

International Harvester Company,

Attention - Mr. J. L. Henn,  
Lincoln, Nebr.

IN ACCOUNT WITH  
DEPARTMENT OF AGRICULTURAL ENGINEERING  
THE UNIVERSITY OF NEBRASKA

Fuel and oil used in test of Farmall F-20 tractor

90 gallons kerosene @ 10.8¢ ..... \$9.72

3 1/2 gals. Mobiloil A. @ 76¢ ..... 2.66

\$12.38

*David J. Henn*  
5-8-34

UNIVERSITY OF NEBRASKA - AGRICULTURAL ENGINEERING DEPARTMENT  
 AGRICULTURAL COLLEGE, LINCOLN

Report of Official Tractor Test No. 221

Dates of test: April 3 to 16, 1934.

Name and model of tractor: McCORMICK-DEERING FARMALL "F-20"

Manufacturer: International Harvester Company, Chicago, Illinois.

Manufacturer's rating: NOT RATED.

Highest rating permissible under the recommendations of the A.S.A.E. and

S.A.E. Tractor Rating Codes: Drawbar - 12.68 H.P. Belt - 21.93 H.P.

One carburetor setting (95.5% of maximum) was used thruout this test.

B R A K E H O R S E P O W E R T E S T S

H. P.	: Crank :	Fuel Consumption	: Water consumption :	Temp. :	
	: shaft :		: per hour gallons :	Deg. F. :	Barometer
	: speed :	Gals. :H. P. :lbs. @ :	Cool- : In :	Cool- : :	Inches of
	: R.P.M. :	per :hrs. @:H.P. :	ing : fuel :Total :	ing : Air :	Mercury
	: :	: hour :gal. :hour :	: : :	:med. : :	:

OPERATING MAXIMUM LOAD TEST. ONE HOUR

23.11	: 1200	: 2.221	: 10.41	: 0.652	: 0.000	: 0.000	: 0.000	: 207	: 81	: 28.530
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RATED LOAD TEST. ONE HOUR

22.16	: 1200	: 2.112	: 10.49	: 0.646	: 0.000	: 0.000	: 0.000	: 207	: 81	: 28.540
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\*VARYING LOAD TEST. TWO HOURS

22.29	: 1198	: 2.150	: 10.37	: 0.654	: --	: --	: --	: 208	: 81	: --
1.40	: 1336	: 0.951	: 1.47	: 4.607	: --	: --	: --	: 208	: 82	: --
11.90	: 1308	: 1.496	: 7.95	: 0.852	: --	: --	: --	: 207	: 82	: --
22.97	: 1169	: 2.195	: 10.46	: 0.648	: --	: --	: --	: 207	: 80	: --
6.07	: 1331	: 1.181	: 5.14	: 1.320	: --	: --	: --	: 208	: 82	: --
17.30	: 1246	: 1.757	: 9.85	: 0.688	: --	: --	: --	: 207	: 80	: --
13.66	: 1264	: 1.622	: 8.42	: 0.805	: 0.000	: 0.000	: 0.000	: 207	: 81	: 28.505

\*20 minute runs. Last line is average for two hours.

D R A W B A R H O R S E P O W E R T E S T S

H. P.	: Draw :	Speed :	Crank :	Slip :	Fuel Consumption	: Water :	Temp. :	
	: Bar :	miles :	shaft :	on :	: H.P. : Lbs. :	used :	:	Barometer
	: pull :	per :	speed :	drive:	Gal. : hr. : per :	Gal. :Cool-:	Air:	Inches of
	: pounds:	hour :	R.P.M.:	wheels:	per : per : H.P. :	per :ing :	:	Mercury
	:	:	:	: % :	hour : gal. : hour :	hour :med. :	:	:

RATED LOAD TEST. TEN HOURS. SECOND Gear.

12.61	: 1524	: 3.10	: 1203	: 2.67	: 1.906	: 6.62	: 1.025	: 0.013	: 206	: 67	: 28.835
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MAXIMUM LOAD TEST

15.38	: 2334	: 2.47	: 1200	: 8.32	: -----	: Not Recorded	: -----	: 205	: 78	: 28.520
15.39	: 1924	: 3.00	: 1202	: 5.82	: -----	: " : " :	: -----	: 205	: 85	: 28.455
14.54	: 1539	: 3.54	: 1199	: 5.00	: -----	: " : " :	: -----	: 206	: 82	: 28.455
13.43	: 1213	: 4.15	: 1199	: 4.74	: -----	: " : " :	: -----	: 206	: 81	: 28.490

UNIVERSITY OF NEBRASKA - AGRICULTURAL ENGINEERING DEPARTMENT  
AGRICULTURAL COLLEGE, LINCOLN

Report of Official Tractor Test No. 221

BRIEF SPECIFICATIONS

MOTOR: Make Own Serial No. FA 832 Type 4 Cylinder, Vertical  
Head I Mounting Lengthwise  
Bore and stroke: 3 3/4" x 5" Rated R.P.M. 1200  
Port Dia. Valves: Inlet 1.4375" Exhaust 1.4375"  
Belt pulley: Diam. 14" Face 6 1/2" R.P.M. 654  
Magneto: Own Model E 4 A  
Carburetor: Zenith Model K 5 Size 1 1/4"  
Governor: Own No. None Type Centrifugal  
Air Cleaner: Own Type Oil washed wire filter  
Lubrication: Circulating Splash

CHASSIS: Type 4 wheels, 2 drivers Serial No. F A 832 Drive Enclosed gear  
Clutch: Own Type Single plate - Dry disc operated by foot  
Advertised speeds, miles per hour: First 2 1/4 Second 2 3/4  
Third 3 1/4 Fourth 3 3/4 Reverse 2 3/4  
Drive wheels: Diameter 40" Face 6"  
Lugs: Type Spade No. per wheel 12 Size 4" high by 3 1/2" face  
Extension rims: Width 6" Lugs per rim 12 Size 4" high by 3 1/2" face  
Seat Pressed Steel  
Total weight as tested (with operator) 4,545 pounds.

FUEL AND OIL:

Fuel: Kerosene Weight per gallon 6.78 pounds

Oil: S.A.E. Viscosity No. 30

Total oil to motor 3.261 gallons

Total drained from motor 3.889 gallons

Total time motor was operated 46 hours

The oil was drained to the middle cock and refilled to the top cock after approximately each 10 hours of operation. All of the oil was drained at the end of the test.

