FACTORS INFLUENCING MOTOR TRUCK LOG HAULING COSTS

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LOG HAULING COSTS

Year by year log hauling by motor truck has steadily increased in importance in the Pacific Northwest. With its increased importance comes the complex problems of how to decrease costs. In many isolated operations, where truck hauling is the only means of transporting logs to market, a close control of costs means the difference between success and failure of the operation.

This paper will not attempt to set up a workable method of computing costs, but will try to bring forth the factors that directly influence hauling costs.

There are always four basic elements of cost: the first of which would be "fixed costs". These are normally figured over an operating period of 52 weeks per year, 5 days per week, and 10 hours per day. These costs include:

(a) Depreciation, figured on the cost of the truck and trailer less tires, with a salvage value of 6 percent and an 8 year life.

(b) Interest, figured at 5 percent on the cost of the truck and trailer with tires.

(c) Liability and Personal Property Damage Insurance, calculated on average fleet rates in areas of low density of population.

(d) Fire and Theft Insurance, figured on 80 percent of the average value of the unit throughout its life.

(e) <u>Collision Insurance</u>, based on $250.00 deductable on average value of truck less trailer at fleet rates.

Dependent costs are the second group, and they apply regardless of whether the truck is moving or standing idle due to delays in loading, unloading or tire failure. These costs include drivers wages, social security tax, unemployment compensation tax, industrial insurance, vacation allowance of two weeks per year and administration costs. The wages are figured with "time and one-half" for overtime.

Vehicle operating costs include fuel, lubrication and repairs. They occur only when the vehicle is moving on the road.

Tire costs are usually figured separately from vehicle operating costs, and take into consideration road types such as pavement, gravel and dirt.

The State of Washington has compiled a table governing cost of log hauling. The information used to make up this table was gathered from various trucking companys and truck operators throughout the state, and is constantly being revised to keep up with changing costs.

The system begins ~~begins~~ by applying what is known as a base charge to each thousand board feet of logs on the truck. At present this base charge is $1.65. In addition to this, there is a charge of 5 cents per thousand board feet for each log. These flat rate charges take care of fixed and dependent costs. The operating and tire costs are taken care of in the following manner.

The roads are broken up into six classifications: A, A-1, B, C, D, and E. While there are roads that do not fall into any one of these six catagorys, in most instances they will be found adequate. The types of roads are as follows:

Class A. Paved and macadamized, and grades not exceeding 6 percent.

Class A-1. Continuously maintained fine gravel, smooth surface, free from chuck holes, washboard, ruts and other hazards. Grades not exceeding 6 percent.

Class B. Graveled roads not exceeding grades of 12 percent; also paved, macadamiz~~es~~d, or permanently and continuously maintained fine gravel, smooth surface, free from chuck holes, ruts, washboard and other hazards, with grades exceeding 6 percent, but not exceeding 12 percent. Good plank road will be included in this.

Class C. All roads with grades exceeding 12 percent, but not exceeding 18 percent; also all dirt, rock or plank roads with grades not exceeding 18 percent.

Class D. All roads with grades exceeding 18 percent; also roads consisting of mud or water to a depth of 8 or more inches, or any road that cannot be negotiated by the truck under its own motive power.

This method of figuring truck costs is quite simple, but has resulted in very accurate estimates.

Many questions arise in connection with trucking costs such as: What effect will a 10 percent load increase or decrease have, or how much can be saved by road improvement that will cut travel time 5 or 10 percent? These, along with many other similar questions arise daily in trucking circles. Perhaps the following example will help to answer the load increase question.

Take a truck and trailer with a gross weight of 17,000 pounds using 10:00 X 20 tires, and increase the pay load from 4,000 to 5,000 board feet of logs. The cost increase will be approximately as follows:

1. 150% tire cost
2. 70% repairs and maintenance
3. 50% fuel and oil
4. 70% depreciation
6. 15% labor, social security and compensation
7. 15% license and insurance

As can be seen from the above figures, the costs do not increase in a straight line relationship, but are entirely disproportionate to the load. If it is the desire of the operator to increase log loads, then to maintain an economical operation, he must use trucks constructed to haul bigger loads.

