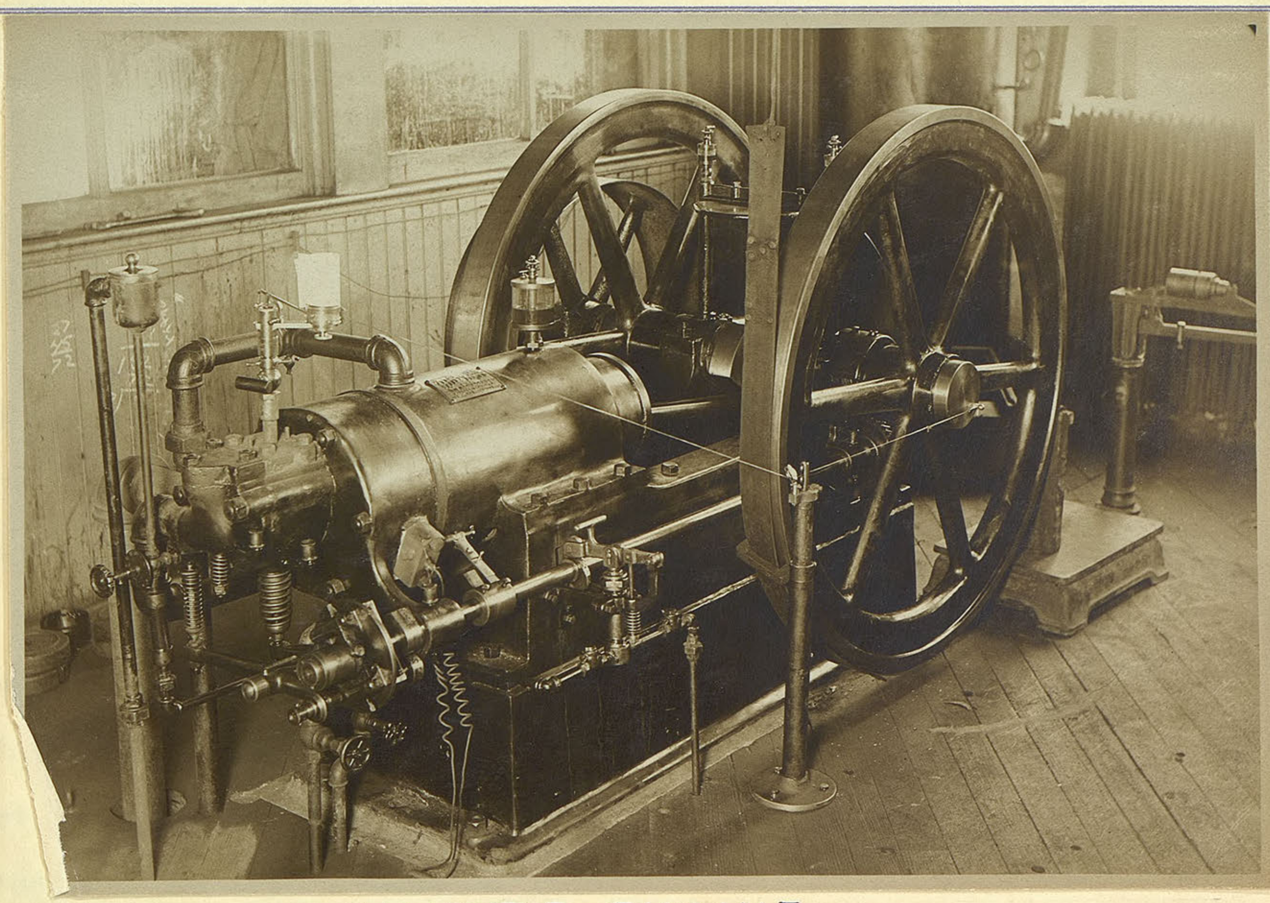
Efficiency Tests on Gasoline Engine.

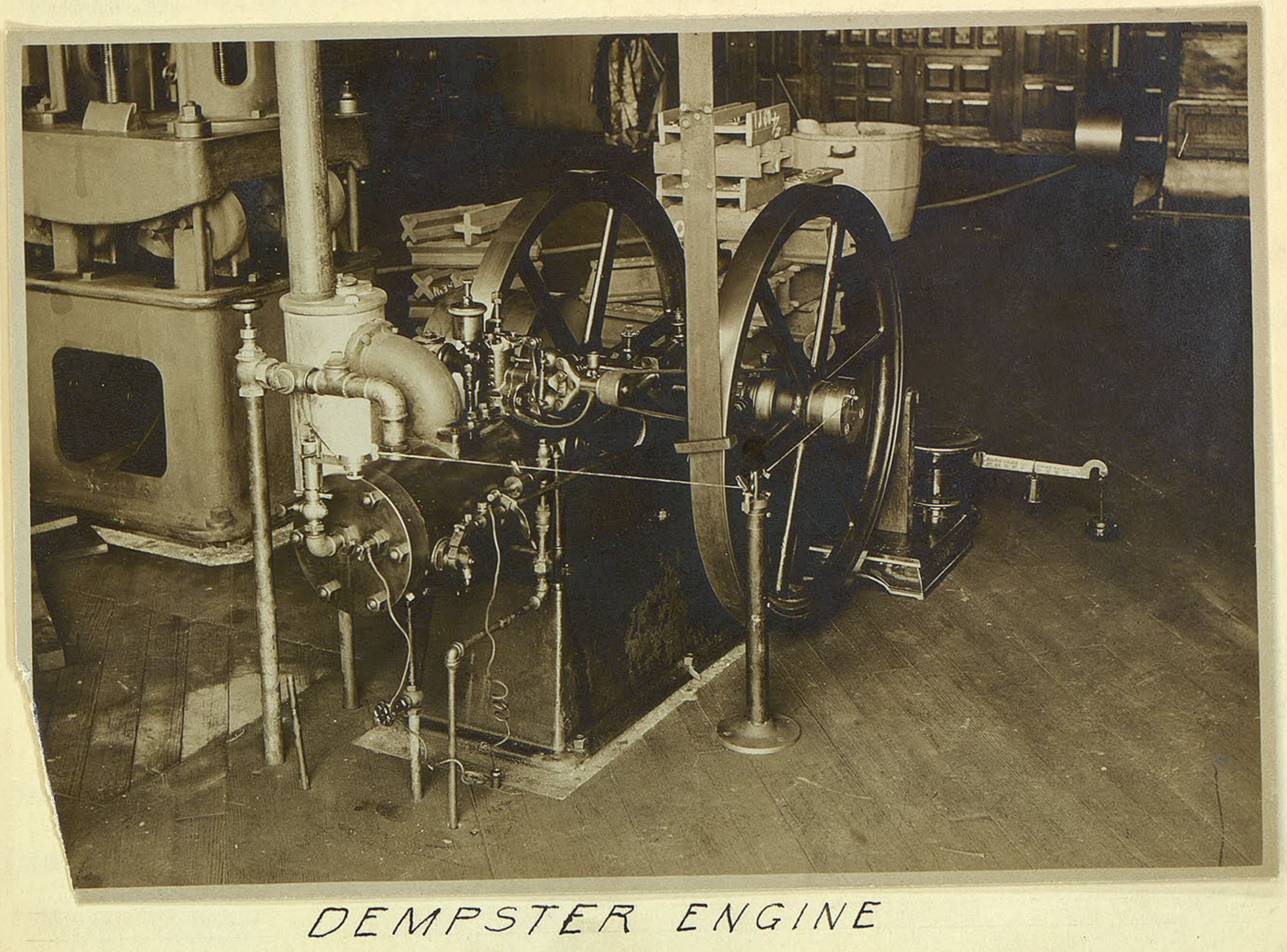
by

Arthur S. Stauffer.

Vernon Matthews.

Otis Neel Blair.


WITTE ENGINE


DEMPSTER ENGINE

The Witte Gasoline Engine 1234.

This is a horizontal, ten horse power engine of the usual four cycle type, ignition taking place every fourth stroke and the speed being governed by cutting out charges of gasoline, (commonly called the "hit and miss" method)

The following tests were made to determine the mechanical efficiency and the amount of gasoline required. The cylinder is cooled by city water direct from the hydrant. The temperatures of the cooling water were not taken as no attempt was made to determine the thermal efficiency of the engine.

In the first two tests the load was applied by means of the ordinary prony brake, but as there was no provision for cooling the brake it, heated too badly for satisfactory results. In place of this was substituted a brake as shown in the frontispiece. This is a leather strap passing part way around the flywheel, the pull being recorded on a platform scale. By varying the arc of contact, the operator is enabled to maintain a steady load upon the engine.

The gasoline was fed by gravity from a tank upon the wall. This tank is provided with a gage glass by which the height of the gasoline can be measured. The overflow was collected in a can and poured back in the tank at the end of the test. Then by measuring the initial and the final heights of the gasoline, the volume used can be easily determined.

Throughout the tests some trouble was given by the heating of the crank pin, due partly to insufficient lubrication and tightness of the bearing, but it was partly caused by roughness of the bearing, for when the first mentioned were remedied, the bearing would heat too much for perfect work.

The efficiency curve plotted from trial #4 shows very good results as the efficiency rises steadily to full load. At the end of trial #2, the crank pin was very hot, and the curve plotted from this trial shows the maximum efficiency at about three fourths load which is unsatisfactory considering the general results from all the trials.

Inspection of the cards shown on other pages indicate too late ignition during the earlier trials, but a readjustment of the sparker overcame this difficulty and the cards of the later trials show in the perpendicularity of the explosion line that ignition occurs just at the end of the compression stroke which is the proper time for the correct working of the engine.

The data from the trials show that the greatest average efficiency is obtained at full load, running as high as 91 1/2% in trial #6, although this seems somewhat high as the other tests range from about 80% to 85%.

The average amount of gasoline used is .8 qt. per brake horse power per hour. With gasoline at 15 ¢ per gallon this would make the cost of running the engine 3¢ per horse power per hour.

#1

120#S

L = 3.9"
A = 2.29 □IN
MEP = 70.1#

5=1684 no 2

#3

120#S.

