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4-23-1957

## Test 613: Case 311 Gasoline

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, [tractortestlab@unl.edu](mailto:tractortestlab@unl.edu)

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Department of Agricultural Engineering  
Dates of test: April 15, 1957 to April 23, 1957  
Manufacturer: J. I. CASE COMPANY,  
RACINE, WISCONSIN  
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 613

CASE 311 GASOLINE

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury			
		Gal per hr	Hp-hr per gal	Lb per hp-hr	Cooling medium	Air wet bulb	Air dry bulb				
TEST B—100% MAXIMUM LOAD—TWO HOURS											
33.00	*	1750	3.012	10.96	0.556	169	58	69	28.947		
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR											
32.32		1750	2.749	11.76	0.518	169	58	69	28.950		
TEST D—RATED LOAD—ONE HOUR											
29.33		1750	2.573	11.40	0.535	161	57	67	28.950		
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)											
29.32		1750	2.575	11.39	0.535	160	56	65	.....		
1.43		1891	1.117	1.28	4.762	111	56	64	.....		
15.63		1860	1.861	8.40	0.726	138	56	64	.....		
31.26		1662	2.639	11.85	0.514	155	56	64	.....		
7.90		1875	1.442	5.48	1.113	132	56	65	.....		
22.98		1826	2.250	10.21	0.597	146	58	65	.....		
18.09		1810	1.981	9.13	0.667	140	56	64	28.950		
TEST L—OPERATING MAXIMUM TORQUE											
% of rated rpm (engine)		100	95	90	85	80	76	70	65	60	55
% of rated-speed torque		100	102	105	107	110	112	113	113	113	112

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury
					Gal per hr	Hp-hr per gal	Lb per hp-hr	Cool- ing med	Air wet bulb	Air dry bulb	
TEST H—RATED LOAD—TEN HOURS—3rd Gear											
23.40	1733	5.06	1748	3.46	2.323	10.07	0.605	160	64	74	28.606
TEST F—100% MAXIMUM LOAD											
29.29	2183	5.03	1756	4.39	3rd	gear . . . . .		168	65	75	28.745
TEST G—OPERATING MAXIMUM LOAD											
25.98	4186	2.33	1744	14.00	1st	gear (part throttle)		150	52	60	28.970
28.74	2878	3.74	1751	6.13	2nd	gear . . . . .		166	64	74	28.720
28.87	2159	5.01	1750	4.45	3rd	gear . . . . .		169	64	74	28.720
24.94	734	12.74	1749	1.57	4th	gear . . . . .		154	52	61	28.970
TEST J—Operating Maximum Load											
27.81	2123	4.91	1748	7.50	3rd	gear . . . . .		147	57	60	28.910
TEST K—OPERATING MAXIMUM LOAD											
25.80	2289	4.23	1753	13.13	3rd	gear (part throttle)		143	55	57	28.901

TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
<b>Rear wheels</b>			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	307 lb each	None	None
Added cast iron	679 lb each	None	None
<b>Rear tires</b>			
No. and size	Two 12-28	Two 12-28	Two 10-28
Ply	4	4	4
Air Pressure	14 lb	14 lb	12 lb
<b>Front wheels</b>			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	43 lb each	None	None
Added cast iron	188 lb each	None	None
<b>Front tires</b>			
No. and size	Two 5.50-16	Two 5.50-16	Two 5.50-16
Ply	4	4	4
Air pressure	28 lb	28 lb	28 lb
<b>Height of drawbar</b>	14½ inches	15 inches	12 inches
<b>Static weight</b>			
Rear end	4226 lb	2254 lb	2180 lb
Front end	1594 lb	1132 lb	1130 lb
<b>Total weight as tested with operator</b>	5995 lb	3561 lb	3485 lb

**FUEL, OIL, WATER and TIME** Fuel Gasoline Octane No. ASTM 82 Research 88 (rating taken from oil company's typical inspection data) Weight per gallon 6.094 lb Oil SAE 20-20W To motor 1.007 gal Drained from motor 0.960 gal Water used 0.064 gal Total time motor was operated 42½ hour.

**CHASSIS TYPE** Tricycle Serial No. 6075363 Tread width rear 48" to 88" front 6¼" and 11½" Wheel base 84¾" Hydraulic control system direct engine drive with throw out lever Advertised speeds mph first 2.68 second 3.94 third 5.18 fourth 12.80 reverse 3.19 Belt pulley diam. 10¼" face 6" rpm 1190 Belt speed 3193 fpm Belt flat Length 57" Width 5" Thickness 0.210" Maximum slip 0.81% Clutch single plate dry disc operated by foot pedal Seat pressed steel cushioned by rubber in torsion Brakes double disc brakes operated by two foot pedals Equalized by locking pedals together Power take-off conventional type Steering power steering not available.

**ENGINE** Make Case Type 4 cylinder vertical Serial No. 110N00114 Crankshaft mounted lengthwise Head I Lubrication pressure Bore and stroke 3⅜" x 4⅞" Rated rpm 1750 Compression ratio 7.1 to 1 Displacement 148 cu. in. Port diameter valves Inlet 1 3/16" Exhaust 1 3/32" Governor variable speed centrifugal Carburetor size ⅞" Ignition system battery Starting system 6 volt battery Air cleaner oil washed wire mesh Muffler was used Oil filter none Cooling medium temperature control thermostat.

**REPAIRS AND ADJUSTMENTS** No repairs or adjustments.

**REMARKS** All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with carburetor set for 100% maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, J, K and L were made with an operating setting of the carburetor (selected by the manufacturer) of 97.9% of maximum belt horsepower.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	30.92	34.40
2. Observed maximum horsepower (tests F and B)	29.29	33.00
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	23.19	29.24

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 613.

L. F. LARSEN  
Engineer-in-Charge

L. W. HURLBUT (Chairman)  
G. W. STEINBRUEGGE  
J. J. SULEK  
Board of Tractor  
Test Engineers

## EXPLANATION OF TEST REPORT

**TEST A:** The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissible include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

### BELT HORSEPOWER TESTS

**TEST B:** The throttle valve is wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

**TEST C:** For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors which have an altogether different fuel system.

**TEST D:** The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

### TEST E:

**Varying load** serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads, of 20 minutes each; rated load, no load,  $\frac{1}{2}$  rated load, maximum load at wide open throttle valve,  $\frac{1}{4}$  and  $\frac{3}{4}$  rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

**TEST L:** This torque test is run with wide open throttle. Loads are applied to reduce engine speed in approximately ten 5% increments. Rated speed equals 100%. The corresponding dynamometer torque is recorded as a per cent of torque at rated speed.

### DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instru-

ment in the test car. When rubber tires are used, all tests are made on the concrete test course. All crawler type tractors are tested on a dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

**TEST F:** A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

**TEST G:** Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

**TEST H:** Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

**TEST J:** The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

**TEST K:** Similar to test J except that the smallest tires and lightest wheels offered by the manufacturer are used.