With regards to speed, there are certain safe maximums that have been determined by road tests, and should be adhered to if the costs are to be kept to a minimum. The maximum speed at which a truck will travel, between the limits of power on an adverse grade and safety on a favorable grade, is usually determined by the ability of the tires to withstand such speed. At high speeds the tires will heat to such an extent that their life is greatly reduced. The general maximum speeds observed during field tests were 40 miles per hour for trucks up to 80,000 pounds gross vehicle weight, 35 miles per hour for trucks 80,000 to 114,000 pounds, and 30 miles per hour for trucks weighing over 114,000 pounds. The maintenance of these maximum speeds is of course entirely dependent on curvature, width of road and grade.

The time of travel of a logging truck while engaged in actively hauling logs is a very important item from a cost standpoint. Costs can be figured per thousand board feet, or on a per minute basis. The latter is usually used prior to computing the actual cost per thousand.

In considering the effect of road width and curvature on travel time, the following example has been set up. Take a loaded truck traveling on a double lane road that averages 6 curves per mile. The grade will not be considered in this. The time required to traverse this mile, taking into consideration three average radii curves, is as follows:

200 foot radii curves	2.4 minutes
100 foot radii curves	3.0 minutes
50 foot radii curves	3.4 minutes

It can be seen from this that there is an increase of 30 percent in travel time between the 200 foot and the 50 foot radii curves.

In the next example, use the same factors, but decrease the road width to 14 feet.

200 foot radii curves	3.2 minutes
100 foot radii curves	3.7 minutes
50 foot radii curves	4.0 minutes

This shows an approximate increase of 20 percent between the 200 foot and the 50 foot radius curve. It would seem from these figures that a decrease in speed necessary to negotiate the curves would be the reason for the marked change in travel time, but this is only partially true. The great reduction in sight distance due to road curvature results in a corresponding decrease in truck speed. Graphs number I an II will give a more complete picture for a variety of curve numbers and radii.

The next item to be considered is the effect of passing traffic on turnouts. On a single lane road, the number of turnouts has a direct bearing on the time of travel for an unloaded truck. The unloaded truck is the only one effected in this case, since the loaded truck always has the right-of-way on a logging road. In this example, assume that there are four loaded trucks per hour passing over this logging road. An unloaded truck would be effected in the following manner.

Turnout spacing	Percent increase in time
250 feet	1.2
500 feet	1.7
750 feet	2.3
1,000 feet	2.9

Graph number III will give a more complete picture of this

Probably the most important single factor effecting time of travel is grade. Many conservative operators limit grades on their primary and secondary roads to 3 percent adverse and 8 percent favorable, where others use 6 percent adverse and 12 percent favorable. Sometimes economies can be effected by resorting to steeper grades. It must be kept in mind however, that cost has a direct relationship with time of travel, so any reduction in speed due to grade means an increase in cost.

In computing the effect of grade on travel time, the first thing necessary is to find the ratio of horsepower times effeciency divided by the gross vehicle weight. This is found by the following formula.

$$\text{Ratio, B} = \frac{\text{Horsepower X Efficiency}}{\text{GVW(in 1,000 pounds)}}$$

The engine effeciency runs from approximately 74 percent at sea level to 61 percent at 6,000 feet. Taking, for example, a truck with 150 horsepower, operating at sea level, and with a gross vehicle weight of 60,000 pounds, the following travel time is observed over the different grades