UNIVERSITY OF NEBRASKA - AGRICULTURAL ENGINEERING DEPARTMENT  
AGRICULTURAL COLLEGE, LINCOLN

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Report of Official Tractor Test No. 221

REPAIRS AND ADJUSTMENTS

No repairs or adjustments.

REMARKS

The tests herein reported were conducted with one carburetor setting which remained unchanged throughout the tests. This condition should be recognized when comparing this test with any Nebraska test conducted prior to 1928.

The extension rims and lug equipment used in the drawbar tests are the same as described on page 2 of this report.

In the advertising literature submitted with the specifications and application for test of this tractor we find no claims and statements which, in our opinion, are unreasonable or excessive.

We, the undersigned, certify that the above is a true and correct report of official tractor test No. 221.

\_\_\_\_\_  
Engineer-in-charge

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Board of Tractor Test Engineers

UNIVERSITY OF NEBRASKA - AGRICULTURAL ENGINEERING DEPARTMENT  
AGRICULTURAL COLLEGE, LINCOLN

Copy of Report of Official Tractor Test No. 221

Dates of test: April 3 to 16, 1934  
Name and model of tractor: McCormick Deering Farmall "F-20"  
Manufacturer: International Harvester Company, Chicago, Illinois.  
Manufacturer's rating: Not rated  
Highest rating permissible under the recommendations of the A.S.A.E. and  
S.A.E. Tractor Rating Codes: Drawbar H.P. 12.68 - Belt H.P. 21.93  
One carburetor setting ( % of maximum) was used thruout this test.

95.5

B R A K E H O R S E P O W E R T E S T S

H. P.	: Crank : : shaft : : speed : : R.P.M. : :	Fuel Consumption Gals. : H. P. : Lbs. @ : per : hrs. @ : H. P. : hour : gal. : hour :	Water consumption : per hour gallons : Cool- : In : ing : fuel : Total : : : : : med. :	Temp. : Deg. F. : Cool- : ing : Air : med. :	: Barometer : Inches of : Mercury :
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OPERATING MAXIMUM LOAD TEST. ONE HOUR

23.11 : 1200 : 2.221 : 10.41 : 0.652 : 0.000 : 0.000 : 0.000 : 207 : 81 : 28.530

RATED LOAD TEST. ONE HOUR

22.16 : 1200 : 2.112 : 10.49 : 0.646 : 0.000 : 0.000 : 0.000 : 207 : 81 : 28.540

\*VARYING LOAD TEST. TWO HOURS

<u>22.29</u>	<u>1198</u>	<u>2.150</u>	<u>10.37</u>	<u>0.654</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>208</u>	<u>81</u>	
<u>1.40</u>	<u>1336</u>	<u>0.951</u>	<u>1.47</u>	<u>4.607</u>	<u>0</u>			<u>208</u>	<u>82</u>	
<u>11.90</u>	<u>1308</u>	<u>1.496</u>	<u>7.95</u>	<u>0.852</u>				<u>207</u>	<u>82</u>	
<u>22.97</u>	<u>1169</u>	<u>2.195</u>	<u>10.46</u>	<u>0.648</u>				<u>207</u>	<u>80</u>	
<u>6.07</u>	<u>1331</u>	<u>1.181</u>	<u>5.14</u>	<u>1.320</u>				<u>208</u>	<u>82</u>	
<u>17.30</u>	<u>1246</u>	<u>1.757</u>	<u>9.85</u>	<u>0.688</u>				<u>207</u>	<u>80</u>	
<u>13.66</u>	<u>1264</u>	<u>1.622</u>	<u>8.42</u>	<u>0.805</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>207</u>	<u>81</u>	<u>28.505</u>

\*20 minute runs. Last line is average for two hours.

D R A W B A R H O R S E P O W E R T E S T S

H. P.	: Draw : : Bar : : pull : : pounds :	Speed miles : per : hour :	Crank : shaft : speed : R.P.M. :	Slip : on : drive : wheels :	Fuel Consumption Gal. : hr. : per : per : H. P. : per : hour : gal. : hour :	Water: used : Gal. : ing : med. :	Temp. : : : Cool- : ing : med. :	: Barometer : Inches of : Mercury :
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RATED LOAD TEST. TEN HOURS. 2nd Gear,

12.61 : 1524 : 3.10 : 1203 : 2.67 : 1.906 : 6.62 : 0.025 : 0.013 : 206 : 67 : 28.835

MAXIMUM LOAD TEST

<u>15.38</u>	<u>2334</u>	<u>2.47</u>	<u>1200</u>	<u>8.32</u>	<u>Not Recorded</u>			<u>205</u>	<u>78</u>	<u>28.520</u>
<u>15.39</u>	<u>1924</u>	<u>3.00</u>	<u>1202</u>	<u>5.82</u>	"	"	"	<u>205</u>	<u>85</u>	<u>28.455</u>
<u>14.54</u>	<u>1539</u>	<u>3.54</u>	<u>1199</u>	<u>3.00</u>	"	"	"	<u>206</u>	<u>82</u>	<u>28.455</u>
<u>13.43</u>	<u>1213</u>	<u>4.15</u>	<u>1199</u>	<u>4.74</u>	"	"	"	<u>206</u>	<u>81</u>	<u>28.490</u>

UNIVERSITY OF NEBRASKA - AGRICULTURAL ENGINEERING DEPARTMENT  
AGRICULTURAL COLLEGE, LINCOLN

Copy of Report of Official Tractor Test No. 221

BRIEF SPECIFICATIONS

MOTOR: Make OWN Serial No. FA 832 Type 4cyl. vertical  
Head I Mounting lengthwise  
Bore and stroke: 3 3/4" x 5" in. Rated R.P.M. 1200  
Port Dia. Valves: Inlet 1.4375 Exhaust 1.4375  
Belt pulley: Diam. 14" in. Face 6 1/2 in. R.P.M. 654  
Magneto: OWN Model E 4 A  
Carburetor: Zenith Model K 5 Size 1 1/4"  
Governor: OWN No. — Type centrifugal  
Air Cleaner: OWN Type oil washed wire filter  
Lubrication: Circulating splash  
CHASSIS: Type 4 wheel - 2 drivers Serial No. FA 832 Drive enclosed gear  
Clutch: OWN Type single plate, dry operated by foot  
Advertised speeds, miles per hour: Low 1st 2 1/4 2nd 2 3/4  
Intermediate 3rd 3 1/4 High 3 3/4 Reverse 2 3/4  
Drive wheels: Diameter 40" Face 6"  
Lugs: Type spade No. per wheel 12 Size 4" high x 3 1/2" face  
Extension rims: Width 6" 12 Size 4" high x 3 1/2" face  
Seat Pressed steel  
Total weight as tested (with operator) 4545 pounds.