L = 3.9"
A = 2.65 □IN
MEP = 81.6#

5=1684 no

#6

120#S

L = 3.9
A = 2.45
MEP = 75.4#

-1684 no 2

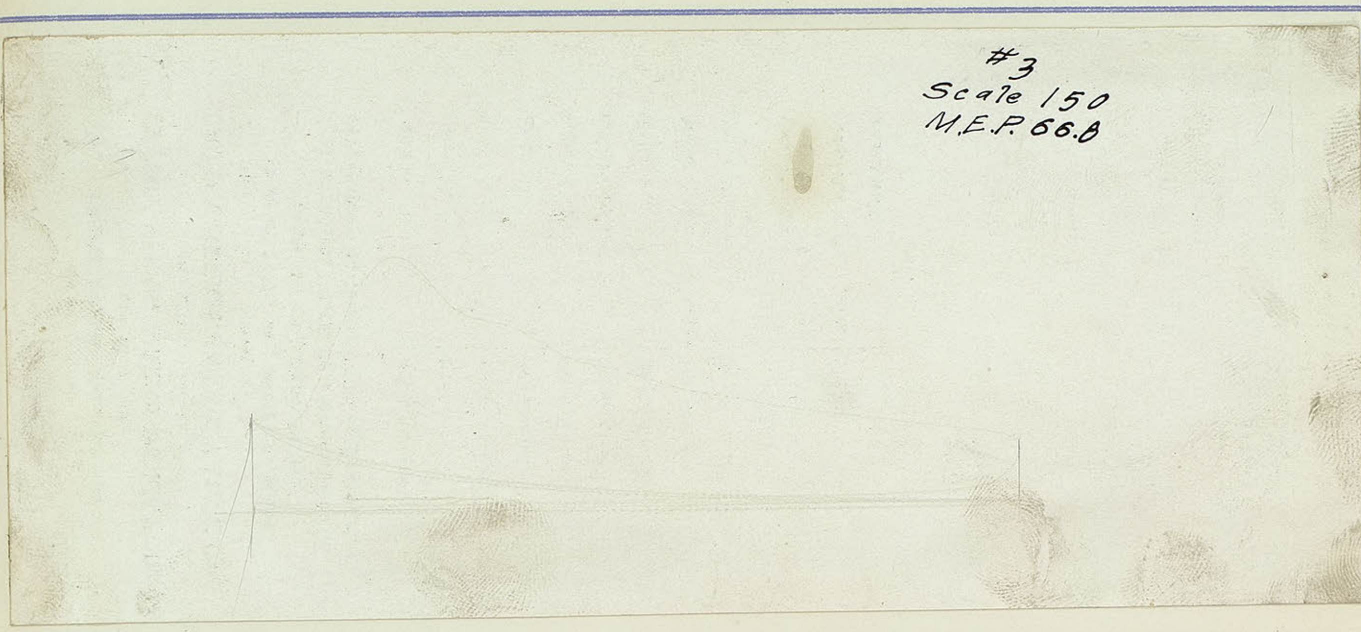
TEST #1

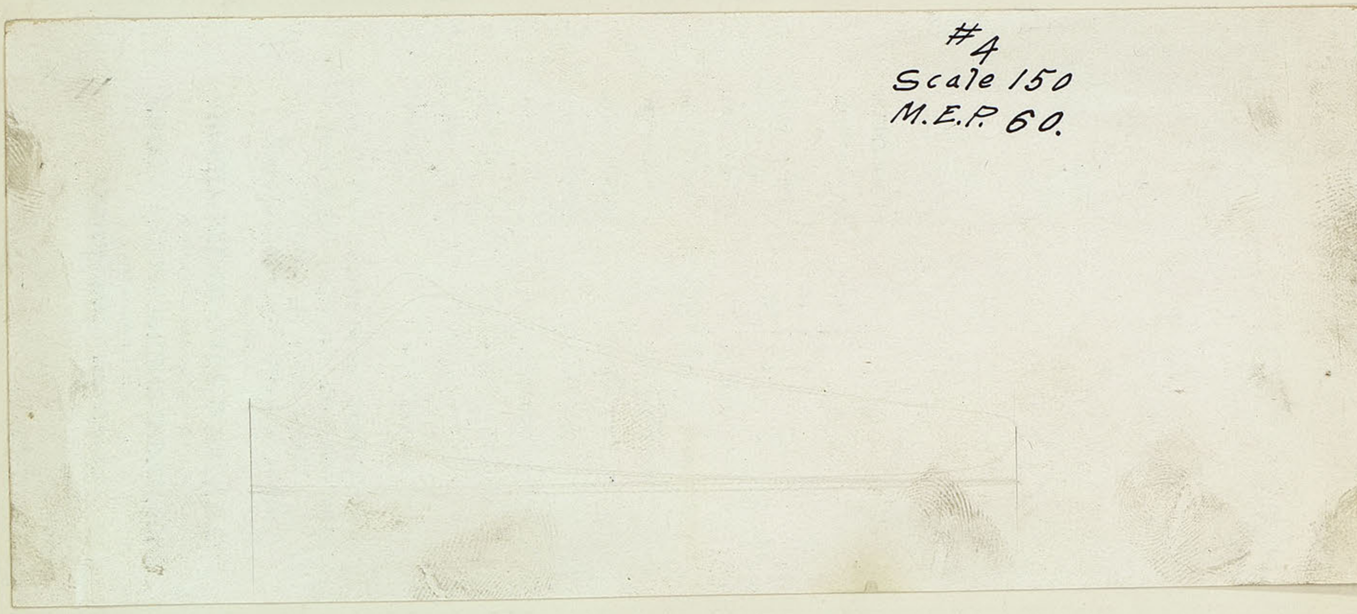
#3
Scale 150
M.E.P. 72.

