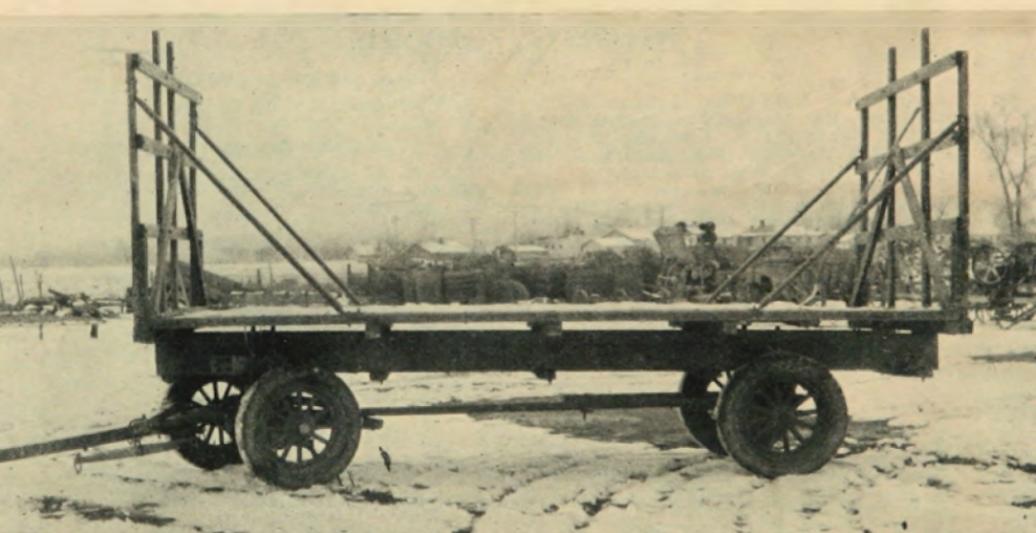


Improving the Farm Wagon

WILLIAM P. KINTZLEY AND DUDLEY P. CRAIG



Rubber-tired Wagon Equipped With Bed for Transporting Hay

Colorado State College
Colorado Experiment Station
Fort Collins

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Improving the Farm Wagon

WILLIAM P. KINTZLEY AND DUDLEY P. CRAIG*

Use of rubber tires on farm vehicles for road service is not new, but the practice of converting old farm wagons into rubber-tired wagons for use only on the farm is unusual. The purpose of this bulletin is to describe a method of low-cost improvement of the horse-drawn wagon for general farm use, with explanation of the simple construction necessary, to the end that this improvement may be used more extensively by Colorado farmers.

William P. Kintzley, farm manager for the Colorado Experiment Station at the Colorado State College of Agriculture and Mechanic Arts, made this change on six old wagons, the wooden, steel-rimmed wheels of which were in bad condition. The original purpose, therefore, was to replace the worn-out wheels and so lengthen the useful life of the wagon.

The first parts of farm wagons to become unserviceable are the wheels, the skeins, and the wearing parts of the axles. The automobile axles and wheels used as replacements under the plan described here should outwear several wagon frames under the low-speed conditions met in farm use. If the increased length of the useful life of the wagon and the decreased cost of maintenance were the only advantages realized, they alone would justify the slight expense required.

Advantages of Rubber Tires

However, other advantages of the rubber-tired wagon over the conventional wagon have become evident with use. The rubber tires being of small diameter as compared to wooden wheels, the box or

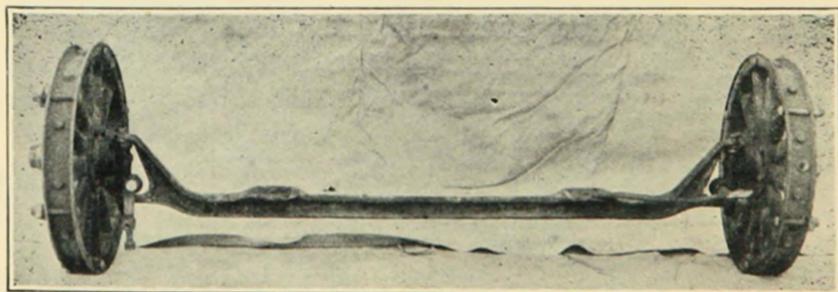


Figure 1.—Axle and wheels as purchased from second-hand dealer, with tie rod removed.

*Formerly in charge of Mechanical Engineering Section, Colorado Experiment Station; died March 1937.