FUEL AND OIL:

Fuel: Kerosene Weight per gallon 6.78  
Oil: S.A.E. #30  
Total oil to motor 3.261 ?  
Total drained from motor 3.889 ?  
Total time motor was operated 46 hrs.

The oil was drained to the middle cock and refilled to the top cock after approximately each 10 hours of operation.  
All of the oil was drained at the end of the test.



UNIVERSITY OF NEBRASKA AGRICULTURAL ENGINEERING DEPARTMENT  
AGRICULTURAL COLLEGE, LINCOLN

Copy of Report of Official Tractor Test No. 221

REPAIRS AND ADJUSTMENTS

*No repairs or adjustments.*

REMARKS

The tests herein reported were conducted with one carburetor setting which remained unchanged throughout the tests. This condition should be recognized when comparing this test with any Nebraska test conducted prior to 1928.

*Wheel and lug equip as on page 2 of this report.*

In the advertising literature submitted with the specifications and application for test of this tractor we find \_\_\_\_\_ claims and statements which, in our opinion, are unreasonable or excessive.

The results of this test indicate that the rating of this tractor does not exceed the provisions of the tractor rating code of the American Society of Agricultural Engineers and the Society of Automotive Engineers.

We, the undersigned, certify that above is a true and correct report of official tractor test No. \_\_\_\_\_.

\_\_\_\_\_  
Engineer-in-Charge

*E. B. Brackett*  
\_\_\_\_\_  
*C. W. Smith*  
\_\_\_\_\_  
*E. B. Lewis*  
\_\_\_\_\_  
Board of Tractor Test Engineers

THE UNIVERSITY OF NEBRASKA  
AGRICULTURAL ENGINEERING DEPARTMENT  
COLLEGE OF AGRICULTURE, LINCOLN

Record of Official Tractor Brake Horsepower Test

Load (rated or other).....A.S.A.E. Maximum..... Date April 9, 1934..... Test No. 221b  
Name, model and rating of tractor..... McCormick-Deering Farmall "F-20"  
..... Serial No. Engine..... FA832..... Serial No. Chassis..... FA832  
Tractor equipment..... Own "E4A" Magneto..... Zenith "K5" carburetor  
Manufacturer..... International Harvester Company Chicago, Illinois.  
Tractor submitted for test by..... International Harvester Company of America  
Tractor operated by..... Adams..... Brake operated by..... Zink  
Brake used, Sprague. Brake arm 21 inches. Brake const. ( $\frac{2nA}{33000}$ ) =  $\frac{1}{3000}$   
Description of belt used..... 6" 4 ply Rubber  
Size of engine pulley (circumference at crown)..... 2.6331..... ft.  
Size of brake pulley (circumference at crown)..... 3.732..... ft.  
Kind of fuel used..... Kerosene..... Fuel test No..... Wt. per gal., lbs. 6.78  
Kind and grade of oil used in engine..... Mobiloil A S.A.E. No. 30  
Kind and grade of oil used in transmission..... Transmission Oil "FW" S.A.E. No. 90  
Humidity..... per cent. Barometric pressure..... 23.490..... inches mercury  
Temperature of atmosphere..... 76..... ° F.  
Fuel consumption:  
Total for test, gals..... 5.083..... Gals. per hour..... 2.541  
Lbs. per H. P. hour..... 0.712..... H. P. hours per gal..... 9.52  
Carburetor adjustments (degrees open)..... High Speed Needle 1 1/8 Turns  
..... Low Speed Needle 1 1/2 Turns  
.....  
Water consumption:  
Total in radiator during test, gals..... 0.00  
Total in fuel mixture during test, gals..... 0.00  
Total used during test, gals..... 0.00

We, the undersigned, certify that this sheet and the log sheet attached hereto give a true and correct record of official tractor test No. 221b

Charles Adams Operator..... Observer  
..... Operator..... Observer  
..... Carlton Zink Engineer-in-charge



# Log of Official Tractor Brake Horse Power Test No. 221b

April 9, 1934

Reading No.	Time	Engine Crankshaft Speed		Engine Belt Pulley Speed		Brake Speed		Belt Slipage % of Column (7)	Net Brake Load Pounds (12)	B.H.P. (13)	Fuel		Water Used		Temperatures	
		Counter Reading (3)	R.P.M. (4)	Counter Reading (5)	R.P.M. (6)	Surface Speed Ft. per Min. (7)	R.P.M. (9)	Surface Speed Ft. per Min. (10)			Scale Reading Pounds (14)	Amount Used Pounds (15)	In Radiator Pounds (16)	In Fuel Mixture Pounds (17)	*Cooling Fluid Deg. F. (18)	Atmosphere Deg. F. (19)
**Observer				0369			1460									
1	8:30			1024	655		2375	915	78.2		124.86				207	77
2	:40			1679	655		3288	913	78.5		121.98	2.88			207	76
3	:50			2339	660		4208	920	78.5		119.10	2.88			207	76
4	9:00			2995	656	2497	5124	916	78.8	0.68	116.20	2.80			207	77
5	:10			3648	653		6034	910	79.8		113.27	2.93			207	77
6	:20			4298	650		6941	907	79.8		110.46	2.81			207	77
7	:30			4951	653		7852	911	79.9		107.62	2.84			207	76
8	:40			5607	656		8766	914	79.9		104.78	2.84			207	77
9	:50			6263	656		9680	914	80.2		101.83	2.95	10'-15" #		207	75
10	10:00			6910	647		10582	902	80.2		99.02	2.81	9'-45" #		207	75
11	10:10			7560	650		1439	907	80.3		96.13	2.84			207	75
12	10:20			8214	654		2400	911	80.4		93.32	2.86			207	75
13	10:30			8863	654		3311	911	80.4		90.40	2.92			207	75
Total			1200		8499			1135	1034.9			34.46	0.00	0.00	2691	988
Average					654	2499		912	79.6	24.20					207	76

\* Taken in discharge line from engine.  
 \*\* Each observer will place his initials at the head of each column in which he records his observations.