Adverse grade	Minutes per mile
+2%	2.9
+4%	5.7
+6%	7.5
+8%	9.4
+10%	11.2

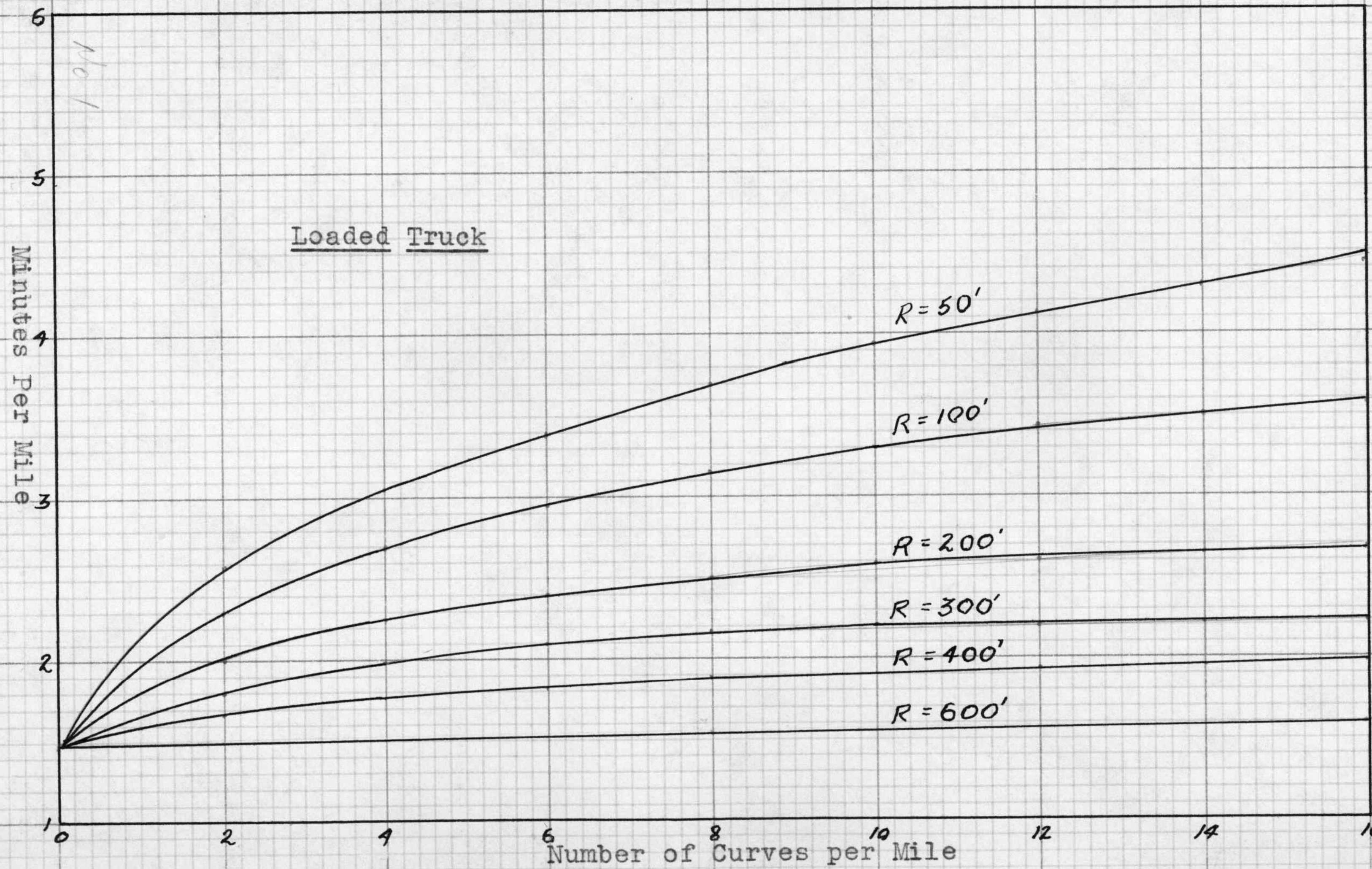
It can be seen from this that for every slight increase in grade there is a drastic reduction in speed. Some operators have claimed that adverse has increased their cost of repair and maintenance, but there seems to be very little evidence to support this.

Graph number IV will give travel times for vehicles ranging in weight from 50,000 to 207,000 pounds, and from 100 to 300 horsepower.