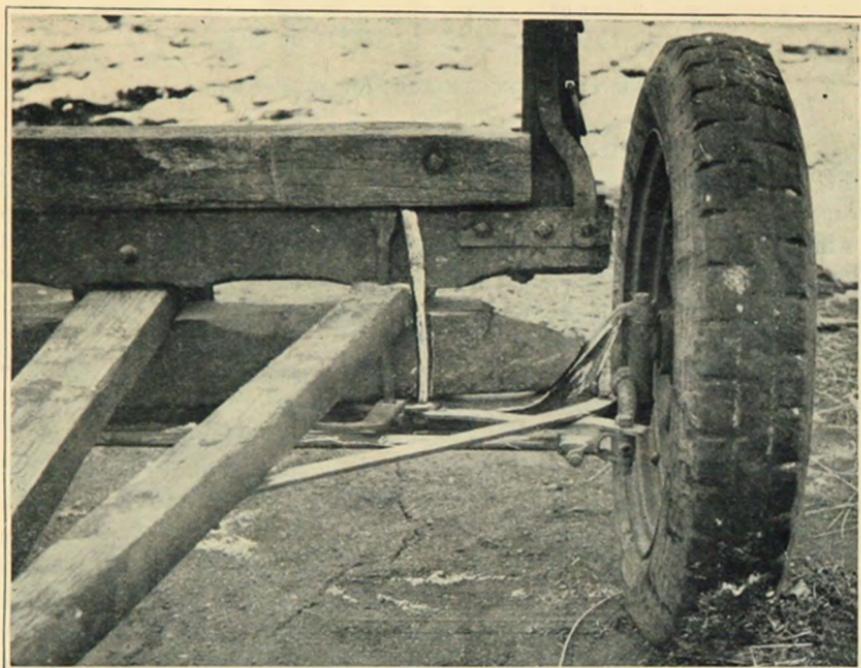


Figure 2.—Part of completed rear axle of wagon. Note extra U-bolt bolted to automobile axle, also strap from steering-rod knuckle to automobile axle, and strap from automobile axle to wagon hound. After construction of this first wagon at the College Farm, it was found more practical to dispense with the strap from the steering knuckle to the U-bolt and to cut the steering rod as described in the text of the bulletin.

rack bed is lowered, thus resulting in greater convenience in practically all farm use. The difference in draft is very greatly in favor of the rubber-tired wheels and can be appreciated fully when a comparison is made of the two types of wagon on the same haul. This advantage is emphasized in use on soft, muddy ground and in plowed fields.

Often alfalfa stands are damaged by hard tires cutting through the sod, sometimes to a depth of several inches. Rubber-tired wheels under the same load will leave only slight depressions, with no cutting of the sod. Over soft earth, the draft required by the original hard-tired wagon becomes excessively high, while the pull required by the rubber-tired wagon does not differ greatly from that required on a hard road. "Old Dobbin" certainly will appreciate the easy-pulling qualities of the rubber-tired wagon.

At times on the farm it is convenient to hitch the wagon to a motor car, rather than to use horses. Heavy loads can be transported about the farm in this manner without undue strain on the motor

car, whether it be a truck or a passenger car. It should be noted, however, that in some instances in Colorado members of the State Highway Courtesy Patrol have questioned whether such use of the wagon upon state highways does not place it in the trailer class, requiring a license. Although the state motor vehicle supervisor has held to the contrary, it may be well to have an understanding with traffic officers in the farmer's community before using the wagon upon highways.

Parts to Be Used

In transforming an old farm wagon to the rubber-tired type, it is necessary to provide two second-hand front axles with wheels, also tires and tubes to fit the wheels. Two U-bolts similar to those used to clamp the sand bolster and the main axle are required.

On the wagons changed over at the College Farm, second-hand front axles of several makes of trucks and passenger cars have been used. The axles must be of the type having two bearing surfaces and U-bolt holes for the original springs to which the wagon gear can be bolted. The holes in the bearing surfaces are so spaced that they accommodate the U-bolts without any change. The truck axle is preferable to the passenger-car axle if heavy loads are to be carried. This is because the truck wheel takes a truck tire that is more sturdily built than the passenger-car tire.

However, the passenger-car axles, wheels, and tires are satisfactory for ordinary loads, and since this type of axle is more common

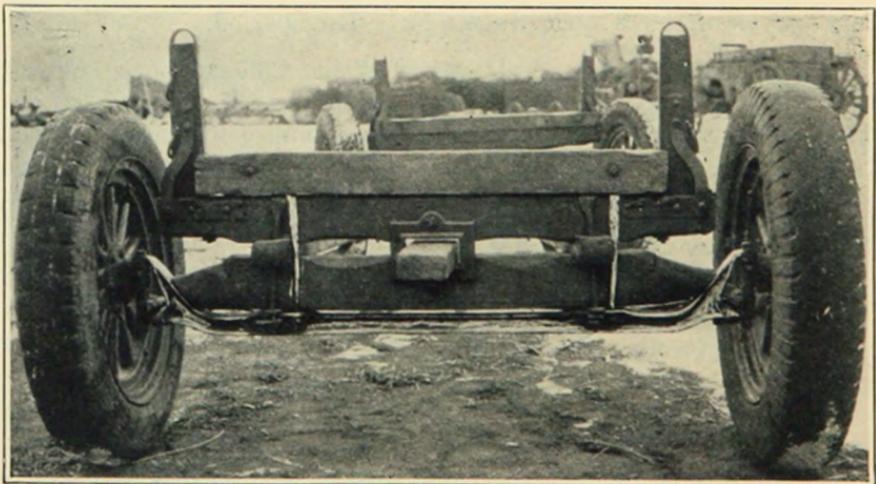


Figure 3.—Rear view of completed rear axle. Note two extra U-bolts which fasten wagon gear to automobile axle.