Remarks # Readings were taken after time had overrun by amount shown in column 16 in minutes and seconds

Idle Adj. 1 1/2 Turn open 24.20 x 1.066 = 25.80 Corrected H.P. 28.465 at 8:20 AM  
 100% High speed Adj. = 1 1/3 Turns 25.80 x 0.85 = 21.93 Rated H.P. 28.490 at 9:07 "  
 22.920 ---- = 1.0502 Fuel in Lbs. / Gal. = 6.78 28.525 at 10:36 2  
 28.490 lbs./B. H.P. Hr. = 0.712 Use 28.490

-536... = 1.03077  
 520 1.03077 = 1.0152  
 1.0152 x 10502 = 1.066 Correction  
 Total Gals. used = 5.083

THE UNIVERSITY OF NEBRASKA  
AGRICULTURAL ENGINEERING DEPARTMENT  
COLLEGE OF AGRICULTURE, LINCOLN

Record of Official Tractor Brake Horsepower Test

Load (rated or other).....**Operating Maximum**..... Date..... **April 9, 1934**..... Test No..... **221c**.....  
Name, model and rating of tractor..... **McCormick-Deering Farmall "F-20"**.....  
.....Serial No. Engine..... **FA832**..... Serial No. Chassis..... **FA832**.....  
Tractor equipment..... **Own "E4A" Magneto Zenith "k5" Carburetor**.....  
Manufacturer ..... **International Harvester Company Chicago, Illinois**.....  
Tractor submitted for test by..... **International Harvester Company of America**.....  
Tractor operated by..... **Adams**..... Brake operated by..... **Zink**.....  
Brake used, Sprague. Brake arm 21 inches. Brake const. ( $\frac{2nA}{33000}$ ) =  $\frac{1}{3000}$   
Description of belt used..... **6" 4 ply Rubber**.....  
Size of engine pulley (circumference at crown) ..... **2.6331** ..... ft.  
Size of brake pulley (circumference at crown) ..... **3.732** ..... ft.  
Kind of fuel used..... **Kerosene**..... Fuel test No..... Wt. per gal., lbs..... **6.79**.....  
Kind and grade of oil used in engine..... **Mobiloil A S.A.E. No. 30**.....  
Kind and grade of oil used in transmission..... **Transmission Oil "EW" S.A.E. No. 90**.....  
Humidity.....per cent. Barometric pressure..... **29.530** ..... inches mercury  
Temperature of atmosphere..... **81** ..... ° F.  
Fuel consumption:  
Total for test, gals..... **2.221** ..... Gals. per hour ..... **2.221** .....  
Lbs. per H. P. hour..... **0.652** ..... H. P. hours per gal..... **10.41** .....  
Carburetor adjustments (degrees open)..... **High speed needle 7/8 turns**.....  
..... **Low speed needle 1 1/2 turns**.....  
.....  
Water consumption:  
Total in radiator during test, gals..... **0.00** .....  
Total in fuel mixture during test, gals..... **0.00** .....  
Total used during test, gals..... **0.00** .....

We, the undersigned, certify that this sheet and the log sheet attached hereto give a true and correct record of official tractor test No..... **221c**.....

*Charles Adams*..... Operator ..... Observer  
..... Operator ..... Observer  
..... *Carlton Zink* .....  
Engineer-in-charge

# Log of Official Tractor Brake Horse Power Test No. 2219

April 9, 1934

Reading No.	(1)	Time (2)	EngineCrankShaftSpeed		Engine Belt Pulley Speed		Brake Speed			Belt Slipage % of Column (7)	Net Brake Load Pounds (12)	B. H. P. (13)	Fuel		Water Used		Temperatures		
			Counter Reading (3)	R. P. M. (4)	Counter Reading (5)	R. P. M. (6)	Surface Speed Ft. per Min. (7)	Counter Reading (8)	R. P. M. (9)				Surface Speed Ft. per Min. (10)	(11)	(12)	(13)	Scale Reading Pounds (14)	Amount Used Pounds (15)	In Radiator Pounds (16)
**Observer					1488														
1		12:40			2137	649		7867	905		76.3		157.85				207		80
2		:50			2796	659		8785	918		76.0		155.37	2.48			207		80
3		1:00			3448	652		9694	909		76.0		152.70	2.67			207		81
4		:10			4103	655		0605	911		76.1		150.24	2.36			207		81
5		:20			48 57	654		1516	911		76.0		147.82	2.42			207		81
6		:30			5415	658		2431	915		76.3		145.26	2.56			207		82
7		:40			6066	651		3326	905		76.3		142.79	2.47			207		82
8																			
9																			
10																			
11																			
12																			
13																			
Total						4578			6374		533.0			15.06	0.00	0.00	0.00	1449	567
Average				1200		654	2489		911	2466	0.92	76.1	23.11				207		81

\* Taken in discharge line from engine.  
 \*\* Each observer will place his initials at the head of each column in which he records his observations.

Remarks Operating Maximum using Low speed needle 1 1/2 turns

High speed needle 7/8 turns

Fuel 6.78 lbs./ Gal.

Lbs./B.H.P. Hr. = 0.652

Gal./Hr. = 2.221

H.P. Hrs./Gal. = 10.41

Barometer

28.525 at 1:10 P.M.

28.540 at 1:40 "

Used 28.540

THE UNIVERSITY OF NEBRASKA  
AGRICULTURAL ENGINEERING DEPARTMENT  
COLLEGE OF AGRICULTURE, LINCOLN

Record of Official Tractor Brake Horsepower Test

Load (rated or other)....Rated.....Date.....April 9, 1934..... Test No....221d.....  
Name, model and rating of tractor....McCormick-Deering Farmall "F-20".....  
.....Serial No. Engine.....FA832..... Serial No. Chassis....FA832.....  
Tractor equipment....Own "E4A" Magneto..... Zenith "K5" Carburetor.....  
Manufacturer ...International Harvester Company..... Chicago, Illinois.....  
Tractor submitted for test by.....International Harvester Company of America.....  
Tractor operated by.....Adams..... Brake operated by.....Zink.....  
Brake used, Sprague.                      Brake arm 21 inches.                      Brake const. ( $\frac{2nA}{33000}$ ) =  $\frac{1}{3000}$   
Description of belt used.....6" 4 ply Rubber.....  
Size of engine pulley (circumference at crown) .....2.6331..... ft.  
Size of brake pulley (circumference at crown) .....3.732..... ft.  
Kind of fuel used.....Kerosene..... Fuel test No..... Wt. per gal., lbs..6.73.....  
Kind and grade of oil used in engine.....Mobiloil A..... S.A.E. No. 30.....  
Kind and grade of oil used in transmission.....Transmission Oil "FW" S.A.E. NO. 90.....  
Humidity.....per cent.      Barometric pressure.....26.540..... inches mercury  
Temperature of atmosphere.....81..... ° F.