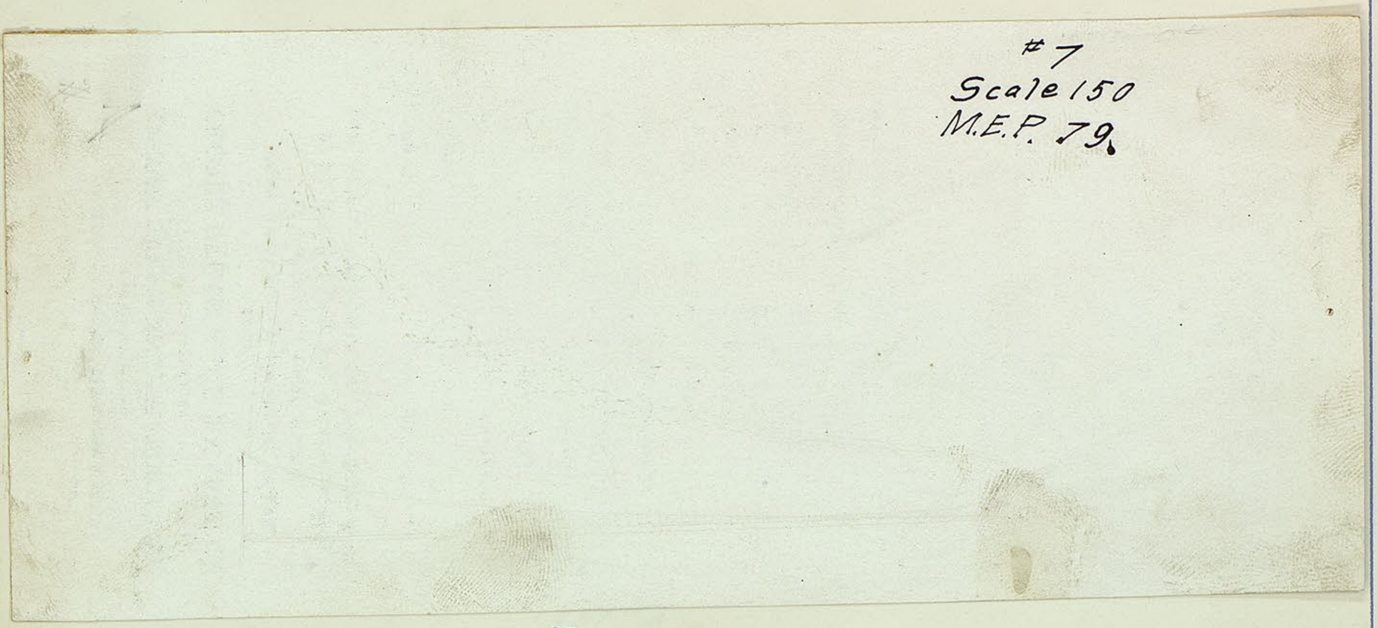
#4
Scale 150
M.E.P. 68.9

#7
Scale 150
M.E.P. 68.8

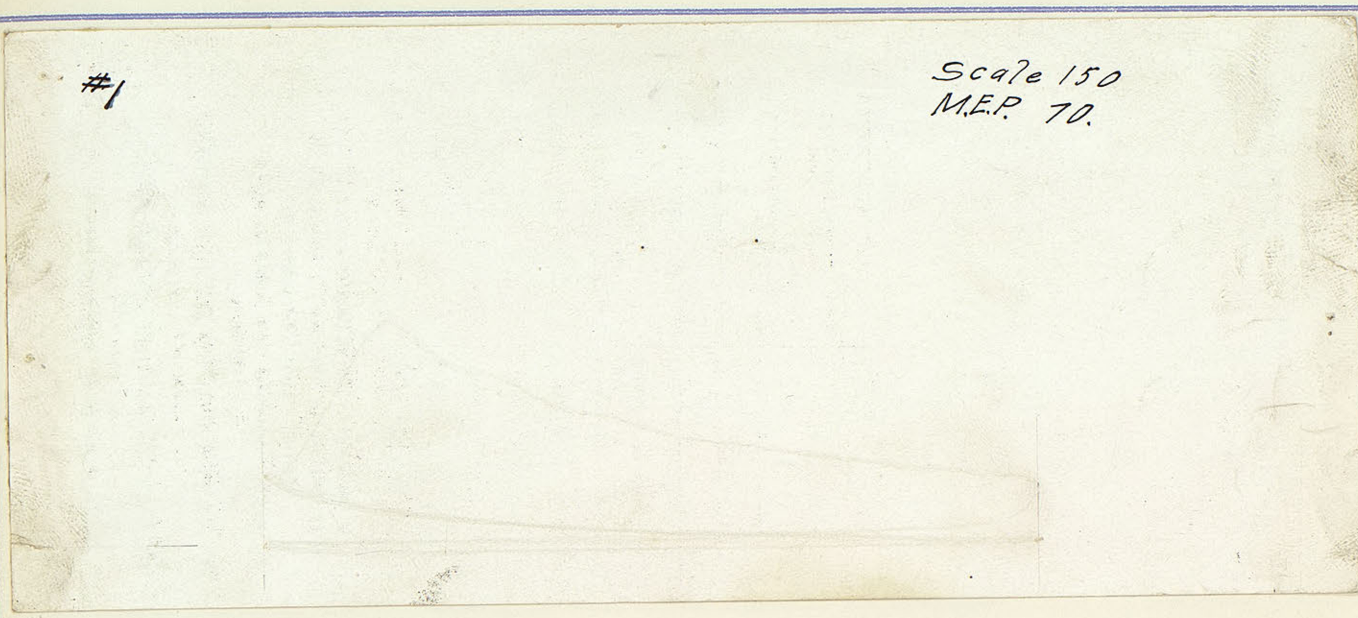
TEST #2

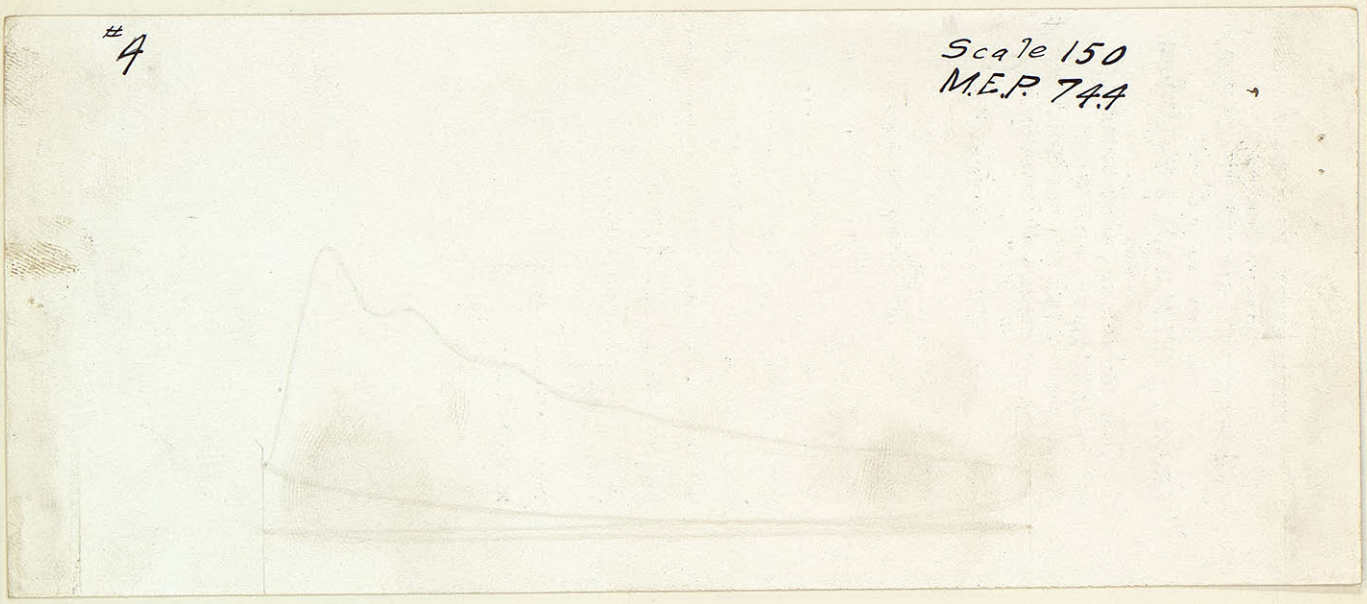


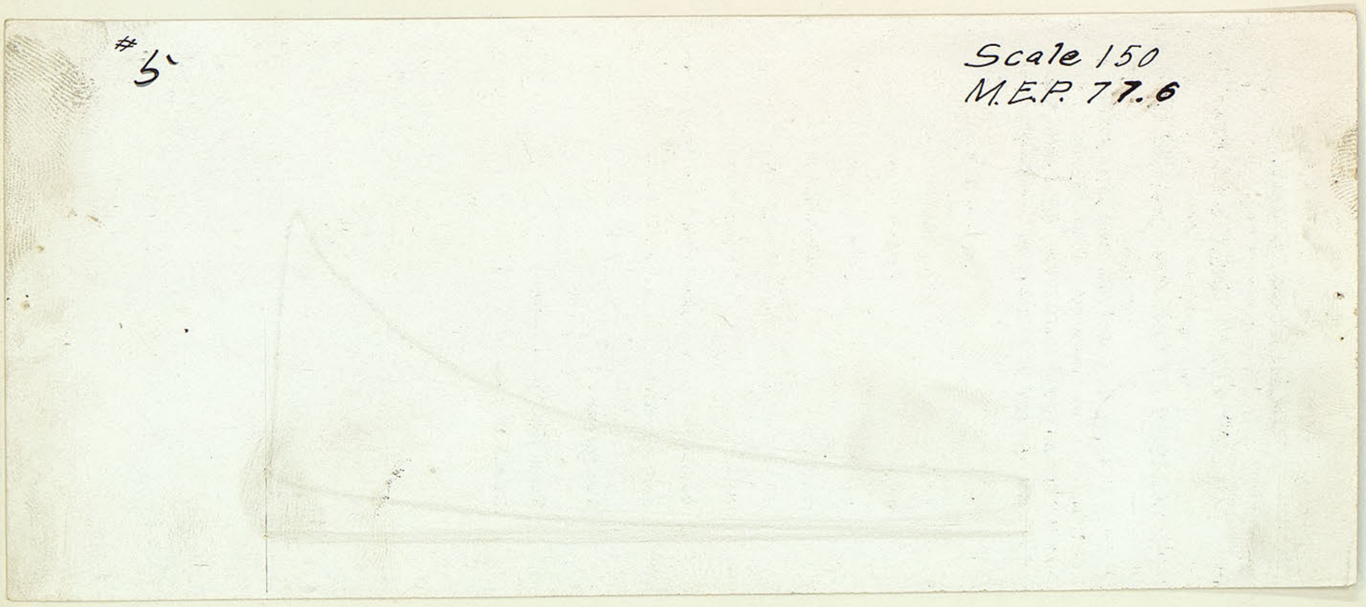




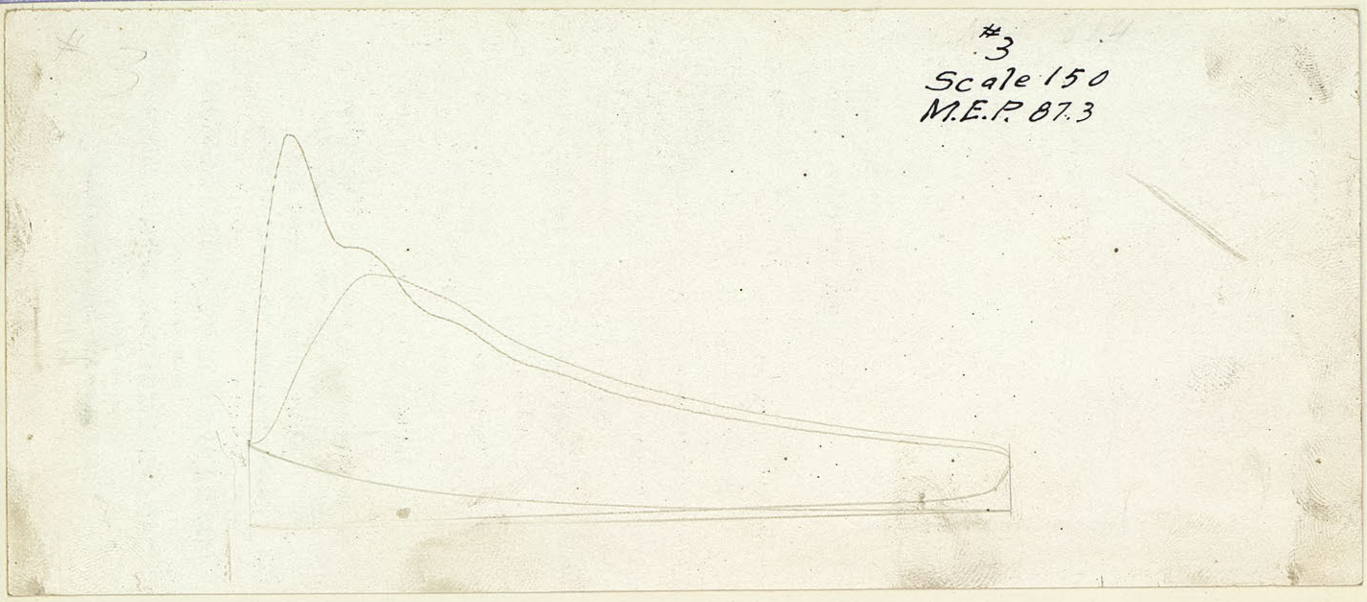
Test #3

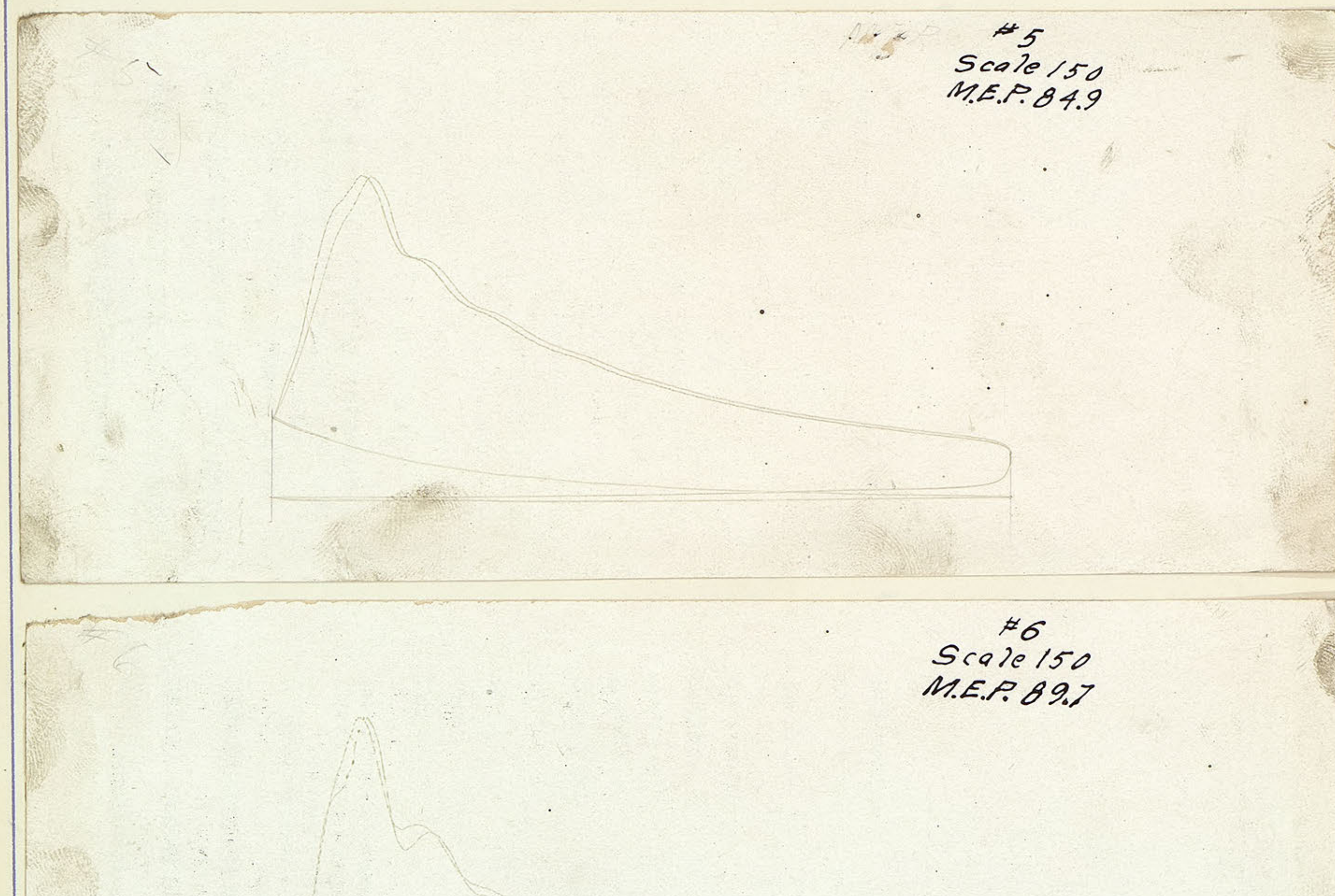


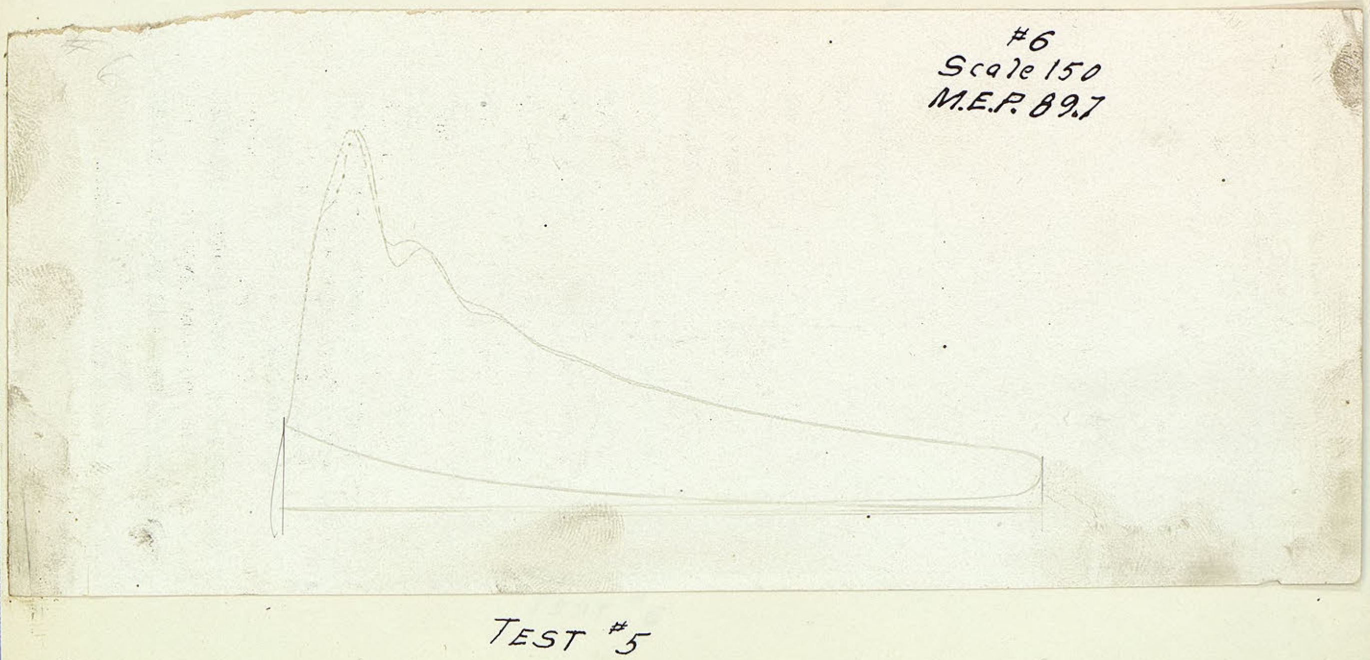




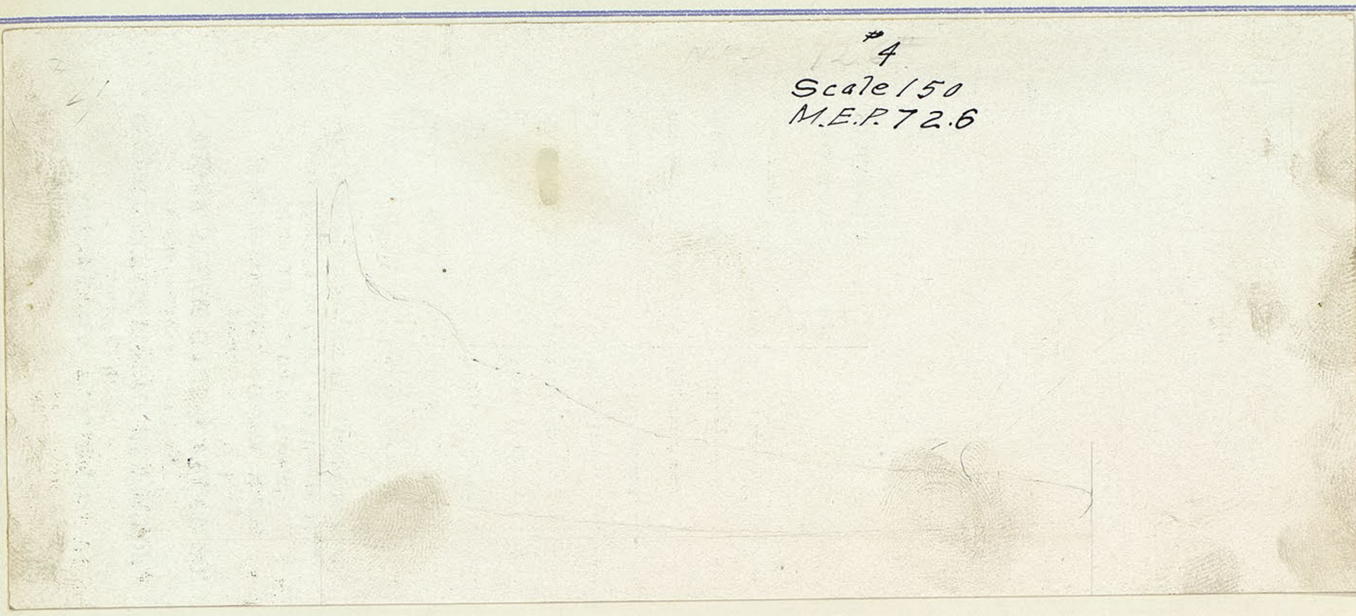
TEST #4

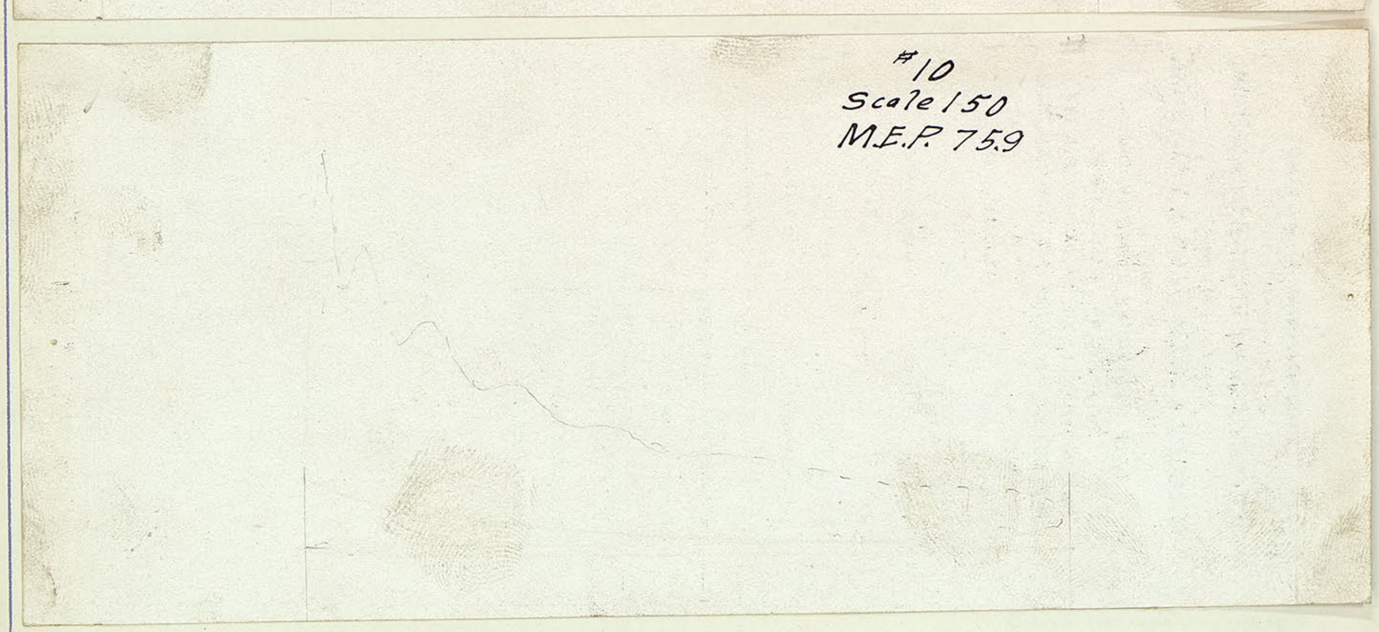




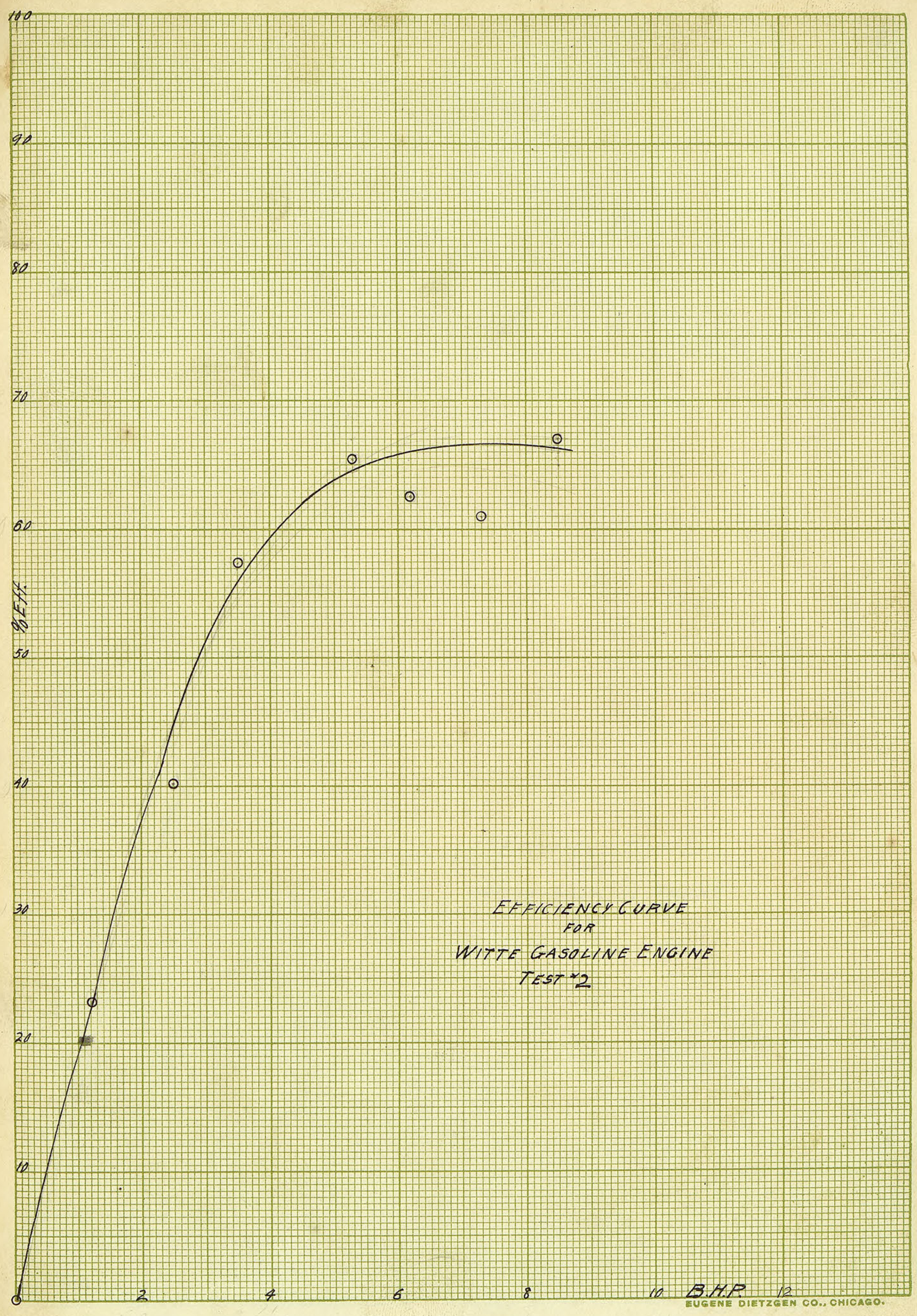


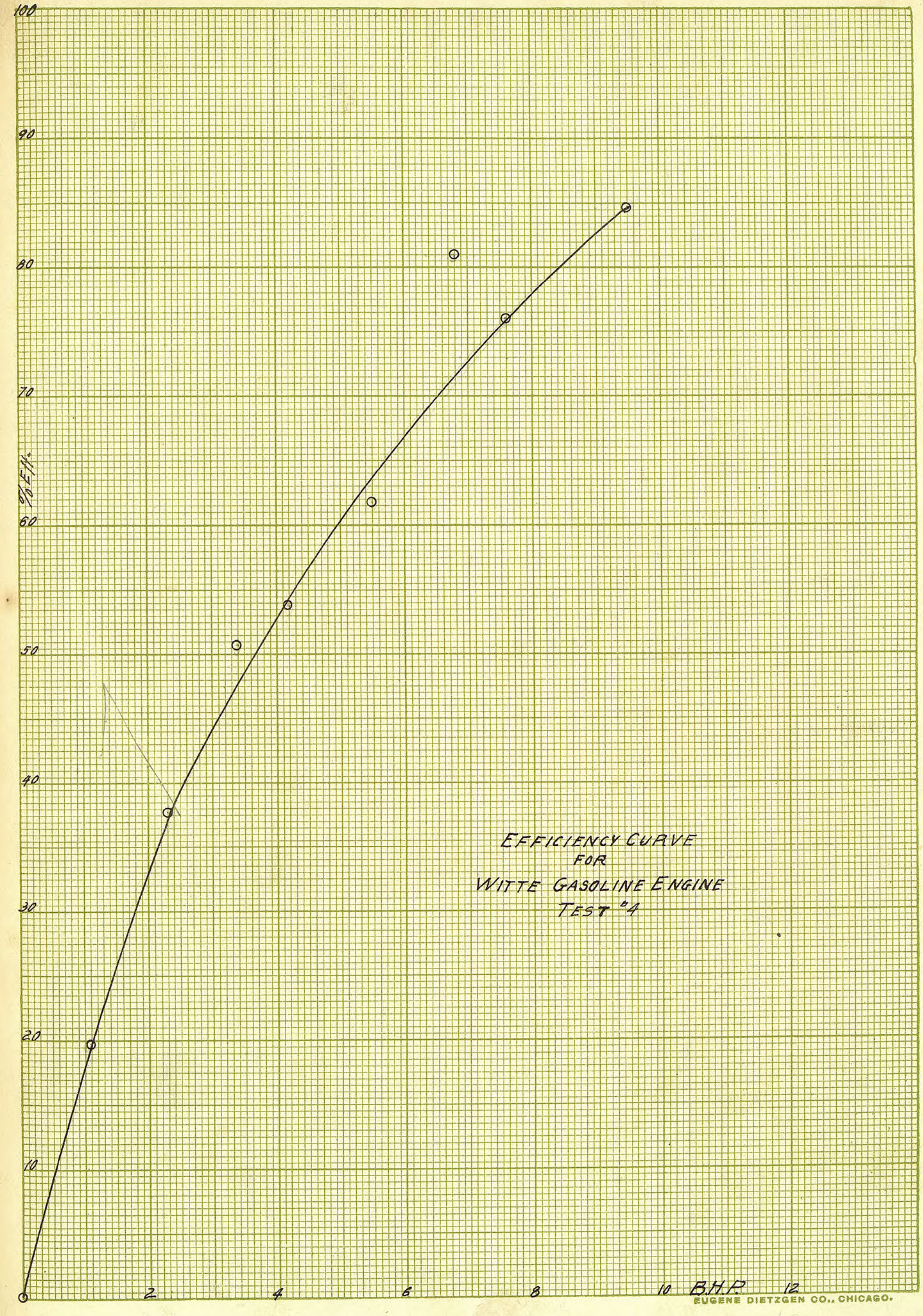
TEST #5





TEST #6


EFFICIENCY CURVE
FOR
WITTE GASOLINE ENGINE
TEST #2
% EFF.
100
90
80
70
60
50
40
30
20
10
2
4
6
8
10
B.H.P.
12
EUGENE DIETZGEN CO., CHICAGO.



EFFICIENCY CURVE
FOR
WITTE GASOLINE ENGINE
TEST #4
% Eff.
B.H.P.
100
90
80
70
60
50
40
30
20
10
2
4
6
8
10
12
EUGENE DIETZGEN CO., CHICAGO.

DEPARTMENT OF MECHANICAL ENGINEERING, K. S. A. C.

TEST MADE AT K.S.A.C. LAB.

ON

DATE WITTE GAS ENGINE

BAROMETER ______ IN ______ LBS.

LOG OF GASOLINE ENGINE TRIAL. #1

OBSERVERS:

CONSTANTS OF ENGINE.

Diam. of cylinder ...... 7.25 in.
Length of stroke .... 1.166 ft.
Area of piston ...... 41.282 sq. in.
Engine constant ..... .00146
Brake constant ......

No. Card.	Time.	R. P. M.	Brake Load	B. H. P.	Explosions per ...... Mins.	Explosions per Minute.	M. E. P.	I. H. P.	Eff.	Remarks.
1	2:10	245	37.25	9.1		118	70.4	11.1	.820	Proney brake
2	2:15	247	35.75	8.8		91	81.8	10.8	.815	
3	2:20	247	35.25	8.7		90	81.6	10.7	.813	$B.H.P. = \frac{RPM \cdot BL}{1000}$
4	2:25	246	38.25	9.4		100	76.0	11.1	.847	
5	2:30	244	38.75	9.5		95	84.9	11.8	.805	Gasoline used 7.05 qts.
6	2:35						Readings omitted			
7	2:40	250	36.25	9.1		95	75.4	10.5	.866	Gasoline per B.H.P. per hr. .84 qt.
8	2:45	248	39.25	9.7		97	79.7	11.3	.858	
9	2:50	253	36.25	9.2		86	85.8	10.8	.852	