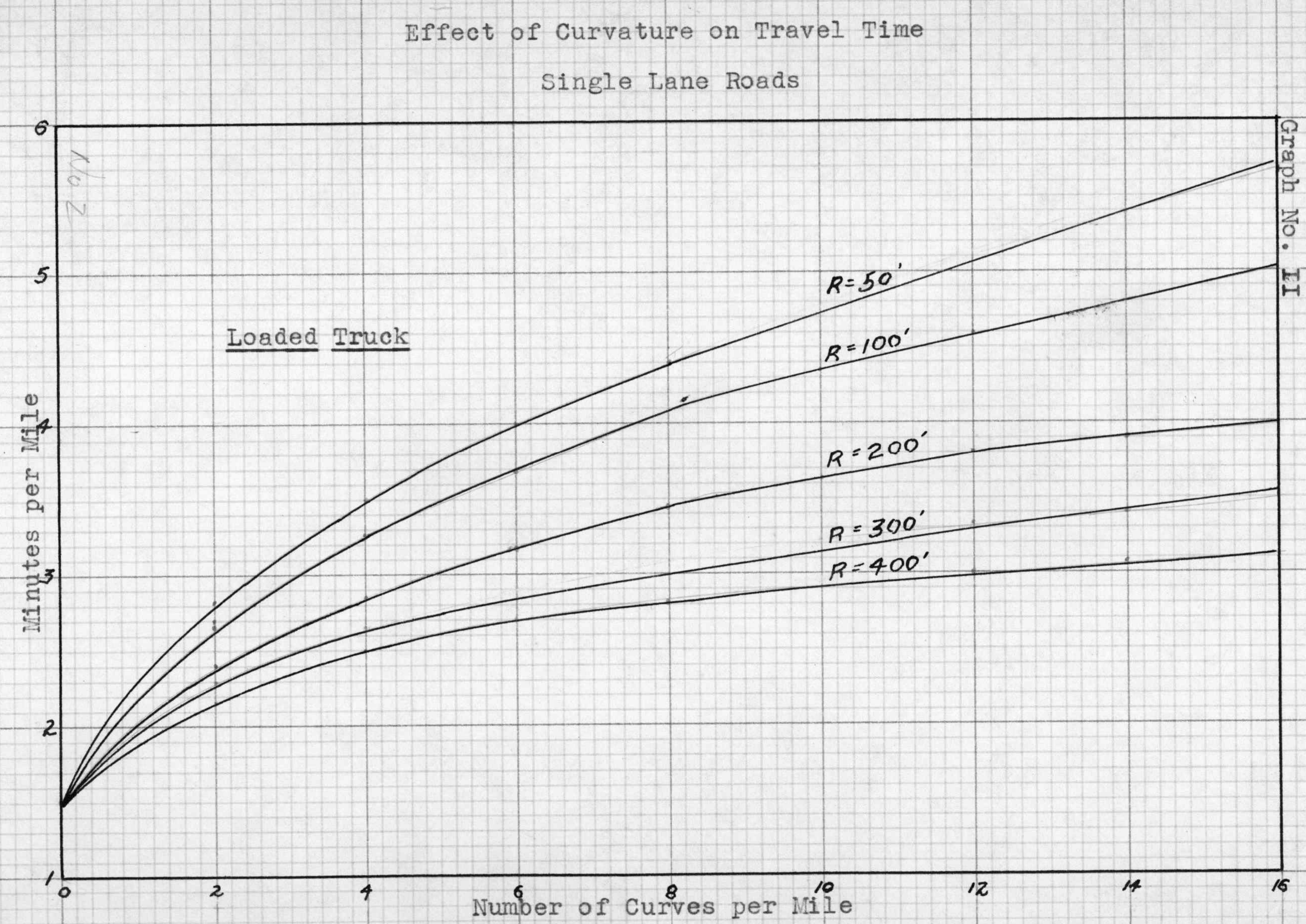
Although this report by no means covers all the points involved in log hauling costs, it does shed some light on the major factors to be considered. From this report it can be seen that it behooves the logging truck operator to make a complete study of his own individual situation, so that an accurate set of costs can be compiled.