Fuel consumption:

Total for test, gals.....2.112..... Gals. per hour .....2.112.....  
Lbs. per H. P. hour.....0.646..... H. P. hours per gal.....10.49.....  
Carburetor adjustments (degrees open).....High Speed Needle 7/8 Turns.....  
.....Low Speed Needle 1 1/2 Turns.....

Water consumption:

Total in radiator during test, gals.....0.00.....  
Total in fuel mixture during test, gals.....0.00.....  
Total used during test, gals.....0.00.....

We, the undersigned, certify that this sheet and the log sheet attached hereto give a true and correct record of official tractor test No. ....221d.....

Charles Adams..... Operator                      Carlton Zink..... Observer  
..... Operator                      Carlton Zink..... Observer

Engineer-in-charge



# Log of Official Tractor Brake Horse Power Test No. 221d.....

April 9, 1934

Reading No.	Time	Engine Crankshaft Speed		Engine Belt Pulley Speed		Brake Speed		Belt Slipage % of Column (7)	Net Brake Load Pounds (12)	B. H. P. (13)	Fuel		Water Used		Temperatures	
		Counter Reading (3)	R. P. M. (4)	Counter Reading (5)	R. P. M. (6)	Surface Speed Ft. per Min. (7)	Counter Reading (8)				R. P. M. (9)	Surface Speed Ft. per Min. (10)	Scale Reading Pounds (14)	Amount Used Pounds (15)	In Radiator Pounds (16)	In Fuel Mixture Pounds (17)
**Observer				6066			3336									
1	1:55			6718	652		4246	910		72.8	139.19				207	81
2	2:05			7372	654		5156	910		72.8	136.75	2.44			207	81
3	:15			8025	653		6066	910		72.7	134.45	2.30			207	82
4	:25			8678	653		6977	911		72.9	132.10	2.35			207	81
5	:35			9339	661		7898	921		72.4	129.73	2.37			207	81
6	:45			9994	655		8811	913		73.2	127.31	2.42			207	81
7	:55			0645	651		9719	908		73.6	124.87	2.44			207	82
8																
9																
10																
11																
12																
13																
Total			1200		4579	2439		6883	510.4			14.32	0.00	0.00	1449	569
Average					654	2439		912	0.80	22.16					207	81

\* Taken in discharge line from engine.  
 \*\* Each observer will place his initials at the head of each column in which he records his observations.

Remarks Using Op. Max. Carburetor Setting

High Speed Adj. 7/8 Turns

Low Speed Adj. 1 1/2 Turns

Fuel

6.78 Lbs./Gal.

Lbs./B.H.P. Hr. = 0.646

Gals./Hr. = 2.112

H.P. Hrs./Gal. = 10.49

Barometer

28.540 at 2:00 P.M.

28.540 at 2:55 "

THE UNIVERSITY OF NEBRASKA  
AGRICULTURAL ENGINEERING DEPARTMENT  
COLLEGE OF AGRICULTURE, LINCOLN

Record of Official Tractor Brake Horsepower Test

221e

Load (rated or other)....Varying..... Date....April 9, 1934..... Test No....221e.....  
Name, model and rating of tractor.....McCormick-Deering Farmall "F-20".....  
.....Serial No. Engine.....FA832..... Serial No. Chassis.....FA832.....  
Tractor equipment.....Own "E4A" Magneto Zenith "K5" Carburetor.....  
Manufacturer ..International Harvester Company Chicago, Illinois......  
Tractor submitted for test by.....International Harvester Company of America.....  
Tractor operated by.....Adams..... Brake operated by.....Zink.....  
Brake used, Sprague. Brake arm 21 inches. Brake const. ( $\frac{2nA}{33000}$ ) =  $\frac{1}{3000}$   
Description of belt used.....6" 4 ply Rubber.....  
Size of engine pulley (circumference at crown) .....2.6331..... ft.  
Size of brake pulley (circumference at crown) .....3.732..... ft.  
Kind of fuel used.....Kerosene..... Fuel test No..... Wt. per gal., lbs....6.78.....  
Kind and grade of oil used in engine.....Mobiloil A S.A.E. No. 30.....  
Kind and grade of oil used in transmission.....Transmission Oil "T" S.A.E. No. 90.....  
Humidity.....per cent. Barometric pressure.....29.505.....inches mercury  
Temperature of atmosphere.....81..... ° F.  
Fuel consumption:  
Total for test, gals.....3.243..... Gals. per hour .....1.622.....  
Lbs. per H. P. hour.....0.895..... H. P. hours per gal....8.42.....  
Carburetor adjustments (degrees open).....High Speed Needle 7/8 Turns.....  
.....Low Speed Needle 1 1/2 Turns.....  
.....  
Water consumption:  
Total in radiator during test, gals.....0.00.....  
Total in fuel mixture during test, gals.....0.00.....  
Total used during test, gals.....0.00.....

We, the undersigned, certify that this sheet and the log sheet attached hereto give a true and correct record of official tractor test No. 221e

Charles Adams Operator  
.....Operator

Carlton Zink Observer  
.....Observer

Carlton Zink  
Engineer-in-charge



# Log of Official Tractor Brake Horse Power Test No. 2216.....

April 9, 1934

Reading No.	(1)	Time (2)	Engine Crankshaft Speed		Engine Belt Pulley Speed		Brake Speed		Belt Slipage % (11)	Net Brake Load Pounds (12)	B. H. P. (13)	Fuel		*Water Used		Temperatures	
			Counter Reading (3)	R. P. M. (4)	Counter Reading (5)	R. P. M. (6)	Surface Speed Ft. per Min. (7)	Counter Reading (8)				R. P. M. (9)	Surface Speed Ft. per Min. (10)	Scale Reading Pounds (14)	Amount Used Pounds (15)	Fuel Cal./Hr. lbs./Hr. (16)	Fuel Cal./Hr. lbs./Hr. (17)
**Observer																	
1		2:35			9339							7898			14.590	2.150	
Rated 2		:45			9994	655		813		73.2		127.31	2.42				207
3		:55			0645	651		908		73.6		124.87	2.44	0.654	10.37		207
Total 4						1306		1821		146.8			4.86				414
Ave 5			1198			653	2485	911	2466	0.76	22.29		2.43				207
6		3:05			1370	725		1017		41		123.68	0.99	6.45	0.951		208
No Load		:15			2100	730		1026		4.1		122.72	1.16	4.607	1.47		207
Total 8						1455		2043		8.2			2.15				414
Ave 9			1336			728	2771	1022	2767	0.14	1.40						207
10		3:25			2813	713		997		35.4		121.00	1.72	10.14	1.496		207
1/2 Load		:35			3525	712		997		35.9		119.34	1.66	0.852	7.95		207
Total 12						1425		1994		71.6			3.83				414
Ave 12			1308			713	2714	997	2699	0.55	11.90						207
Total																	
Average																	

\* Taken in discharge line from engine.  
\*\* Each observer will place his initials at the head of each column in which he records his observations.