10	2:55	243	38.25	9.3		94	76.6	10.5	.886	
11	3:00	252	37.25	9.4		98	78.8	11.3	.832	
12	3:05	255	33.75	8.5		86	87.4	11.0	.773	
	Maximum.	255	39.25	9.7		118	87.4	11.8	.886	
	Minimum.	245	33.75	8.5		86	70.4	10.5	.773	
	Total.	2730	406.25	100.7		1050	878.4	120.9	9.167	
	Average.	248	36.93	9.2		95	79.9	11.0	.833	

DEPARTMENT OF MECHANICAL ENGINEERING, K. S. A. C.

TEST MADE AT K.S.A.C. LAB.

ON WITTE GAS ENGINE

DATE 5-16-04

BAROMETER ________ IN ________ LBS.

LOG OF GASOLINE ENGINE TRIAL. #2

OBSERVERS:

CONSTANTS OF ENGINE.

Diam. of cylinder....... 7.25 in.
Length of stroke........ 1.166 ft.
Area of piston...... 41.282 sq. in.
Engine constant..... .00146
Brake constant.......

No. Card.	Time.	R. P. M.	Brake Load	B. H. P.	Explosions per ...... Mins.	Explosions per Minute.	M. E. P.	I. H. P.	Eff.	Remarks.
1	3:28	274	0	0		35	68	3.5	0	Prony brake
2		274	4.75	1.2		41	87	5.2	.231	
3		265	9.25	2.5		64	66.7	6.2	.403	B.H.P. = $\frac{R.P.M. \cdot BL}{1000}$
4		258	13.75	3.5		70	60	6.1	.574	
5		268	19.75	5.3		78	71	8.1	.654	
6		255	24.25	6.2		98	70	10.0	.620	
7		248	29.25	7.3		102	79	11.8	.610	
8	3:50	249	34.25	8.5		115	75.2	12.6	.675	
	Maximum.	274	34.25	8.5		115	79	12.6	.675	
	Minimum,	248	0	0		35	60	3.5	0	
	Total.									
	Average,									

DEPARTMENT OF MECHANICAL ENGINEERING, K. S. A. C.

TEST MADE AT K.S.A.C. LAB.

ON WITTE GAS ENGINE

DATE 5-16-'04

BAROMETER ________ IN ________ LBS.

LOG OF GASOLINE ENGINE TRIAL #3

OBSERVERS:

CONSTANTS OF ENGINE.

Diam. of cylinder....... 7.25 in.
Area of piston..... 41.282 sq. in.
Length of stroke....... 1.166 ft.
Engine constant..... .00146
Brake constant...... .04014

No. Card.	Time.	R. P. M.	Brake Load	B. H. P.	Explosions per 2 Mins.	Explosions per Minute.	M. E. P.	I. H. P.	Eff.	Remarks.
1	2:50	180	115#	7.2	180	90	67.1	8.8	.818	Strap brak
