

For circulation to -
2. H.Q. members.

1. Director 2 72
2. Mr. G. B. Kyle 8 May 53
3. Mr. J. I. McKinnon 8/6/53.

H. Q. MACHINERY DEVELOPMENT COMMITTEE

File 323/17
516/5

REPORT NO. 21

on

THE USE OF LARGE DIAMETER WHEELS ON FOUR WHEELED TIMBER

TRAILERS

Origin

In Report No. 15 it was shown that on two wheeled trailers rolling resistance on soft ground could be materially reduced by increasing the diameter of the wheels and tyres. The experiment has now been taken a stage further to determine whether there is any advantage in using large wheels on four wheel trailers for loads up to 3 Tons.

These experiments with large diameter wheels refer only to special vehicles designed to negotiate extremely soft and uneven ground conditions with minimum damage to the surface. For heavier loads under relatively good conditions there is no object in using these large diameters.

Description

A special trailer was built for the Forestry Commission by Whitlock Bros. of Great Yeldham - Essex. The main features were four large diameter wheels taking large section tyres and the wheel tracks arranged so that the front and rear wheels followed different tracks. There were three alternative positions for the rear axle to make provision for experiments in variation of weight distribution between the front and rear axles. The platform was underslung to reduce the platform loading height and the front axle was outriggered on a beam to accommodate the steering. Photograph Nos. 1 and 2 attached to this report show the general appearance of the vehicle.

A detailed specification is given as an appendix to this report.

Observations

1. Rolling resistance figures were recorded on a soft clay ride on an uphill gradient of 4° . A two wheel trailer on 9 x 36 tyres was used for comparison and a load of 2 Tons was carried in each case.

The average rolling resistance figures taken at the same points on the course in each case were:-

4 wheel trailer - 2,440 lbs.

2 " " - 2,000 lbs.

2. Load distribution on the two axles was:-

With no load = front $12\frac{3}{4}$ cwts. rear $13\frac{3}{4}$ cwts.

With Payload of

2 Tons - $9\frac{1}{2}$ cwt. = " 16 " " 3 Tons.

At 3 Tons the rear tyres were carrying an overload.

The uneven distribution with the trailer loaded was due to the need to outrig the front axle to give room for the front wheels to steer. This uneven distribution of the load is almost certainly a contributing factor in the unfavourable rolling resistance figures noted at Observation 1. Of the three alternative rear axle positions only the rear one was used as in any other position, the proportion of the load on the rear axle would have been even greater.

3. The manoeuvrability of this trailer in narrow forest rides was difficult and reversing compared very unfavourably with the two wheel trailers.

4. As in the case of all four wheel trailers the ability to unhitch the tractor without supporting the trailer was a big advantage over the two wheeled type.

5. The ability of the trailer to negotiate obstacles such as drainage ditches was a great asset.

6. A Fordson half track tractor was able to haul this trailer under all the conditions found on this trial.
7. Whilst tractor type tyres were used during this trial in order to get the large tyre section of 11 inches on a 36 inch wheel it should be noted that the load carrying capacity of these tyres (6 ply) is 2,880 lbs compared with a capacity of 5,046 lbs for 9 x 36 (10 ply) implement tyres. (The 11 x 36 tractor tyre is not made in a higher ply rating than 6 ply). The results of this and other recent tests suggest that, although a larger section tyre does give an advantage on soft ground, the diameter is a greater factor. Consequently the 9 x 36 with its greater loading capacity appears to be the best compromise. The retail price of the 9 x 36 (10 ply) cover is £35. 15. 6, whilst that of the 11 x 36 (6 ply) tractor cover is £28. 14. 0.

Conclusions. The results of this and other trials with wheeled trailers on soft ground suggest that:-

- (a) For loads under 3 Tons the best solution is two wheeled trailers using wheels fitted with 9 x 36 (10 ply) implement tyres.
- (b) For loads of 3 Tons and over a four wheeled trailer is desirable. Whilst the advantages of large diameter wheels still apply they introduce a steering problem on the front. A suitable compromise appears to be the use of 9 x 36 wheels and tyres on the rear and the acceptance of a smaller diameter on the front.

Further Action A trailer on rubber track units is now on test and a report will be issued.

R. G. SHAW
Machinery Research Officer.

April, 1953.

Shades of
1939 discoveries!!

I should read
4-5 tons
instead of 3
tons.

6/5/53
B May 53

Appendix to Report No. 21

Specification of the Experimental Trailer
on four Large Wheels

Payload Capacity	-	3 Tons
Overall Width	-	7 ft. 6 ins.
" Length	-	17 ft. (including drawbar)
Tyre size (front)	-	11.25 x 28
" " (rear)	-	11. x 36
Height of Platform	-	2 ft. 4 ins.
Platform area	-	7 ft. 6 ins. x 5 ft. 3 ins.
Turning Circle Radius	-	16 ft. 6 ins.
Wheelbase	-	8 ft. 8 ins.
Track of front wheels	-	3 ft. 9½ ins.
" " rear "	-	6 ft. 7 ins.
Price (in prototype form)	-	£375.



The Four wheeled Whitlock trailer on large wheels and tyres.



The trailer carrying a load of 2 tons during the rolling resistance tests.