Remarks

# Log of Official Tractor Brake Horse Power Test No. 2219

April 9, 1934

Reading No.	Time	EngineCrankShaftSpeed		Engine Belt Pulley Speed		Brake Speed		Belt Slippage % of Column (7)	Net Brake Load Pounds (12)	B. H. P. (13)	Fuel		Water Used		Temperatures		
		Counter Reading (3)	R. P. M. (4)	Counter Reading (5)	R. P. M. (6)	Surface Speed Ft. per Min. (7)	Counter Reading (8)				R. P. M. (9)	Surface Speed Ft. per Min. (10)	Scale Readings Pounds (14)	Amount Used Pounds (15)	In Pounds (16)	In Pounds (17)	*Cooling Fluid Deg. F. (18)
**Observer																	
1	3:45			4170			4646				116.92						
Gov. Max.	:55			4807	635		5530	894			77.7	2.50	14.88	2.195	207	80	
3	4:05			5444	639		6422	892			77.5	2.46	0.648	10.46	207	79	
Total					1274			1776			155.2	4.96			414	159	
Avg.			1169		637	2424		888	2404	0.83	77.6	22.97			207	80	
6	4:15			6169	725		7439	1017			18.0	1.29	8.01	1.181	208	83	
1/4Load	:25			6894	725		8455	1016			17.8	1.38	1.320	5.14	208	80	
Total					1450			2033			35.8	2.67			416	163	
Ave.			1331		725	2759		1017	2753	0.24	17.9	6.07			208	82	
10	4:35			7572	678		9404	949			54.8	1.99	11.91	1.757	207	80	
3/4 Load	:45			8251	679		9353	949			54.5	1.98	0.663	9.85	207	79	
Total					1357			1898			119.3	3.97			414	159	
Ave.			1246		679	2534		949	2569	0.58	54.7	17.30			207	80	
13				7588	8267			11565	2610	0.46	526.9	31.93	21.99		2487	971	
Total					699	2622		964	2610	0.46	43.9	13.66			207	81	
Average			1264														

\* Taken in discharge line from engine.  
 \*\* Each observer will place his initials at the head of each column in which he records his observations.

Remarks # Dropped the 3:35 to 3:45 Max. period on account of belt slippage

Total fuel used 3.243 Gals.

Friction H.P. = 21.1 lbs. at 919 rev/min = 6.46 H.P.

Lbs./Hr. = 10.995

Compression at 1200 rev./min.

Lbs./B.H.P. Hr. = 0.805

Cyl. No. Lbs.

Barometer

Gal./Hr. = 1.622

28.505 at 4:12 P.M.

H.P. Hrs. / Gal = 8.42

28.505 at 3:35 "

77

77

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THE UNIVERSITY OF NEBRASKA  
AGRICULTURAL ENGINEERING DEPARTMENT  
COLLEGE OF AGRICULTURE, LINCOLN

Record of Official Tractor Drawbar Horsepower Test

Rated or maximum load.....~~Maximum~~.....Date.....April 10, 1934.....Test No.....221f...  
Name, model and rating of tractor.....McCormick-Deering Farmall "F-20".....  
Serial No. Engine.....FAB32.....Serial No. Chassis.....FAB32.....  
Manufacturer.....International Harvester Company Chicago, Illinois.....  
Tractor submitted for test by.....International Harvester Company of America.....  
Tractor equipment.....Own "E4A" Magneto Zenith "K5" carburetor.....  
Style and dimension of lugs.....Spade 4" high & 3 1/2" Face.....  
Circumference of drive wheels, at face.....10.472.....Point of lugs.....12.566.....  
Tractor operated by.....Adams.....Dynamometer car operated by.....Zink.....  
Dynamometer used.....Gulley.....Load used.....Loading Machine.....  
Kind of fuel.....Kerosene.....Test No.....W.t per gal.....6.78.....lbs.  
Kind and grade of oil used in engine.....Mobiloil S.A.E. No. 30.....  
Kind and grade of oil used in transmission.....Transmission Oil "FW" S.A.E. No. 90.....  
Humidity.....per cent. Barometric pressure.....23.410.....inches.  
Temperature of atmosphere.....84.....Temperature of engine.....208.....  
Weather conditions.....Fair.....  
Condition of track.....Good.....

Fuel Consumption: **Not Recorded**

Total for test, gal.....Gals. per hour.....

Pounds per H. P. hour.....H. P. hours per gal.....

Water Consumption: **Not Recorded**

Total used in test, gal.....Gal. per hour.....

We, the undersigned, certify that this and attached sheets hereto give a true and correct record of the official tractor test No. 221f.....

Charles Adams.....Operator.....Observer.

.....Operator.....Observer.

Gulley Zink  
Engineer-in-charge

Log of Official Tractor Drawbar Horse Power Test No. 221f.....

Date.....April 10, 1934.

**NOTE:** Record all stops by the word "Stop" and "Start" in column 1, record time and give full data.

• Taken in discharge line from engine.

\*\*\* Engine R. P. M. =                      Gear Ratio x Column (a) =

Column (3)

\*\*\* Each Observer will write his initials at the head of each column in which he records his observations.