2	2:55	229	"	9.2	208	104	69.5	10.6	.868	
3	3:00	253	"	10.2	253	126.5	72.0	13.4	.761	Brake constant = $\frac{\pi d \cdot 115}{33000}$
4	3:05	254	"	10.2	254	127	68.9	12.8	.797	
5	3:10	249.5	"	10.0	246	123	67.4	12.1	.826	Gasoline used 3.9 qts.
6	3:15	249.5	"	10.0	241	120.5	69.9	12.2	.820	
7	3:20	250.5	"	10.1	246	123	68.8	12.4	.806	Gasoline per B.H.P. per hr. .8 qt.
	Maximum,	254	115#	10.2	254	127	72.0	13.4	.868	
	Minimum,	180	"	9.2	180	90	67.1	8.8	.761	
	Total,	1715.5		66.9	1628	814	483.6	82.3	5.696	
	Average,	245	"	9.55	232	116	69.1	11.7	.813	

DEPARTMENT OF MECHANICAL ENGINEERING, K. S. A. C.

TEST MADE AT K. S. A. C. LAB.

ON WITTE GAS ENGINE

DATE 5-28-'04

BAROMETER ______ IN ______ LBS.

LOG OF GASOLINE ENGINE TRIAL. #4

OBSERVERS:

CONSTANTS OF ENGINE.

Diam. of cylinder....... 7.25 in. Area of piston...... 41.282 sq. in.

Length of stroke........ 1.166 ft. Engine constant..... .00146

Brake constant...... .00035

No. Card.	Time.	R. P. M.	Brake Load	B. H. P.	Explosions per ...... Mins.	Explosions per Minute.	M. E. P.	I. H. P.	Eff.	Remarks.
1	5:15	282	0	0		46	70	4.7	0	Strap brake
2		284	12.5#	1.1		46	82.7	5.6	.196	
3		286	23.0	2.3		54	77.0	6.1	.377	Brake const. = $\frac{\pi d}{33000}$
4		284	34.5	3.4		59	77.6	6.7	.507	
5		262	46.0	4.2		72	74.4	7.8	.539	
6		274	57.5	5.5		74	82.2	8.9	.618	
7		280	69.0	6.8		76	75.9	8.4	.810	
8		272	80.5	7.6		88	77.3	9.9	.766	
9	5:40	262	103.5	9.5		96	79.6	11.2	.848	
	Maximum,	286	103.5	9.5		96	82.7	11.2	.848	
	Minimum,	262	0	0		46	70.	4.7		
	Total,									
	Average,									

DEPARTMENT OF MECHANICAL ENGINEERING, K. S. A. C.

TEST MADE AT K.S.A.C. LAB.

ON WITTE ENGINE

DATE 5-31-'04

BAROMETER ______ IN ______ LBS.

LOG OF GASOLINE ENGINE TRIAL. #5

CONSTANTS OF ENGINE.

Diam. of cylinder 7.25 in. Area of piston 41.282 sq. in.

