HORSE *V.* MOTOR TRANSPORTATION OF MATERIALS.

THE question of the advantage, financial and otherwise, of replacing horse-drawn vehicles with motor equipment for the haulage of materials and apparatus is one of frequent recurrence in contracting, manufacturing, and municipal utility organizations. Those who have in mind an investigation into the relative merits of the two methods of transportation will probably find the following tests and their analyses of considerable use and guidance, as the degree of correctness of the deductions from a study of the case is dependent upon the thoroughness of analysis of existing conditions. The specific case demonstrated below relates to the substitution of a 5-ton gasoline motor truck for three 2-horse-drawn vehicles for short hauls, and the method of determining the economic considerations involved is as cited by Henry F. W. Arnold in a recent article appearing in The Engineering Magazine. Before analyzing it, however, it should be remembered that in order to obtain reliable data upon which to base a comparison of the results obtained from the use of automobile truck equipment versus horse-drawn vehicles it is always desirable, and generally feasible, to have the dealer demonstrate the ability of his truck to perform the work in question. Even when a predilection exists in favor of some special make of truck it is well to encourage a demonstration of several makes, in order that a careful comparison may be made of different trucks under actual working conditions.

The case is a manufacturing plant whose product consists of light and heavy machinery, the latter predominating. Although the plant is located on a trunk-line railroad and has its own spur loading tracks, it requires the services of three two-horse trucks to haul machines and material to and from the freight-houses and to make the necessary local deliveries. The management desired to know if the three horse-drawn trucks could be supplanted by one automobile truck and what advantages would accrue financially, or otherwise, if the change was made.

A careful analysis of the existing conditions, considered from all angles, established the fact that a 5-ton gasoline truck would best meet the requirements of the service in question. Accordingly several demonstrations were arranged for.

During the demonstration a careful log was kept of the performance of the automobile trucks and all matters of interest noted. A corresponding log was also kept of the horse-drawn vehicles for the purpose of comparison. Tables I. and II. show summaries of two representative logs kept during the test at the above plant.

Table I.—Summary of Log of 5-Ton Gasoline Truck Demonstration.

Name of truck, ————. Weight, 10,800 pounds. Remarks, ————. Date, April 24, 1914. Weather, rain. Temperature, 50 F. Client, ————.

Total miles	18.00
Total tons material handled	49.49
Total ton-miles	73.66
Average miles per hour	6.27
Total gallons gasoline	6.30
Gallons gasoline per mile	0.35
Per cent. of time spent on road	27.5
Per cent. of time loading and unloading	72.5
Miles per gallon of gasoline	2.82
Gallons lubricating oil per 100 miles	0.50

Table II.—Summary of Log of Two-horse Truck Demonstration.

Name of truck, ————. Weight, 4,740 pounds. Remarks, ————. Date, April 28, 1914. Weather, fair. Temperature, 70 F. Client, ————.

Miles per hour	2.88
Per cent. of time on road	37.6
Per cent. of time loading and unloading	62.4
Total ton-miles	23.25
Total tons material handled	21.23
Total miles	9.95

From a comparison of the summaries of the two logs, we find that the motor truck has 73.66 ton-miles to its credit (a figure that can be taken as a fair average of the daily performance of the truck under normal conditions); while the corresponding figure for one horse-drawn truck, during practically the same amount of time, is 23.25 ton-miles. In the case of the three two-horse-drawn trucks this figure would be 69.75 ton-miles. These results indicate that from the standpoint of material handled one motor truck has a slight advantage over the three horse-drawn trucks. This conclusion was further borne out by the results obtained from other demonstrations.

In order to arrive at an understanding regarding the financial side of the question, a comparison of the initial investments, annual fixed charges, and operating costs is shown in Table III.

Table III.

	Motor Truck	3 Two-Horse Trucks
Initial investment	$4,800.00	$3,154.00
Fixed charges—		
Interest at 6 per cent.	288.00	183.24
Depreciation of motor truck at 10 per cent., exclusive of tires	480.00	
Depreciation of horse equipment: horses, 12½%; wagons, 10%; harness, 20%		358.50
Services of veterinary		60.00
Insurance and taxes	81.80	44.20
Total	$ 849.80	$ 645.94
Operating costs—		
Labor—operator and helper	$1,560.00	
3 drivers and 3 helpers		$3,980.00
Maintenance	312.00	378.00
Tires	360.00	
Gasoline	236.00	
Oil and grease	57.00	6.00
Feed, bedding and shoeing		876.00
Total	$2,525.00	$5,240.00
Total annual cost	$3,374.80	$5,885.94
Annual saving in favor of automobile truck	$2,511.14	

The figures denote a saving of $2,511.14 in the total annual cost of operation in favor of the motor truck; an annual saving that would more than pay the additional initial investment required for its purchase. This saving is largely made possible by the fact that, in the substitution of the motor truck for the horse-drawn equipment, two drivers and helpers will be dispensed with, resulting in an annual saving of $2,420 in labor alone. The data referring to the cost and maintenance of the horse-drawn vehicles are taken directly from the company's books and are therefore accurate. The initial investment for the