THE UNIVERSITY OF NEBRASKA  
AGRICULTURAL ENGINEERING DEPARTMENT  
COLLEGE OF AGRICULTURE, LINCOLN

Record of Official Tractor Drawbar Horsepower Test

Rated or maximum load.....Op. Maximum.....Date April 10, 1934.....Test No. 221g.....  
Name, model and rating of tractor.....McCormick-Deering Farmall "F-20".....  
Serial No. Engine.....FA832.....Serial No. Chassis.....FA832.....  
Manufacturer.....International Harvester Company.....Chicago, Illinois.....  
Tractor submitted for test by.....International Harvester Company of America.....  
Tractor equipment.....Own "E4A" Magneto.....Zenith "K5" Carburetor.....  
Style and dimension of lugs.....Spade 4" High & 3 1/2" Face.....  
Circumference of drive wheels, at face.....10.472.....Point of lugs.....12.566.....  
Tractor operated by.....Adams.....Dynamometer car operated by.....Zink.....  
Dynamometer used.....Gulley.....Load used.....Loading Machine.....  
Kind of fuel.....Kerosene.....Test No.....W.t per gal.....6.78.....lbs.....  
Kind and grade of oil used in engine.....Mobiloil S.A.E. No. 30.....  
Kind and grade of oil used in transmission.....Transmission Oil "FW" S.A.E. NO. 30.....  
Humidity.....per cent.....1st. 28.520.....2nd. 28.455.....3rd. 28.455.....4th. 28.490.....  
Temperature of atmosphere.....1st. 85.....2nd. 85.....3rd. 82.....4th. 81.....Barometric pressure.....inches.....1st. 205.....2nd. 205.....3rd. 206.....4th. 206.....  
Weather conditions.....Fair.....  
Condition of track.....Good.....  
Fuel Consumption: Not Recorded

Total for test, gal.....Gals. per hour.....

Pounds per H. P. hour.....H. P. hours per gal.....

Water Consumption: Not Recorded

Total used in test, gal.....Gal. per hour.....

We, the undersigned, certify that this and attached sheets hereto give a true and correct record of the official tractor test No. 221g.....

Charles Adams Operator.....Observer.....

.....Operator.....Observer.....

Engineer-in-charge



# INTERNATIONAL HARVESTER COMPANY

INCORPORATED

606 SOUTH MICHIGAN AVENUE  
CHICAGO, U S A

ADDRESS CORRESPONDENCE TO  
ENGINEERING DEPARTMENT

April 30, 1934

## MEMORANDUM

### F-20 FARMALL TRACTOR University of Nebraska Test

Permission is given to strike out from the specifications accompanying the request for test of the F-20 Farmall Tractor submitted by the International Harvester Company, <sup>OF AMERICA</sup> for test by the Nebraska Board, reference to Low Pressure Pneumatic Tires and Wheels in the special equipment offered.

This is in view of the decision by the International Harvester Company <sup>OF AMERICA</sup> not to conduct a test on this tractor on rubber tires.

INTERNATIONAL HARVESTER COMPANY  
OF AMERICA

BY \_\_\_\_\_

LBS:FMB

*Original signed by  
McCaffrey.*





**THE UNIVERSITY OF NEBRASKA**  
**DEPARTMENT OF AGRICULTURAL ENGINEERING**

Log of Official Tractor Drawbar Horse Power Test No. **221h** .....

Date.....**April 16, 1934**.....

Chart and Reading No.	Time (2)	Stop Watch in 400 ft. minutes (3)	Engine Crankshaft R. P. M. (4)	Drive Wheel Slippage				Speed			Average Draft Pounds (15)	Drawbar Horsepower (16)	Temperature Degrees F.		Fuel Used Pounds (19)	Water Used Pounds (20)
				Left Wheel	Right Wheel	Av. Rev. Columns 6 and 8	Distance Traveled (Feet) (10)	Distance Measured on Ground (Feet) (11)	Slippage % Columns 10 and 11	Feet per Minute (13)	Miles per Hour (14)		Cooling Fluid (17)	Atmosphere (18)		
***Observer	<b>7:43</b>	<b>Start Test</b>		Counter Reading 400 ft. (5)	Counter Reading 400 ft. (6)											
				<b>3150</b>	<b>6678</b>											
<b>1S</b>	<b>9:00</b>	<b>1.8025</b>		<b>3577</b>	<b>42.7</b>	<b>42.8</b>	<b>42.75</b>						<b>209</b>	<b>53</b>		
<b>1N</b>	<b>9:05</b>	<b>1.8100</b>		<b>3999</b>	<b>42.2</b>	<b>43.9</b>	<b>43.05</b>			<b>276.8</b>	<b>3.15</b>	<b>1574</b>	<b>13.20</b>	<b>53</b>		
<b>2S</b>	<b>10:20</b>	<b>1.8000</b>		<b>4421</b>	<b>42.7</b>	<b>42.6</b>	<b>42.65</b>						<b>205</b>	<b>52</b>		
<b>2N</b>	<b>10:25</b>	<b>1.7875</b>		<b>5273</b>	<b>42.5</b>	<b>42.3</b>	<b>42.40</b>			<b>278.7</b>	<b>3.17</b>	<b>1479</b>	<b>12.49</b>	<b>57</b>		
<b>3S</b>	<b>10:43</b>	<b>1.8200</b>		<b>5699</b>	<b>42.6</b>	<b>42.6</b>	<b>42.60</b>						<b>206</b>	<b>62</b>		
<b>3N</b>	<b>10:48</b>	<b>1.8150</b>		<b>6126</b>	<b>42.7</b>	<b>42.3</b>	<b>42.50</b>			<b>275.1</b>	<b>3.13</b>	<b>1559</b>	<b>13.00</b>	<b>62</b>		
<b>4S</b>	<b>11:47</b>	<b>1.8075</b>		<b>6549</b>	<b>42.3</b>	<b>42.5</b>	<b>42.40</b>						<b>205</b>	<b>68</b>		
<b>4N</b>	<b>11:52</b>	<b>1.8125</b>		<b>6975</b>	<b>42.6</b>	<b>42.5</b>	<b>42.55</b>			<b>276.2</b>	<b>3.14</b>	<b>1479</b>	<b>12.38</b>	<b>68</b>		
<b>Stop</b>	<b>12:18</b>	<b>Stopped for fuel in tractor and loading machine and change tire</b>														
<b>5S</b>	<b>1:01</b>	<b>1.8375</b>		<b>7400</b>	<b>42.5</b>	<b>42.7</b>	<b>42.60</b>						<b>207</b>	<b>74</b>		
<b>5N</b>	<b>1:06</b>	<b>1.8425</b>		<b>7828</b>	<b>42.8</b>	<b>42.7</b>	<b>42.75</b>			<b>271.7</b>	<b>3.09</b>	<b>1616</b>	<b>13.31</b>	<b>74</b>		
<b>6S</b>	<b>2:12</b>	<b>1.8375</b>		<b>8254</b>	<b>42.6</b>	<b>42.5</b>	<b>42.55</b>						<b>206</b>	<b>74</b>		
<b>6N</b>	<b>2:17</b>	<b>1.8300</b>		<b>8680</b>	<b>42.6</b>	<b>42.5</b>	<b>42.55</b>			<b>272.7</b>	<b>3.10</b>	<b>1360</b>	<b>11.24</b>	<b>74</b>		

Notes: Record all stops by the word "Stop" and "Start" in column 1, record time and give full data.

