5.20
21	8	144	700	4.86
22	"	"	695	4.82
23	"	"	720	5.00
24	"	"	750	5.20
25	"	"	740	5.14
		Average	720	5.00

Plow frame with which the tests were made.

Comparison of the total drafts of the six series of plows.

Tables 1.

Depth inches	I 14 in. Turf.	II 14 in. St'bl'	III 16 in. Turf.	IV 16 in. Turf & St'bl'	V 16 in. St'bl'	VI 16 in. St'bl'
4	291	315	331	318	383	400
5	318	383	331	393	383	465
6	318	555	481	446	583	515
7	413	596	510	503	655	565
8	436	548	571	570	683	625

Tables 2.

4	295	285	303	355	318	378
5	370	330	341	393	405	445
6	330	380	433	415	521	505
7	423	435	485	483	553	543
8	478	508	523	546	591	595

Tables 3.

4	241	275	298	300	340	480
5	298	310	360	370	420	571
6	353	360	418	435	500	598
7	406	410	468	463	553	656
8	430	450	518	525	596	720

Comparison of Lbs. draft per Sq.in. of cross section cut and turned.

Tables 1.

Depth inches	I 14 in. Turf.	II 14 in. St'bl'	III 16 in. Turf.	IV 16 in. Turf & St'bl'	V 16 in. St'bl'	VI 18 in. St'bl'
4	4.61	5.62	5.18	4.96	5.99	5.55
5	4.54	5.47	4.14	4.91	4.83	5.16
6	3.78	6.54	5.01	4.31	6.07	4.73
7	3.21	6.08	4.55	4.48	5.85	4.48
8	4.19	5.19	4.46	4.45	5.33	4.33

Tables 2.

4	5.26	5.09	4.68	5.59	4.95	5.24
5	5.28	4.57	4.29	4.91	5.06	4.94
6	3.92	4.52	4.51	4.38	5.42	4.37
7	4.31	4.44	4.66	4.31	4.93	4.30
8	4.26	4.53	4.09	4.24	4.58	4.13

Tables 3.

4	4.31	4.91	4.65	4.68	5.25	6.59
5	4.26	4.43	4.50	4.62	5.24	6.34
6	4.20	4.28	4.36	4.53	5.20	5.48
7	4.14	4.18	4.17	4.11	4.93	5.20
8	3.83	4.02	4.04	4.09	4.65	5.00

Conclusions.

The tables in the conclusions are taken from table No. 3 in all of the series. They were taken as a basis for conclusion for the following reasons. 1. The soil was in an almost ideal condition for plowing; 2. Work was carried on with more regularity and with less errors, due to practice in working with the apparatus; 3. The results were more nearly uniform. They were found to have a nearly regular increase in total draft as the depth and width of furrow increased; also the draft per sq.in. in cross section was in a descending ratio as the depth increased. The regularity of the increasing and decreasing numbers, made it seem that these drafts were nearly accurate, and could be used as a safe basis for conclusion.

The degree of work done with the stubble moldboard was much better in all the tests since pulverization was practically complete.

SERIES I.

Table 3 width 14 in. Turf moldboard.

Depth inches.	Sq. in. across furrow.	Lbs. draft.	Lbs. draft per. Sq.in.
4	56	241	4.31
5	70	298	4.26
6	84	353	4.20
7	98	406	4.14
8	112	430	3.83

SERIES II

Table 3 width 14 in. Stubble moldboard.

4	56	275	4.91
5	70	310	4.43
6	84	360	4.28
7	98	410	4.18
8	112	450	4.02

Series I table 3 is the draft tests of the turf moldboard 14 in. wide and is to be compared with the stubble moldboard in series II table 3. Here are the two extremes so far as shape of moldboard is concerned, while the width and depths remain the same.

In series I the soil is turned entirely over while in series II the soil is crushed down by the extra bluff moldboard, and thoroughly pulverized.

SERIES III

Table 3. width 16 in. Turf moldboard.

Depth inches.	Sq. in. across furrow.	Lbs. draft.	Lbs. draft per. Sq.in.
4	64	298	4.65
5	80	360	4.50
6	96	418	4.36
7	112	468	4.17
8	128	518	4.04

SERIES IV

Table 3. width 16 in. Turf + Stubble moldboard.

4	64	300	4.68
5	80	370	4.62
6	96	435	4.53
7	112	468	4.11
8	128	525	4.09

SERIES V

Table 3. width 16 in. Stubble moldboard.

4	64	340	5.25
5	80	420	5.24
6	96	500	5.20
7	112	553	4.93
8	128	596	4.65

Tables No.2 found in series III. IV. and V. are tests of plows of the same width of moldboard, but here we have in series III. and V. the extremes in shape, with series IV. as the medium, called the turf and stubble moldboard plow.

The medium or turf and stubble moldboard in series IV. so far as, the degree of work is concerned, turns the most economical furrow. The pulverization is nearly as complete as that done in series V. while the added draft above series III, which does little pulverization, is not equal to the added degree of work. "Work" always refers to that which is accomplished and is never to be mistaken for draft.

SERIES VI.

Table 3. Width 18 in. Stubble moldboard.

Depth inches.	Sq. in. across furrow.	Lbs. draft.	Lbs. draft per. Sq.in.
4	72	480	6.66
5	90	571	6.34
6	108	598	5.38
7	126	656	5.20
8	144	720	5.00

A comparison of the same depth but different widths of moldboard is shown in the following table.

Stubble moldboard, depth 5 in.

Where obtained.	Width inches.	Sq.in. across furrow.	Lbs. draft.	Lbs. draft per.Sq.in.
Series II table 3.	14	70	310	4.43
Series V table 3.	16	80	420	5.24
Series VI table 3.	18	90	571	6.34

Table No. 3 series VI. are the results obtained with the 18 in. Stubble moldboard plow and is interesting when compared with the draft of moldboard bottoms of different widths but same shape.

Notice in table of "Comparison of the same depth but different widths of moldboard," the draft per Sq.in. of cross section of furrow is less with the narrower moldboard. This holds true with all the tables in the conclusions.

Considering the tests it is safe to say that within the limits of the 14 in. and 18 in. furrow,

I. The narrower the furrow turned the draft per Sq.in. of cross section is less.

II. The greater the depth while the width remains constant the draft per Sq.in. of cross section is less.

Using the theory advanced by Prof. King in his Physics of Agriculture pages 430- 433, and estimating that a horse can exert a steady pull equal to ⅛ of his weight, while plowing at 2½ miles per hour, the following table will be a reliable basis from which to judge.

Weight of horses required to cut and turn 14 in. and 16 in. furrows at different depths with stubble moldboard.

Width of plow.	Depth of furrow.	Draft required.	Wt. of team. required.
14 in.	4	275	2200
" "	5	310	2480
" "	6	360	2880
" "	7	410	3280
" "	8	450	3600
16 in.	4	340	2620
" "	5	420	3360
" "	6	500	4000
" "	7	553	4424
" "	8	596	4768