# GOOD ROADS AFFORD BEST IMPETUS FOR BUSINESS FROM STORE KEEPER TO THE BANKER

A popularized report of road tests made for the Good Roads Bureau of the California State Automobile Association by Professor J. B. Davidson, Division of Agricultural Engineering of the University of California.

The draft required to move a loaded wogan on different types of roads has, of course, been made the subject of repeated investigation, but so far as is known no determinations have been made with reference to the various types of road which are to be found in California under soil and weather conditions which here exist. It is common knowledge that cheap makeshift patchwork road building and maintenance are expensive, and in California, perhaps more than in any other place, the public conscience has awakened to the economic value of the good road. But, insofar as relates to the waste of power and the waste of money incident thereto, which result from hauling heavily loaded wagons or trucks day after day and year after year, over bad roads, no report is extant which attempts to picture, in popularized form, the economics inherent in the high-type, modern, hard highways as opposed to mud or dust or ruts.

In planning the tests herewith reported, the Good Roads Bureau of the California State Automobile Association considers itself extremely fortunate in having secured the interest and co-operation of Professor J. B. Davidson of the Agricultural Engineering Division of the University of California, his assistant, Mr. L. J. Fletcher, with Mr. Austin B. Fletcher, Engineer of the California Highway Commission and a national figure among road builders, Mr. C. H. Sweetser, District Engineer of the U. S. Office of Public Roads and Rural Engineering, and Mr. W. H. Lynch, Senior Highway Engineer, of the same office. The presence of these gentlemen and their interest and assistance in the tests made lend to the determinations recorded and herein published that dignity and authenticity without which a publication of this character is comparatively valueless.

An appliance of the recording and intergrating type known as the Iowa Dynamometer was use. This dynamometer was designed by Professor Davidson while on the staff of the Iowa State College, was patented by this institution as a novel and valuable type of recording instrument, and is believed by those in authority to be one of the most accurate instruments of the kind. It automatically measures the draft supplies a direct reading, and at the same time retains a graphic record made on a strip of paper drawn under a record pencil. The record so provided supplies an accuate check upon the reading made direct.

In order to insure absolute accuracy in these tests, the particular instrument employed was subjected to careful inspection in the Engineering Laboratory of the University of California at Berkeley before being utilized.

The tests were made at the University Farm of the University of California near Davis, Yolo County, and upon the State Highway in the vicinity and over various country roads and stretches of the State Highway in Sacramento County near Sacramento.

**Types of Road Tested.**

Earth road, dust 3-4 to 2 inches deep.

Earth road, stiff mud, firm underneath.

Gravel, compact, in good condition.

Gravel, loose, not packed.

Water-bound Macadam good condition.

Oil Macadam, new, good condition.

Concrete, 3-8 inch top, asphaltic oil and screenings.

Concrete, unsurfaced, smooth.

Concrete, 1 1-2 inch Topeka top.

Topeka top, 1 1-2 inch, on plank. Approach to causeway.

The various roads chosen for experiments fairly represent the roads of California under summer weather conditions, the readings made on the muddy earth road being made possible by an overflow from an irrigation ditch on the University Farm at Davis and merely intimating, rather than conclusively picturing the pull per ton necessary to move a loaded wagon over, or rather through, mud.

The tests were held uniformly with a load of 6,000 pounds gross which was made up of a standard farm wagon loaded with California rice in sacks. The motive power used in the tests at Davis was supplied by a fine team of draft horses weighing about 1600 pounds each, wagon and horses being the property of the University of California. In the tests made in the vicinity of Sacramento a standard two-ton truck, the property of the California Highway Commission, was used, through the courtesy of Mr. Austin Fletcher, Highway Engineer. So far as possible, all conditions were kept uniform except road surfaces, the same wagon, the same load, the same driver and the same horses being employed and practically the same speed being maintained in the horse-drawn tests, while the same man drove the truck when it was utilized as motive power, different speeds being recorded as set forth by Professor Davidson in his report.

Uniform weather conditions prevailed in all the tests made, each day being warm and bright with a maximum temperature which approximated 105 degrees, there being no wind that would affect the tests in any marked degree.

In reviewing the tests made, it is to be regretted that it was impossible to get a comprehensive series of readings over muddy roads, such as the average farming community is blessed with in winter, the "muddy road" tested being a mere hint of the hub-deep mud which wet weather brings.

In testing the pull necessary to move the load over the earth road the results arrived at upset the theory once expressed by the Governor of one of our States, who declared that "the good earth road" was easier to pull over than any other type of road. This contention did not prove up, for the tests made by Professor Davidson showed that the pull required was 3 1-3 times as great as over unsurfaced concrete and nearly twice as great as over concrete with the 3-8 inch skin top.

Comparison between the lowest pull recorded, that necessary to keep the three-ton load moving, after it was started, over the level, unsurfaced concrete road, which amounted to 83 pounds or 27.6 pounds per ton, and the pull through stiff mud, which was 654 pounds for the load, or 218 pounds per ton, furnishes ample food for thought. Over the concrete road the horses pulled together 83 pounds, each horse pulling only 41 1-2 pounds, while over the mud the team pull was 654 pounds and the pull on each horse was 327 pounds. The difference of 285 1-2 pounds pull for each horse, which is wasted energy, wasted as absolutely as if it never had existed; and this energy, wasted day in and day out, in the winter in every part of almost every state in the United States is what is meant when Bradstreet's Agency, with its fingers on the business pulse of the Nation, says: "Bank clearings (New York, Chicago or San Francisco) were affected by the usual seasonal conditions.