Length of stroke 1.166 ft. Engine constant .00146

Brake constant ______

OBSERVERS:

No. Card.	Time.	R. P. M.	Brake Load	B. H. P.	Explosions per ...... Mins.	Explosions per Minute.	M. E. P.	I. H. P.	Eff.	Remarks.
1	1:10	287.5				37	78.0	4.2		Test with no brake load.
2	1:15	282.5				36	92.7	4.8		
3	1:20	281				35	87.3	4.4		Gasoline used 3.1 qts.
4	1:25	285				32	92.7	4.3		
5	1:30	283.5				32	84.9	3.9		Gasoline per I.H.P. per hr. .8 qt.
6	1:35	286				31	89.7	4.0		
7	1:40	286				28	91.2	3.7		
8	1:45	284.5				26	100.2	3.8		
9	1:50	285.5				26	70.0	2.8		
10	1:55	285.5				27	76.2	2.7		
11	2:00	284				28	97.5	4.0		
12	2:05	285.5				27	97.0	3.8		
	Maximum,	287.5								
	Minimum,	281.				37	100.2	4.8		
	Total,	3416.5				26	70.0	2.7		
	Average,	284.5				365	1057.4	46.4		
						30.4	88.1	3.9		

DEPARTMENT OF MECHANICAL ENGINEERING, K. S. A. C.

LOG OF GASOLINE ENGINE TRIAL. #6

TEST MADE AT K.S.A.C. LAB.

ON WITTE ENGINE

DATE 6-1-'04

BAROMETER ________ IN ________ LBS.

OBSERVERS:

CONSTANTS OF ENGINE.

Diam. of cylinder....... 7.25 in.

Length of stroke....... 1.166-- ft.

Area of piston....... 41.282 sq. in.

Engine constant..... .00146

Brake constant...... .03997

No. Card.	Time.	R. P. M.	Brake Load	B. H. P.	Explosions per ...... Mins.	Explosions per Minute.	M. E. P.	I. H. P.	Eff.	Remarks.
1	4:15	253	112#	9.9		115	68.4	11.5	.860	
2	4:20	252	"	9.9		110	65.1	10.5	.943	
3	4:25	254	"	10.0		109	67.8	10.8	.926	
	4:30		"							10 min. stop.
	4:35									
4	4:40	252	"	9.9		110	72.6	11.6	85.3	
5	4:45	253	"	9.9		102	76.2	11.3	87.6	
6	4:50	251	"	9.8		108	64.8	10.2	96.1	
7	4:55	252	"	9.9		107	68.7	10.7	95.2	
	5:00									Incorrect readings.
	5:05									
8	5:10	254	"	10.		101	75.9	11.2	88.4	
9	5:15	254	"	10		101	69.3	10.2	98.0	
										Strap brake
										Gasoline used 5.8 qts.
										Gasoline per B.H.P. per hr. .6 qt.
										Brake const. = $\frac{\pi d \cdot 112}{33000}$
	Maximum.	254	112#	10		115	76.2	116	.980	
	Minimum,	251	"	9.8		101	64.8	10.2	.860	
	Total,	2275		89.3		958	628.8	98.1	8.235	
	Average,	253	"	9.9		106.4	69.9	10.9	.915	

Dempster Gasoline Engine.

Class BB No.283.

This engine belongs to the type of the internal combustion engines known as the two cycle engines. It is a horizontal engine as shown by the frontispiece. The engine has good features among which a few will be mentioned. The air inlet pipe passes through the muffler and this heating the entering air and giving better and quicker vaporization of the gasoline. This would be a good advantage in winter and no disadvantage in warm weather.

The governor is not a throttling governor but it acts such that when the speed is too great the charges are shut off from the cylinder and consequently no explosion occurrs until the speed is reduced.

The inlet valve for the gasoline and air is worked by the suction of the piston instead of by a cam as is found in some types of engines.

Next as to the starting of the engine. It was found that the battery sent out by the firm gave too weak a spark to explode or fine the mixture. The engine gave considerable trouble and only one explosion could be made after which the engine stopped. The valves were cleaned and engines overhauled but it still refused to run. It was thought that the charge was too rich so the throttle was experimented on but of little use. Finally another battery was placed in series and the spark increased to nearly one-fourth inch in length, after which very little trouble was experienced. It is better to have too large a spark than to have too weak a spark.

In starting the engine it seems that nearly too rich a charge is drawn in so by opening a small cock on the lower side of cylinder air was admitted to cylinder and very little trouble occurred in starting.

Next we shall take up the method of testing. The load was applied by a strap brake as shown in the frontispiece and needs but little description.

The arc of contact was about 180° and to regulate the load it was increased or decreased. This brake was found to be superior to the prony and rope brake. Very little heating occurred as the amount of metal in the rim conducted the heat from the rubbing surface. A little oil was put on the belt occasionally which made the brake act smoothly.

The speed was read by use of a speed counter and watch which is more accurate than the tacometer.

To find the gasoline used a gravity tank was used and the overflow pipe from the engine uncoupled and a can placed such that the overflow was caught and poured back into the tank;a glass gage was placed on the side of the tank so that the fall of gasoline in the tank could be measured and by knowing the area of tank the consumption of gasoline could be calculated.

The counting of the explosions was accomplished by getting near the end of the exhaust pipe where the burnt gases are thrown into the air and counting the explosions by listening to the report made by the exhaust.

A good plan was to count the explosions up to ten and then make a mark and so on. This was easily done and quite accurate. At no load the explosions occurred irregular but as soon as a load was applied they were regular,distinct and easily heard.

The cards taken in the tests were taken by a Crosby Gas Engine Indicator.

The time of spark affects the force of the explosion. By shifting the spark it was found that the engine ran best when the spark occurred such that the wrist pin was about 15° from dead center on the compression stroke.

The cylinder was cooled by hydrant water but no records kept.

As to the cards appearing on the following pages. They are the real cards used and taken in the tests given in the log s. They are a representative card of the two cycle type. These cards in general are similar to the steam engine type of cards.

From the slant of the explosion line it is seen that the spark occurs a little late.

The sudden drop in the expansion line, a little before the end of the expansion stroke is necessary so that the charge compressed in the crank end may pass to the head end and blow out the burnt gases before the return stroke or compression stroke.

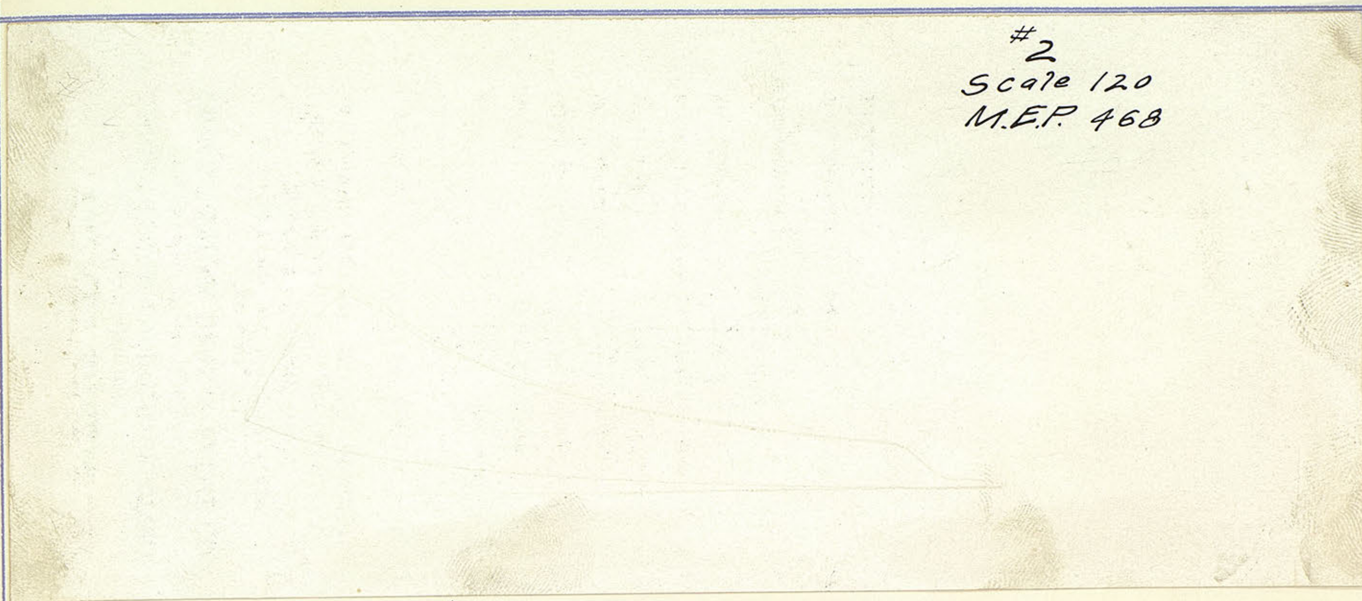
The I.H.P. of the individual cards may be found in the logs at the end of the discussion.

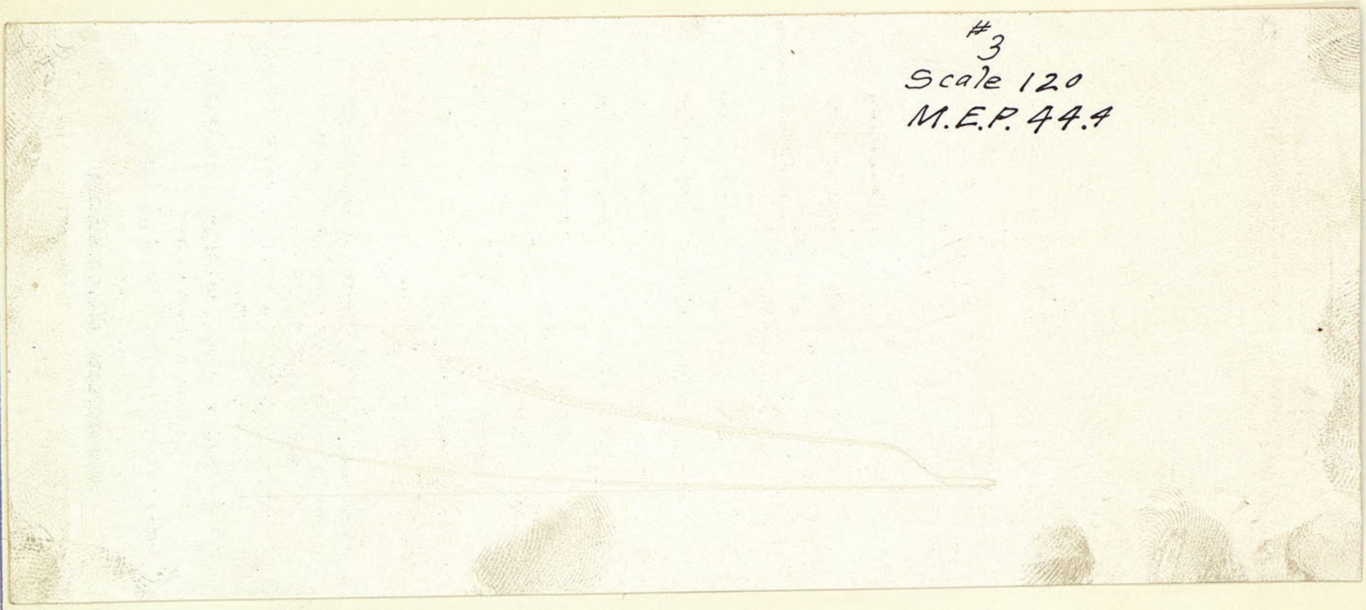
In the tests the greatest efficiency is, on the average, 74% in tests three and four where the average load is greater than in the first test.