\* Taken in discharge line from engine.

\*\* Engine R. P. M. =  $\frac{\text{Column (3)}}{\text{Gear Ratio} \times \text{Column (a)}}$

\*\*\* Each Observer will write his initials at the head of each column in which he records his observations.

THE UNIVERSITY OF NEBRASKA  
AGRICULTURAL ENGINEERING DEPARTMENT  
COLLEGE OF AGRICULTURE, LINCOLN  
Record of Official Tractor Drawbar Horsepower Test

Rated or maximum load....Rated.....Date.....April 16, 1934..... Test No....221h.....  
Name, model and rating of tractor.....McCormick-Deering Farmall "F-20".....  
Serial No. Engine.....FA832.....Serial No. Chassis.....FA832.....  
Manufacturer .....International Harvester Company Chicago, Illinois.....  
Tractor submitted for test by.....International Harvester Company of America.....  
Tractor equipment.....Own "E4A" Magneto.....Zenith "A5" Carburetor.....  
Style and dimension of lugs.....Spade 4" High & 3 1/2" Face.....  
Circumference of drive wheels, at face.....10.472.....Point of lugs.....12.566.....  
Tractor operated by.....Adams.....Dynamometer car operated by.....Zink.....  
Dynamometer used.....Gulley.....Load used.....Loading Machine.....  
Kind of fuel.....Kerosene.....Test No.....W.t per gal.....6.78 lbs.  
Kind and grade of oil used in engine.....Mobiloil.....S.A.E. No. 30.....  
Kind and grade of oil used in transmission.....Transmission Oil "FW".....S.A.E. No. 90.....  
Humidity.....per cent. Barometric pressure.....28.835 inches.  
Temperature of atmosphere.....67.....Temperature of engine.....206.....  
Weather conditions.....Fair.....  
Condition of track.....Good.....  
Fuel Consumption:  
Total for test, gal.....19.056.....Gals. per hour.....1.9056.....  
Pounds per H. P. hour.....1.025.....H. P. hours per gal.....6.62.....

Water Consumption:

Total used in test, gal.....0.125.....Gal. per hour.....0.013.....

We, the undersigned, certify that this and attached sheets hereto give a true and correct record of the official tractor test No. ....221h.....

.....Charles Adams.....Operator. ....Observer.

.....Operator. ....Observer.

.....Butler Zink.....  
Engineer-in-charge

April 10, 1934

Log of Official Tractor Drawbar Horse Power Test No. 2218

**NOTE:** Record all stops by the word "Stop" and "Start" in column 1, record time and give full data.

**NOTE:** Record all stops by the word "S"  
Taken in discharge line from engine.

Engine R. P. M. =	Gear Ratio x Column (a)
1000	1.00
1200	1.20
1400	1.40
1600	1.60
1800	1.80
2000	2.00
2200	2.20
2400	2.40
2600	2.60
2800	2.80
3000	3.00
3200	3.20
3400	3.40
3600	3.60
3800	3.80
4000	4.00
4200	4.20
4400	4.40
4600	4.60
4800	4.80
5000	5.00
5200	5.20
5400	5.40
5600	5.60
5800	5.80
6000	6.00
6200	6.20
6400	6.40
6600	6.60
6800	6.80
7000	7.00
7200	7.20
7400	7.40
7600	7.60
7800	7.80
8000	8.00
8200	8.20
8400	8.40
8600	8.60
8800	8.80
9000	9.00
9200	9.20
9400	9.40
9600	9.60
9800	9.80
10000	10.00

Engine R. F. M. =

Column (3)
Each Observer will write his initials at the head of each column in which he records his observations.

**THE UNIVERSITY OF NEBRASKA**  
**DEPARTMENT OF AGRICULTURAL ENGINEERING**

Log of Official Tractor Drawbar Horse Power Test No. **2216**

Date **April 10, 1934**

Chart and Reading No.	Time (2)	Stop Watch in 400 ft. minutes (3)	Engine Crankshaft R. P. M. (4)	Drive Wheel Slippage				Speed			Average Draft Pounds (15)	Drawbar Horsepower (16)	Temperature Degrees F.		Fuel Used Pounds (19)	Water Used Pounds (20)
				Left Wheel Counter Reading (5)	Rev. in 400 ft. (6)	Right Wheel Counter Reading (7)	Rev. in 400 ft. (8)	A. Rev. Columns 6 and 8 (9)	Distance Traveled (Feet) (10)	Distance Measured on Ground (Feet) (11)	Slippage % Columns 10 and 11 (12)	Feet per Minute (13)	Miles per Hour (14)	Cooling Fluid (17)	Atmosphere (18)	
***Observer																
				<b>First Gear</b>												
2N	4:51	2.3200		1416 1870 3297	45.4	4921 5372 6780	45.1	45.25				215.5	2.45	206	78	Not Recorded
4N	5:22	2.2800		3751	45.4	7230	45.0	45.20				219.3	2.49	203	77	
Total		4.6000						90.45						409	155	
Ave.		2.3000	1200					45.23	545.4	500	8.32	217.4	2.47	205	78	
				<b>Second Gear</b>												
5S	2:40	1.8875		4801 5240	43.8	8334 8774	44.0	43.95				264.9	3.01	205	85	
5N	2:48	1.9000		5683	44.3	9213	43.9	44.10				263.2	2.99	205	85	
Total		3.7875						88.05						410	170	
Ave.		1.8938	1202					44.03	530.9	500	5.82	264.0	3.00	205	85	
				<b>Third Gear</b>												
1N	3:15	1.6025		6117 6554	43.7	9647 0081	43.4	43.55				312.0	3.55	206	82	
2N	3:24	1.6050		6991 7430	43.9	0515 0951	43.6	43.75				311.5	3.54	206	82	
Total		3.2075						87.30						412	164	
Ave.		1.6038	1190					43.65	526.3	500	5.00	311.8	3.54			

Notes: Record all stops by the word "Stop" and "Start" in column 1, record time and give full data.

\* Taken in discharge line from engine.

\*\* Engine R. P. M. =  $\frac{\text{Column (3)}}{\text{Gear Ratio} \times \text{Column (a)}}$

\*\*\* Each Observer will write his initials at the head of each column in which he records his observations.