The "usual seasonal conditions" is mud. Mud makes business bad in the country store because the farmer cannot get to town either to buy or sell. Bad business in the country store makes bad business in the country bank, and bad business in the country bank finds immediate reflection in financial centers, where bank clearings fall off and the city merchant finds his business dull because the country merchant, two hundred miles away perhaps, has found his business dull on account of bad roads.

When forced to go to town through the usual "seasonal mud" the farmer can haul only one-eighth the weight, so our tests prove, that would be possible had he concrete roads to travel over such as our California Highway system supplies. His marketing costs are therefore increased eight times, this increased cost being passed along to the average ultimate consumer, whose good wife, engaged in stretching his salary to limits that no rubber band would stand, ponders on the high cost of living, makes one dollar do the work of two, performing miracles of finance, never realizing that she is affected even in the most remote degree by the "usual seasonal condition" which commercial agencies speak of as affecting "bank clearings."

Yet she is. Supply the farmer with a modern road that he can travel over every day in the year instead of when weather permits, that he can haul over with absolute economy instead of never-ending waste, and the resultant decrease in hauling costs, estimated by the United States Office of Public Roads and Rural Engineering as more than $200,000,000 every year which we pay out in tribute to bad roads, would enable that greatest of our institutions, the American wife and mother, to take a little additional comfort for herself, to give a better education to her children, to make the wages of the family's breadwinner go farther with something left over to tuck away in the savings bank for that rainy day.

In extension of the tests here pictured it is the plan of the Good Roads Bureau of the California State Automobile Association to make a series of tests of muddy roads, under usual "seasonal conditions" common in winter, that the high cost of mud may be made yet more plain. Professor Davidson has pledged co-operation in this plan and a supplimentary pamphlet will be published in due time.

To end this informal presentation of the matter without a tribute to Professor Davidson cannot be done. He gave freely of his time, devoted much thought to the subject and brought to bear that technical education and experience which places him among the leaders of his profession. His daily task as Professor of Agriculture Engineering of the University of California is to promote efficiency upon the farm, and he is the kind of a man who is influenced not only by a love of the subject, but also by a desire to serve and be of benefit.

His report, more or less technical, and illustrated by tables showing records made in the tests, speaks for itself and tells a story that the road building engineer cannot fail to understand.

**Report of Tests.**

Conducted for the purpose of demonstrating the influence of road surface on tractive resistance.

Made by the staff of Division of Agricultural Engineering, University of California, for the California State Automobile Association by J. B. Davidson, Professor of Agricultural Engineering, University of California.

Purpose of tests: To determine the tractive resistance of a standard farm wagon, when loaded, on various road surfaces. As far as possible all factors influencing the tractive resistance of a loaded wagon, except the road surface itself, were either eliminated or maintained constantly throughout the tests. Thus one wagon with the same load was used and was drawn by a team in all the tests reported here, except those on an oil macadam road, where a motor truck was used. The tests were made on June 13th and July 9th and 10th. The weather was bright and sunny in each case and the highest temperature for each day was about 105 degrees. The warm weather was the occasion for an increased tractive resistance on the oil roads over that for average temperatures.

The rate of travel was decided in each case and averaged 2.4 miles per hour for the team. On grades tests were made both up and down grade and the results averaged.

Equipment: Wagon, standard farm wagon with steel axles of equal length with wheels 28 and 46 inches in diameter and four-inch tires. Load, 6,000 pounds gross, consisting of rice in sacks. Team, two heavy draft horses, weighing about 1,600 pounds each. The load was drawn with a motor truck in the tests on oil macadam. Dynamometer. The dynamometer was of the integrating and recording type known as the Iowa. The force representing the tractive resistance of the loaded wagon acting through the instrument compresses a spring carefully calibrated to indicate the force acting. The average resistance over a uniform distance, measured automatically, is indicated directly by the instrument at the end of the run. A record of the resistance is also made on a strip of paper drawn under a recording pencil. This record so provided is used to check the average results furnished by the instrument. The tests were started after the load was in motion and moving at a uniform rate.

## AT MUNICIPAL HOME.

Because of the prevalence of influenza no visitors will be admitted at the Municipal Home at present, and no other persons unless first examined by the physician of the Home.


## Stomach Disorder

**Only Six Months To Live. Read What B. B. B. Did For Him.**

Mr. Hans Kehki, Magnolia, Alta., writes:—"Some years ago I became very sick from stomach disorder, which the doctor told me had started from drinking bad water. I tried local doctors, but, finding I got worse from day to day I went to a doctor in Edmonton. He told me that I must have an operation, and that if I didn't I couldn't live any longer than six months. I told him I had better die after six months than be cut to pieces. I did not have the operation, but returned home. No one was there to meet me at the station, because they did not know I was coming. I felt so bad I couldn't walk farther than 10 yards without resting. It took me 6 hours to walk 2 miles; the distance from the station to my home.

Some weeks later I read an advertisement about your Burdock Blood Bitters. After I had used one bottle I felt much better, and after I had used three bottles I was completely cured; therefore you see your B. B. B. has saved my life, and I cannot praise it too highly."

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## OBITUARY

**Mrs. W. L. Keith.**

Special to The Standard.

St. Stephen, N. B., Feb. 20.—The death occurred in Milltown, Maine, this afternoon, or Mrs. W. L. Keith, aged about 55 years. She was taken with a paralytic stroke last evening and passed away shortly after dinner today. She is survived by her husband, W. L. Keith, who is second overseer of the Canadian Cottons, Milltown; also three daughters, Mrs. Fred Barstow and Mrs. Franklin Eaton, of Calais, and Evelyn, at home; also one brother, Hudson Babb, postmaster at Milltown, Maine, and one sister in the States.