Effect of Curvature on Travel Time

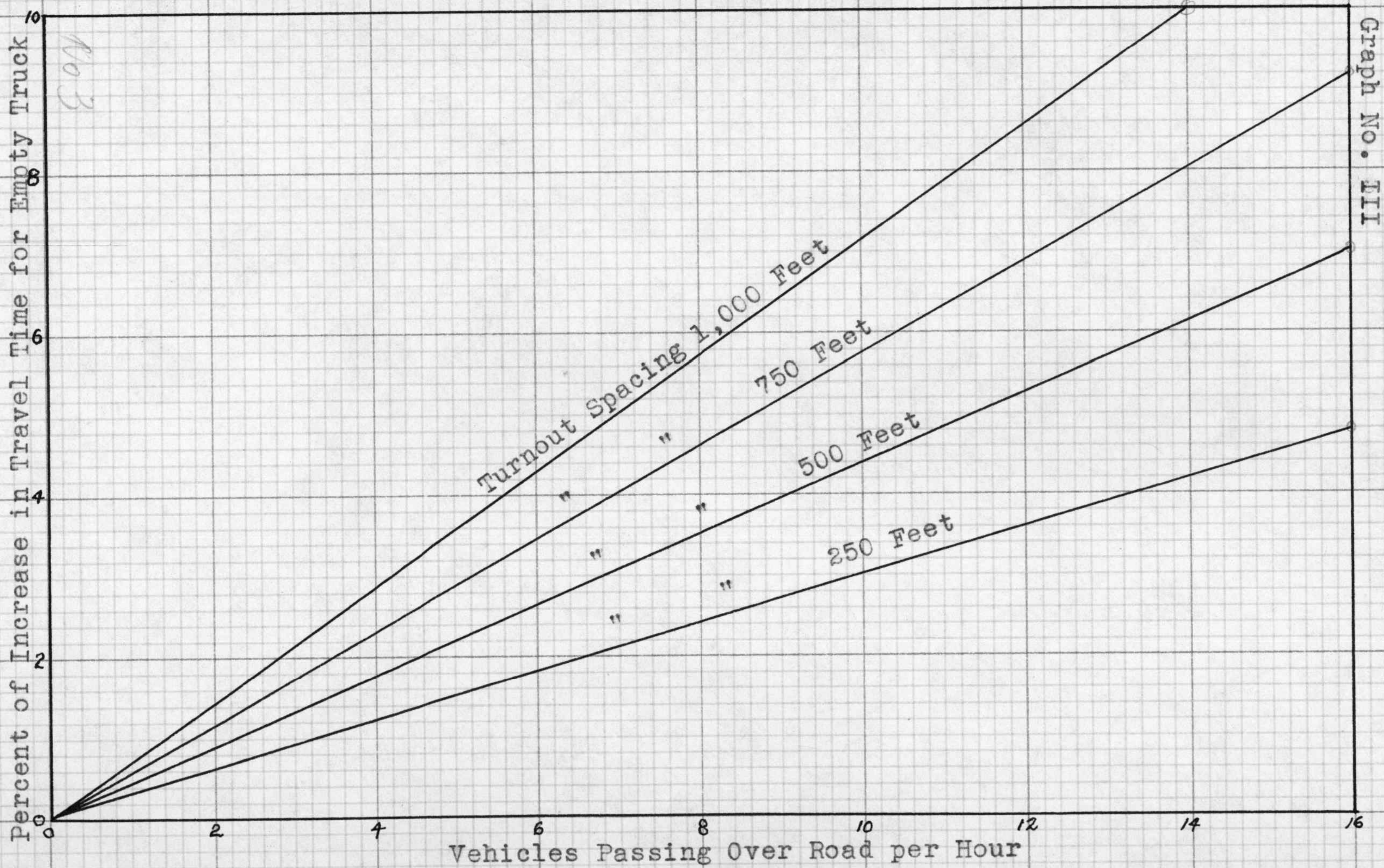
Double Lane Roads



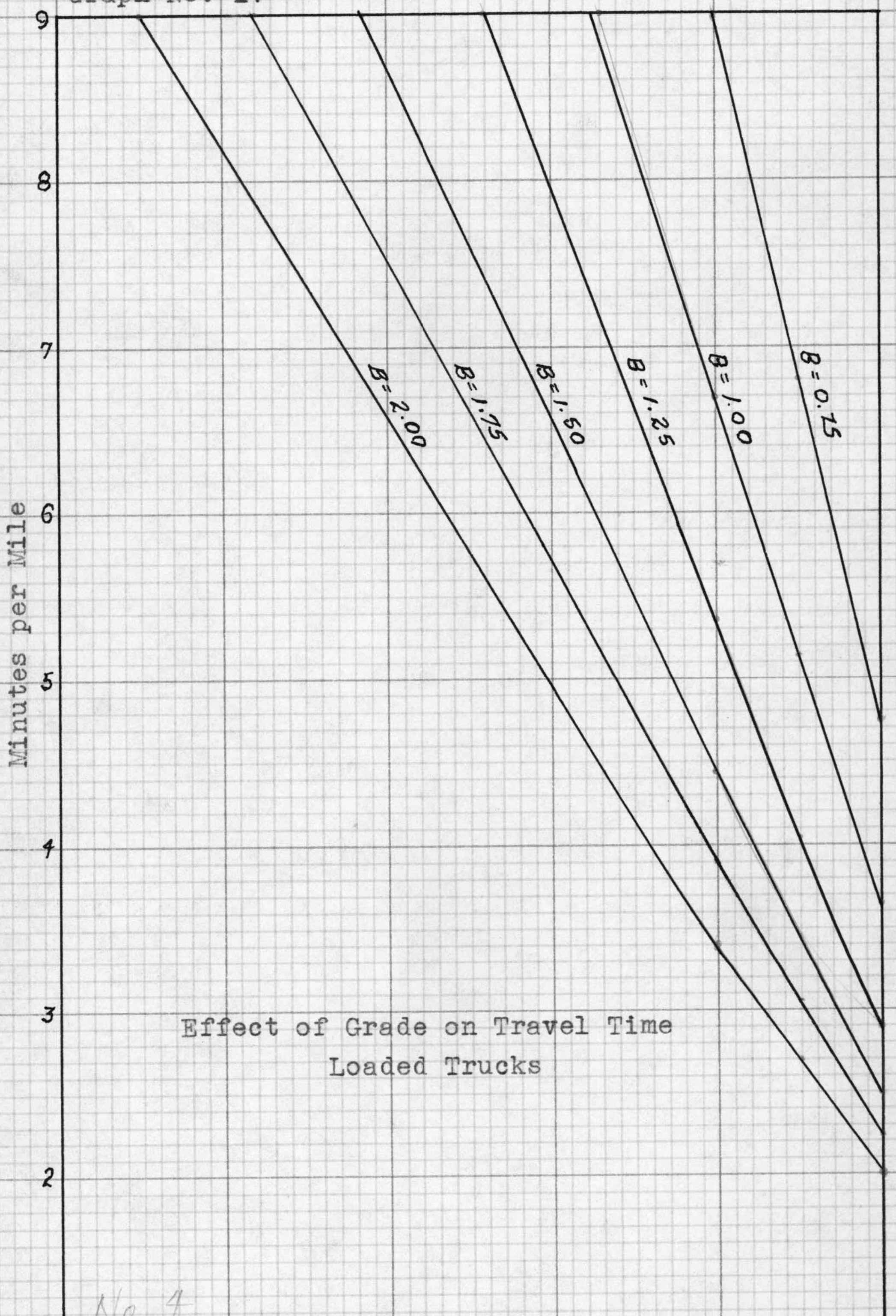
Graph No. I


Effect of Curvature on Travel Time
Single Lane Roads
Graph No. II
Loaded Truck
R=50'
R=100'
R=200'
R=300'
R=400'
Minutes per Mile
Number of Curves per Mile
1
2
3
4
5
6
0
2
4
6
8
10
12
14
16

Effect of Passing Traffic on Turnouts



Graph No. IV



Effect of Grade on Travel Time
Loaded Trucks

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