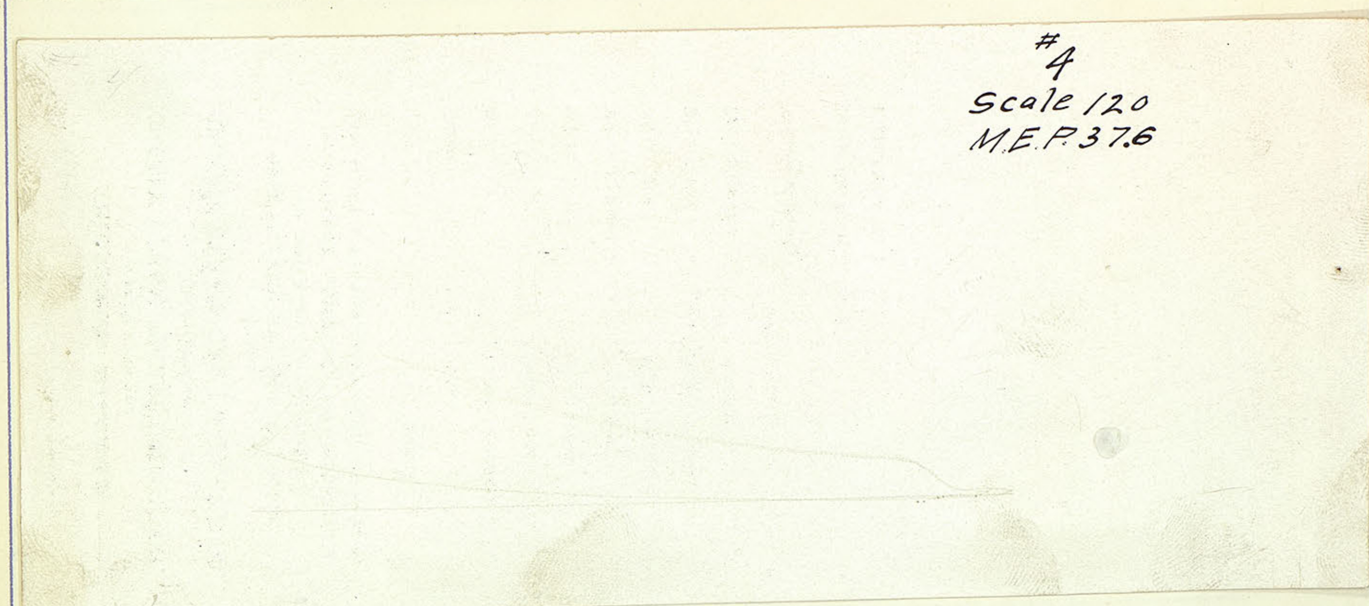
The curve on the efficiency and B.H.P. of log number two shows that the efficiency increases with the load.

The engine uses from 1.3 to 1.8 quarts of oil per H.P. per. hour which is rather high.

In regard to the revolutions per minute it can be seen by log two that at no load the speed is 345 per minute and as the load increased it fell two 174 R.P.M. For cards 5 to 10 of same log it is noticed that the B.H.P. is nearly constant as the load increases. But the speed decreases nearly proportionally as the load increases and thus makes the break H P nearly constant.







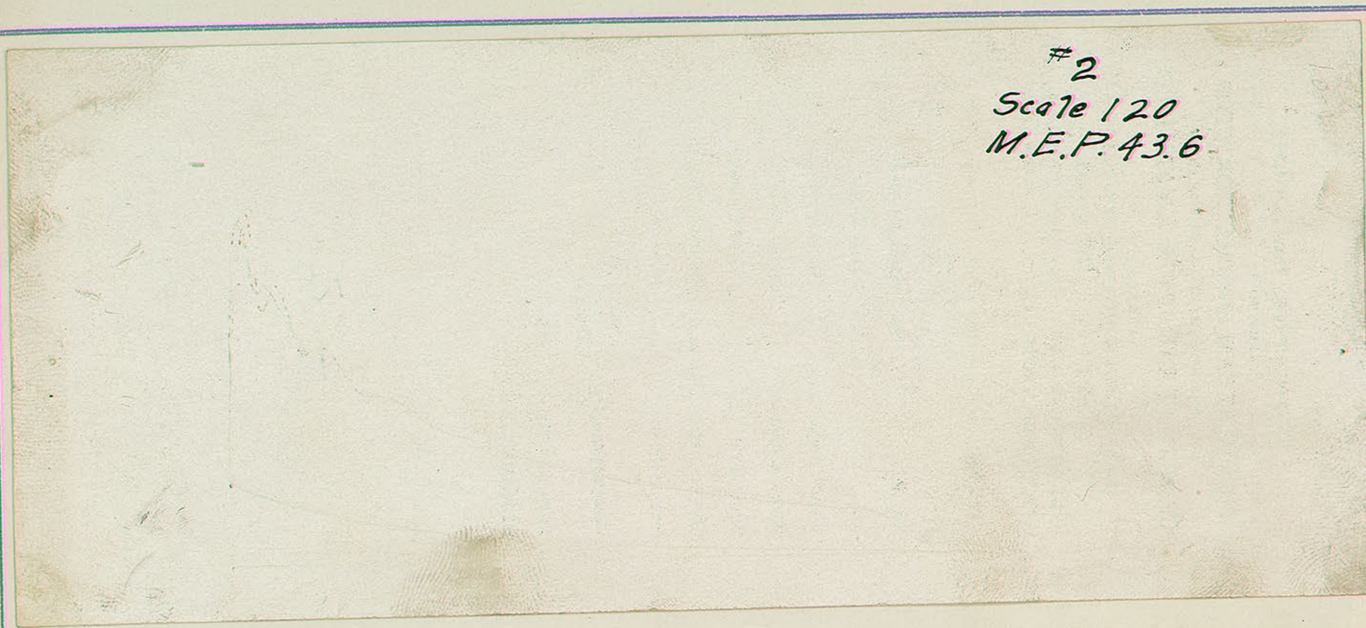
TEST #1.

