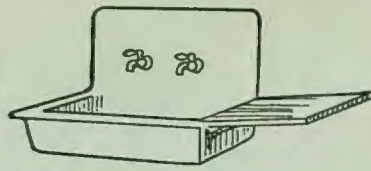
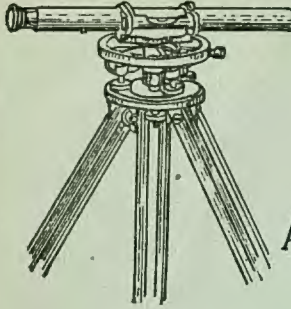


MN 2000 AENL 21



AGRICULTURAL ENGINEERING NEWS LETTER

AGRICULTURAL EXTENSION DIVISION
UNIVERSITY OF MINNESOTA

UNIVERSITY FARM, ST. PAUL, DECEMBER 15, 1933—No. 21

RUBBER TIRES ON FARM TRACTORS

J. B. TORRANCE

Recently the tractor public has had as a problem for thought and a subject of much conversation, the use of rubber tires on the farm tractor. The introduction of the low-pressure pneumatic tractor tire has been the cause of widespread interest. The advantages claimed by the advocates of these tires are better traction, greater possible speed, a wider range of operations, greater comfort for the operator and increased life of the tractor. From the numerous questions raised concerning this latest article of tractor equipment, three seem to stand out most prominently: Will these tires hold traction, how much do they cost, and how long will they last?

Lack of definite information as to the performance of tractors equipped with these tires as compared with those equipped with steel wheels and lugs has resulted in numerous investigations. The extent of these investigations has been limited as yet, primarily due to the lack of time. An examination of the conclusions drawn from the various studies and observations shows some striking similarities and seems to indicate that the claims of the advocates of these tires are not altogether without foundation.

Traction with Rubber Tires

The question of traction seems to have been the first of the many problems to be investigated. Tests were made in many places and under varied conditions. It was shown that a greater draw-bar pull is possible in low gear using steel wheels and spade lugs than with rubber equipped wheels. The limiting factor was the power of the engine while with rubber tires slippage was the controlling factor. However, when using higher speeds the rubber tires have the advantage. It is at these higher speeds that most of the ordinary farm operations are or may be conducted. Many tests indicate the loads drawn with steel wheels can be handled at the next higher speed when using rubber tires and in some cases a greater load may be drawn at the higher speed. It should be kept in mind in this connection that it is not always possible to utilize this added speed with our present day machinery equipment.

The matter of traction has always been a problem with the tractor manufacturer. Our first tractors obtained traction

through their great weight. The excessive weight limited the field of usefulness and resulted in the present day machines of greatly reduced weight. The reduced weight made necessary a study of wheel and lug equipment to hold traction and so use to best advantage the power of the engines. Because of the great variety of conditions under which our modern farm tractors are expected to operate no all-purpose wheel and lug equipment has yet been discovered. The advocates of this new low-pressure pneumatic tire are offering their product toward the solution of this problem.

Traction is secured through the large contact area made possible by the large cross section of the tire and the low pressure. It has been found that one size of tire will not handle all situations and several are available. A small cross section tire 9x36 is for use on the "General Purpose" tractor when the rows to be cultivated are close together. The more common size, 11.25x24, was used in most of the work under observation. Two larger sizes are also made, the 12.75x28 and the 13.50x24. These tires are built with six plies the better to withstand the flexing resulting from the low operating pressures of from ten to sixteen pounds. To assist in obtaining the added traction needed for some conditions, it has been found necessary to add weights to the wheels. The amounts and location of the weights depend upon the operating conditions. If, for instance, it is necessary to plow rather deeply and the tractor is leaning quite sharply, throwing more weight on the furrow wheel, it will be necessary to place a greater weight in the land wheel to prevent excessive slippage. Additional traction is secured as weights are added but this does not continue indefinitely, for beyond some point, as yet undetermined, additional weights have no effect.

Loss of traction in mud or other slippery conditions is experienced with tractors equipped with rubber tires in about the same way as with automobiles and trucks. For such conditions some chain or lug equipment will be necessary. In this connection the statement of a farmer who had purchased and was using low-pressure tires was rather significant. He claimed that he had been able to use his tractor in the field any time that ground was in condition to be worked.

Rolling Resistance Reduced

The percentage of total engine power available at the draw-bar has been greatly increased in the later tractors. This increase has been made possible by reducing the total tractor weight, the use of non-friction bearings and more efficient transmission systems. Now the new tires seem to have added their bit by reducing the rolling resistance of the tractor which results in a larger percentage of the engine power being made available at the draw-bar. This is no doubt the chief reason for the reduced fuel consumption when the rubber tires are used.

Life of Tires

The length of life of the tires is not known for the simple reason that they have not been on the market long enough. If mileage comparable with that obtained with automobile and truck tires is possible, the tractor tires would last for many years. The life of the rubber seems to be the factor determining the life of the tires rather than the miles traveled. Estimates of four years have been made by users of these tires. The conditions under which these tractor tires operate are so different from those of other tires that there is little upon which to base an estimate.

Usefulness of Tractor Increased

One of the problems of the modern tractor designer has been to build a machine which might be used profitably on the farm performing the greatest possible variety of draw-bar operations as well as doing the belt work. Rubber tires broaden the field of draw-bar work opening up possibilities of hauling in addition to the other common operations. Moving from field to field is made easier, especially where it is necessary to travel on or across surfaced roads. However, traveling across a row-crop field or over a rough meadow in haying operations sets up a rather uncomfortable condition for the driver. The comfort of the operator is increased in most all cases, the vibrations and shocks being largely absorbed by the tires. On dry, dusty fields much less dust is stirred up by the rubber tires. Several instances are known where the added comfort for the driver was the main factor influencing the purchase of the tires.