than the truck axle in automobile junk yards and second-hand shops, its price, as well as that of the necessary tires, will be less.

Automobile tire dealers have an almost unlimited supply of used tires that have been deemed unsafe for automobile use under the high-speed conditions of highways. Casings which have received considerable wear may give satisfactory service on farm wagons. Such tires can be bought at moderate prices. The casings used on wagons on the College Farm have been of the 6:00x20 or 5:50x20 sizes.

If a passenger-car axle is used, it must be selected with wheels to accommodate popular-sized tires. The rim should not exceed 20 inches in diameter, as the low-pressure tires with their greater surface area on the ground are better than the old type of high-pressure tires. The carrying capacity of a casing is controlled by the volume of air and not by the pressure.

There will be very little wear on tires due to actual service of the farm wagon. The deterioration of the rubber will occur mostly during periods when the wagon is not in use.

As an illustration of the slight wear to which tires are subjected in farm use, the following typical example may be considered: A wagon is used to move 100 tons of hay from stacks to feedlots, hauling 2 tons to a load for a distance of 2 miles, which is an excessive distance on most farms. This would mean 50 trips, a total of 100 miles under load. Considering this low mileage and the extremely low speed, the wear in a month of such service would be negligible in comparison with even a day's wear on such tires in ordinary motor-trucking service. Hence, even a badly worn tire will give satisfactory service under a farm wagon for a long period.

In changing over several wagons at the College Farm, the cost of the necessary parts has been approximately \$25 for each wagon. These parts included the axles, bolts, straps, and used tires and tubes. One progressive farmer of Larimer County, Colo., who changed a wagon to the rubber-tired type and is enthusiastic over its advantages, made the change at a cost of approximately \$15.

Making the Change

In transforming a worn-out farm wagon to the rubber-tired type, the axles to be used should be thoroughly cleaned. It is advisable to remove the wheels, pack them with grease, and replace them on the axles. Broken cotter pins should be replaced. The rod by which the steering knuckle is connected to the steering mechanism should be cut by means of a hack saw. The cut ends of this rod are flattened, and holes are drilled in them at correct locations to reach

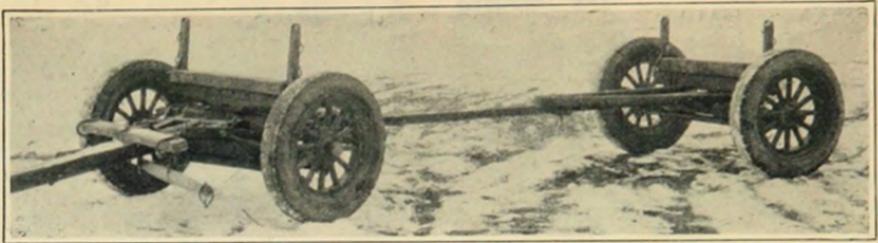


Figure 4.—Completed wagon with rack and bed removed.

the U-bolt clamp on the axle, tying the wheel in a permanent position. If the wheel alignment is not correct at the time of assembling the wagon, adjustment may be made by taking the rod ends from the U-bolt and screwing up the threads to the desired position.

The wagon wheels are removed and the metal guard (skein) of each is removed from the axle. Each end of the wagon axle is sawed at an angle to fit the automobile axle. Two U-bolts, one near each end, clamp the main wooden axle and the sand bolster to the automobile axle. For this construction see figures 2 and 3.

To strengthen the built-up axle gear, an iron strap is connected from the bearing surface of the automobile axle to the hound of the original wagon gear. Two straps are used on each axle, one from each end of the axle. The same construction is used on the rear axle. These straps stiffen the axle gear and keep the built-up axle in a vertical position. This construction is illustrated in figure 2.

Finally, the complete gear should be given a protective coat of paint.

The cover illustration and figure 4 show one of the wagons that has been transformed into a rubber-tired wagon under the supervision of Mr. Kintzley. It should be noted that no changes have been made other than those absolutely necessary to attach and properly support the two automobile axles. Further advantages could be gained by changing the rack to lower the bed of the wagon at least six inches. This would not interfere with the operation of the wagon.

Automobile springs should be omitted from the wagon. If they are used, high loads will easily tip over.