#3
Scale 120
M.E.P. 30

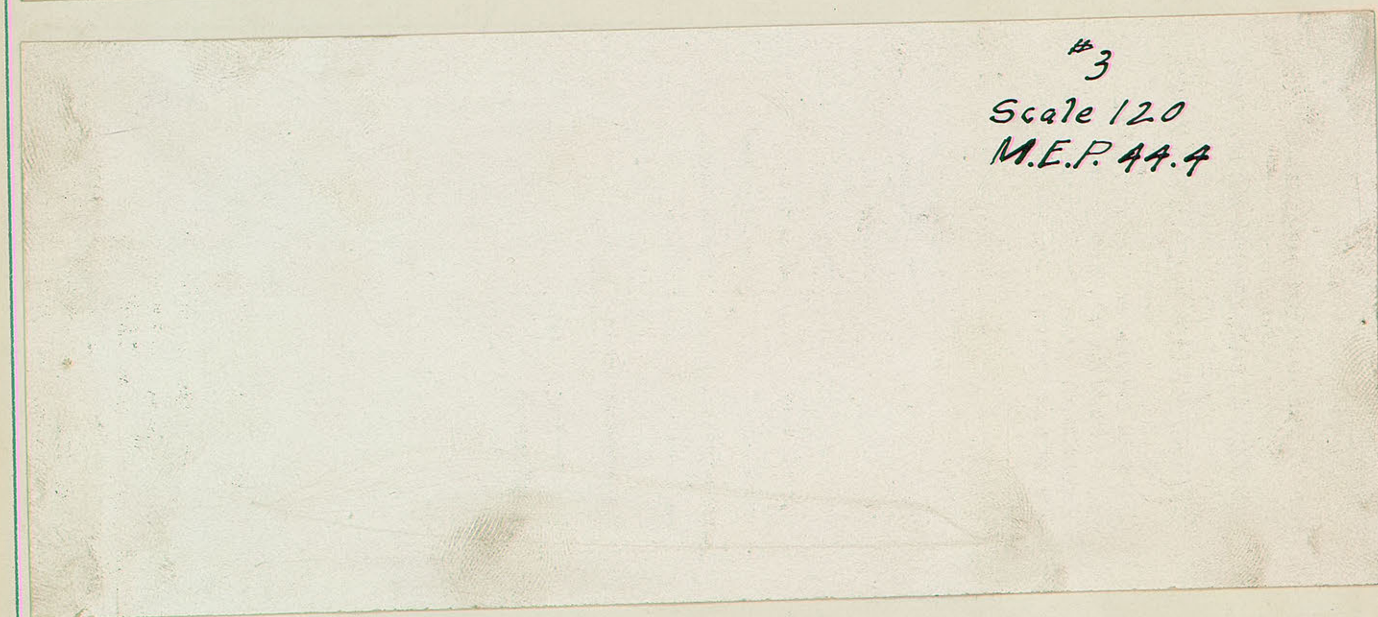
#5
Scale 120
M.E.P. 40.4

#6
Scale 120
M.E.P. 40.8

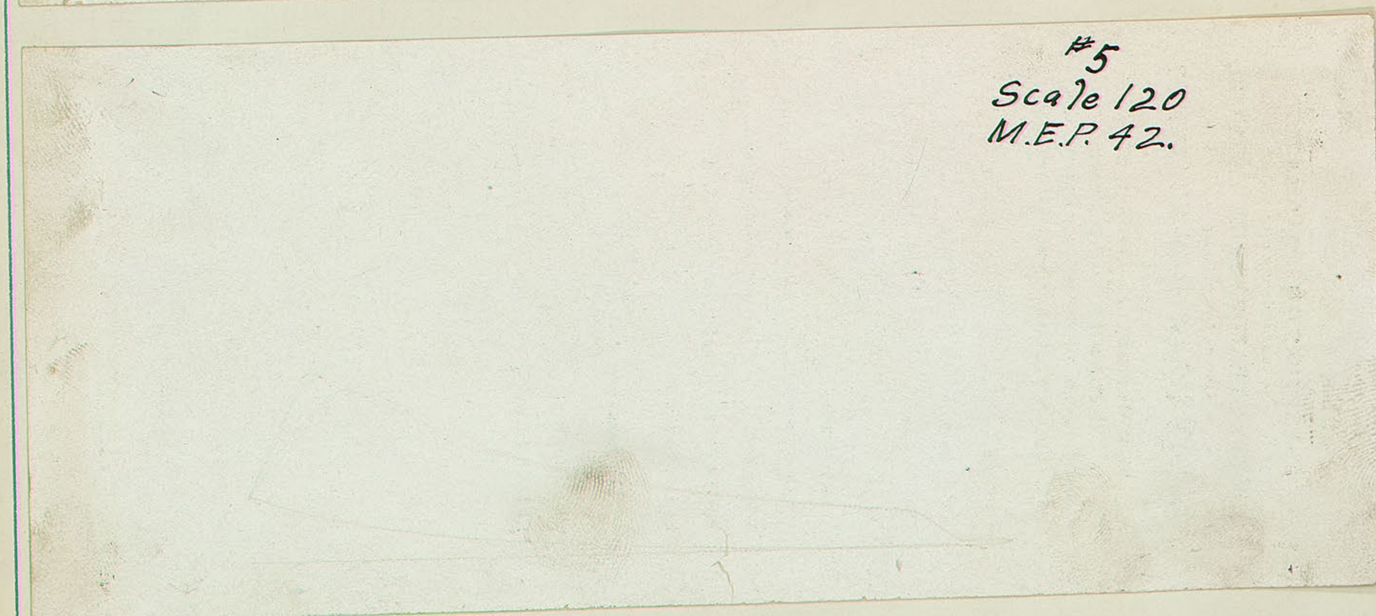
TEST #2



#2
Scale 120
M.E.P. 43.6

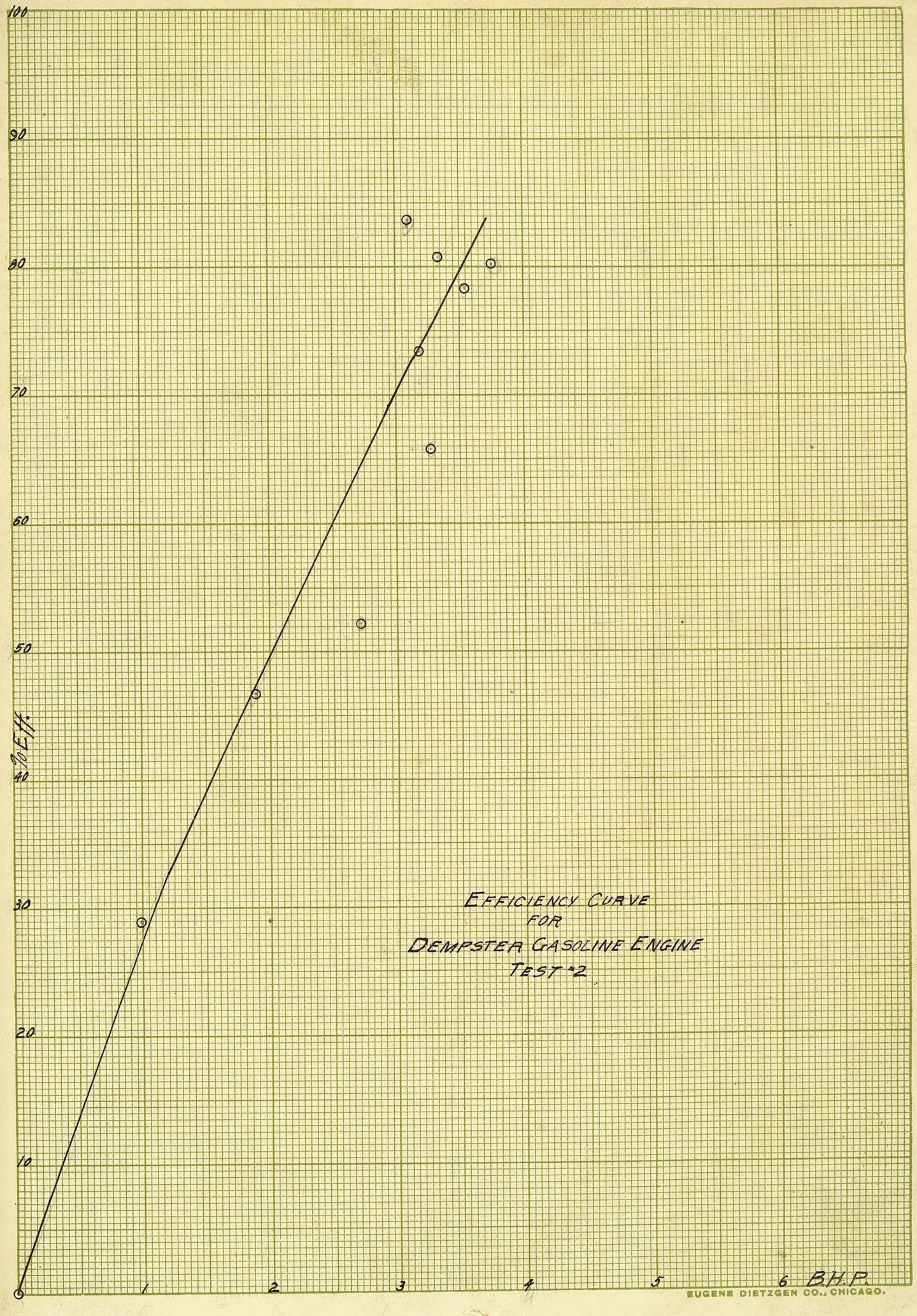


#3
Scale 120
M.E.P. 44.4



#5
Scale 120
M.E.P. 42.

TEST #3



100
90
80
70
60
50
40
30
20
10
% Eff.
1
2
3
4
5
6
B.H.P.
EFFICIENCY CURVE
FOR
DEMPSTER GASOLINE ENGINE
TEST #2
EUGENE DIETZGEN CO., CHICAGO.

DEPARTMENT OF MECHANICAL ENGINEERING, K. S. A. C.

TEST MADE AT K.S.A.C. LAB.

ON DEMPSTER GAS. ENGINE.

DATE 6-6-'04.

BAROMETER ______ IN ______ LBS.

LOG OF GASOLINE ENGINE TRIAL. #1

OBSERVERS:

CONSTANTS OF ENGINE.

Diam. of cylinder....... 6 in.
Length of stroke........ .5052 ft.
Area of piston...... 28.274 sq. in.
Engine constant...... .000433
Brake constant...... .0113

No. Card.	Time.	R. P. M.	Brake Load	B. H. P.	Explosions per 2 Mins.	Explosions per Minute.	M. E. P.	I. H. P.	Eff.	Remarks.
1	8:25	217.5	40#	24.6	435	217.5	45.2	4.25	.579	
2	8:30	272.5	"	3.08	449	224.5	46.8	4.55	.677	
3	8:35	232.5	"	2.63	469	234.5	44.4	4.42	.595	
	8:40									Engine stopped
4	8:45	228	"	2.58	477	238.5	37.6	3.[illegible]8	.665	
5	8:50	250	"	2.83	483	241.5	45.2	4.[illegible]4	.613	
6	8:55	252.5	"	2.86	490	245	43.6	4.[illegible]3	.618	Strap brake
7	9:00	239.5	"	2.71	465	232.5	42.8	4.[illegible]1	.628	Brake constant $= \frac{\pi d \cdot 40}{33000}$
8	9:05	233	"	2.63	460	230	40.8	4.[illegible]6	.648	
9	9:10	237.5	"	2.69	474	237	38.0	3.[illegible]0	.691	Gasoline used 5.1 qts.
10	9:15	230	"	2.60	455	227.5	44.4	4.[illegible]3	.600	
11	9:20	229.5	"	2.60	450	225	48.8	4.[illegible]5	.547	Gasoline per B.H.P. per hr. 1.86 qts.
12	9:25	225.5	"	2.55.	452	226	42.2	4.[illegible]3	.642	
	Maximum.	252.5	40#	3.08	490	245	48.8	[illegible].75	.677	
	Minimum,	217.5	"	2.46	435	217.5	37.6	[illegible].88	.547	
	Total,	2847		32.22	5554	27[illegible]7	51[illegible]8	[illegible]95	7.513	
	Average,	237	"	2.69	463	23[illegible]	4[illegible]	4.3	.625	

DEPARTMENT OF MECHANICAL ENGINEERING, K. S. A. C.

TEST MADE AT K.S.A.C. LAB.

ON DEMPSTER GAS. ENGINE

DATE 6-6-'04

BAROMETER ________ IN ________ LBS.

LOG OF GASOLINE ENGINE RIAL. #2

OBSERVERS:

CONSTANTS OF ENGINE.

Diam. of cylinder....... 6 in.
Length of stroke........ .5052 ft.
Area of piston..... 28.274 sq. in.
Engine constant.... .00433
Brake constant..... .00283

No. Card.	Time.	R. P. M.	Brake Load	B. H. P.	Explosions per .... Mins.	Explosions per Minute.	M. E. P.	I. H. P.	Eff.	Remarks.
1	9:45	345	0#	0		75	48	[illegible]7	0	
2		335	10#	.98		250	31.2	[illegible]8	.29	Strap brake
3		332	20#	1.88		310	30.0	4[illegible]3	.466	
4		319	30#	2.71		316	38.0	5[illegible]0	.521	Brake constant $\frac{\pi d}{33000}$
5		288	40#	3.26		277	40.4	4[illegible]5	.658	
6		249	45#	3.17		244	40.8	4[illegible]	.735	
7		236	50#	3.34		234	40.8	4[illegible]3	.808	
8		241	55#	3.75		219	50.0	[illegible]	.791	
9		208	60	3.53		206	50.4	4[illegible]9	.786	
10	10:15	174	62.5	3.08		174	48.8	[illegible]9	.837	
	Maximum,	345	62.5	37.5		175	50.4	[illegible]0	8.37	
	Minimum,	174	0	0		75	30	1[illegible]7	0	
	Total,									
	Average,									

DEPARTMENT OF MECHANICAL ENGINEERING, K. S. A. C.

TEST MADE AT K.S.A.C. LAB.

ON DEMPSTER GAS. ENGINE

DATE 6-6-'04

BAROMETER ______ IN ______ LBS.

LOG OF GASOLINE ENGINE TRIAL. #3

OBSERVERS:

CONSTANTS OF ENGINE.

Diam. of cylinder....... 6 in.
Length of stroke........ .5052 ft.
Area of piston...... 28.274 sq. in.
Engine constant..... .000433
Brake constant...... .01387

No. Card.	Time.	R. P. M.	Brake Load	B. H. P.	Explosions per 2 Mins.	Explosions per Minute.	M. E. P.	I. H. P.	Eff.	Remarks.
1	11:25	225.5	49#	3.13	447	223.5	42	4.06	.771	Strap brake
2	11:30	230	"	3.19	458	230	43.6	4.32	.739	
3	11:35	235	"	3.26	459	229.5	44.4	4.41	.739	Brake constant = $\frac{\pi d 49}{33000}$
4	11:40	235	"	3.27	466	233	44.	4.44	.736	
5	11:45	236.5	"	3.28	471	235.5	42.	4.28	.766	Gasoline used 4.39 qts.
6	11:50	238	"	3.30	473	236.5	43.2	4.42	.747	
1	2:15	233.5	"	3.23	462	231	46.8	4.68	.690	Gasoline per B.H.P. per hr. .136 qt
2	2:20	215	"	2.98	430	215	42.4	3.95	.754	
	30 Min. delay									
3	2:50	226	"	3.13	451	225.5	42.8	4.28	.731	
4	2:55	237.5	"	3.30	469	234.5	42.0	4.36	.757	
5	3:00	240	"	3.33	470	235	43.6	4.54	.733	
6	3:05	242.5	"	3.36	488	244	44.	4.76	.723	
	Maximum,	242.5	49	3.36	488	244	46.8	4.76	.771	
	Minimum,	215	"	2.98	430	215	42.0	3.95	.690	
	Total,	2795		38.76	5544	2772	520.8	52.50	8.886	
	Average,	233	"	3.23	462	231	43.4	4.38	.741	

General Conclusions.

In compating the two types of gasoline engines, it may be well to note a few points of interest. The Witte, four cycle, seems to be the most efficient as its highest efficiency is 91 1/2% while that of the Dempster is only 74%.

The four cycle engine is most economical in fuel, its best average was .8 qt. per brake horse power per hour while that of the two cycle is 1.3 qt. per horse power per hour.

The Compression in the four cycle is greater, which bears out the idea that the efficiency increases with the initial.

The two cycle is very extravagant in the use of gasoline, and we ~~thought~~ think that it is due to the burnt gases not all escaping from the compression end of the cylinder during exhaust, and of course the burnt gases will interfere with proper combustion.

The four cycle engine keeps up its speed when loaded to near its full capacity, while the two cycle engine makes a great drop in its R.P.M. as the load increases. On the four cycle engine the governor cuts out about one charge in fifteen which shows that it keeps up almost to its rated speed, while the governor of the other fails to act as soon as the load is applied: i.e. the speed of the engine falls so that the governor balls are not thrown out. This was noticed by the counting of the explosions the number being the same as the R.P.M.