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THE NEWS LETTER
OF THE
BUREAU OF PUBLIC ROADS

VOL. 3, NO. 1 NOVEMBER, 1927 A. C. ROSE, EDITOR

CONTENTS

CHIEF OF BUREAU TO BE KNIGHTED BY KING OF NORWAY

In recognition of his services to the Norwegian Bureau of Public Roads, Mr. MacDonald has been offered appointment by the King of Norway as a Knight of the First Class of His Order of St. Olav.

Notification of the contemplated honor was received by Mr. MacDonald on November 10, through the Charge d' Affaires, ad interim, of the Royal Norwegian Legation, whose letter follows:

"My dear Mr. MacDonald:

"I have been instructed by my Government to inform you that it is the intention of His Majesty the King of Norway to appoint you a Knight of the First Class of His Order of St. Olav in recognition of services you have rendered the Norwegian Bureau of Public Roads, more especially services you have been good enough to render Mr. Baalsrud, the Director of Public Roads of Norway. I have the honor to inquire whether you are desirous of accepting this contemplated honor.

"I do not omit to inform you that I am fully aware that in your case Congress would probably have to give its consent before you are able to accept and wear a foreign decoration. I will, in case you are desirous of accepting this distinction, inquire of my Government whether it has any objection to depositing the insignia of the order with the State Department until such consent can be obtained.

"I am, my dear Mr. MacDonald,

Very sincerely yours,

(Signed) A. Lundh.
Charge d' Affaires a.i."

It is understood that the State Department will make the necessary arrangements for acceptance of the distinction, and that the order itself will be held in the archives of that Department while Mr. MacDonald remains in the Federal service.

U. S. SUPREME COURT RULES ON GRADE-CROSSING ACCIDENT

(Not for release)

The Baltimore and Ohio Railroad
Company, Petitioner
vs.
Dora Goodman, Administratrix of
Nathan Goodman
No. 58.- October Term, 1927.

The United States Supreme Court, in an opinion delivered by Justice Holmes, on October 31, 1927, held that an automobile driver, going upon a railroad track at a grade crossing, did so at his own risk and that the railroad company was not responsible for damages claimed for such an accident.

The suit was brought by the widow and administratrix of Nathan Goodman against the Baltimore and Ohio Railroad for running him down at a grade crossing. The defense made by the railroad company was that Goodman's own negligence caused his death. At the trial, in the lower court, the railroad company asked the court to direct a verdict in its favor, but the request and others looking to the same end were refused, and Mrs. Goodman received a judgment which was affirmed by the United States Circuit Court of Appeals. 10 F (2d) 58. The railroad company then appealed the case to the United States Supreme Court.

The Supreme Court in reversing the judgment of the lower court - Justice Sutherland being absent - rendered the following opinion: "Goodman was driving an automobile truck in an easterly direction and was killed by a train running southwesterly across the road at a rate of not less than sixty miles an hour. The line was straight but it is said by the respondent that Goodman 'had no practical view' beyond a section house two hundred and forty-three feet north of the crossing until he was about twenty feet from the first rail, or, as the respondent argues, twelve feet from danger, and that then the engine was still obscured by the section house. He had been driving at the rate of ten or twelve miles an hour but had cut down his rate to five or six miles at about forty feet from the crossing. It is thought that there was an emergency in which, so far as appears, Goodman did all that he could.

"We do not go into further details as to Goodman's precise situation, beyond mentioning that it was daylight and that he was familiar with the crossing, for it appears to us plain that nothing

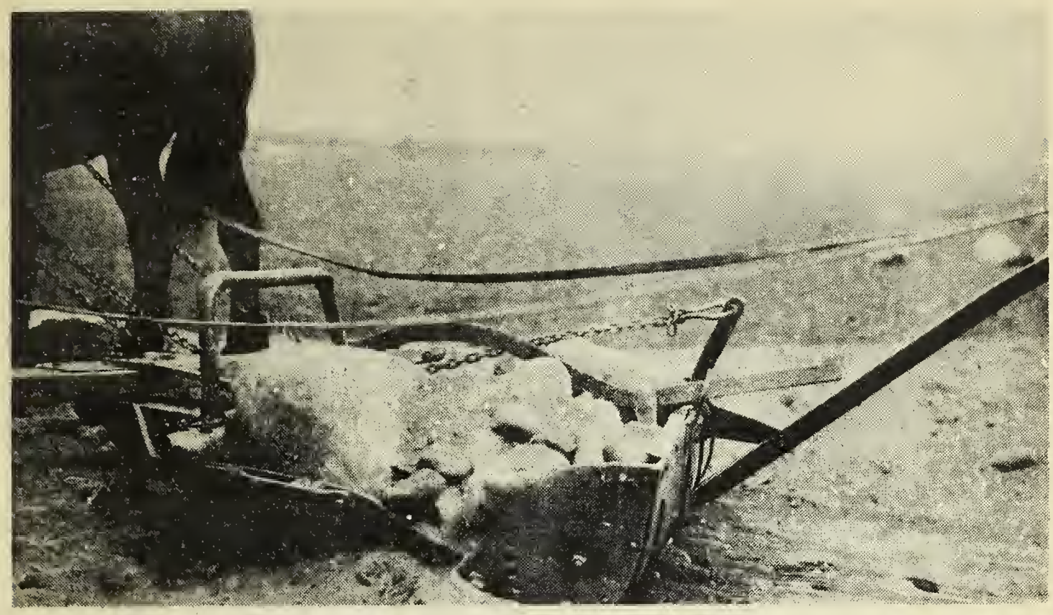
is suggested by the evidence to relieve Goodman from responsibility for his own death. When a man goes upon a railroad track he knows that he goes to a place where he will be killed if a train comes upon him before he is clear of the track. He knows that he must stop for the train, not the train stop for him. In such circumstances it seems to us that if a driver cannot be sure otherwise whether a train is dangerously near he must stop and get out of his vehicle, although obviously he will not often be required to do more than to stop and look. It seems to us that if he relies upon not hearing the train or any signal and takes no further precaution he does so at his own risk. If at the last moment Goodman found himself in an emergency it was his own fault that he did not reduce his speed earlier or come to a stop. It is true as said in Flannelly v. Delaware & Hudson Co., 225 U. S. 597, 603, that the question of due care very generally is left to the jury. But we are dealing with a standard of conduct, and when the standard is clear it should be laid down once for all by the courts. See Southern Pacific Co. v. Berkshire, 254 U.S. 415, 417, 419."

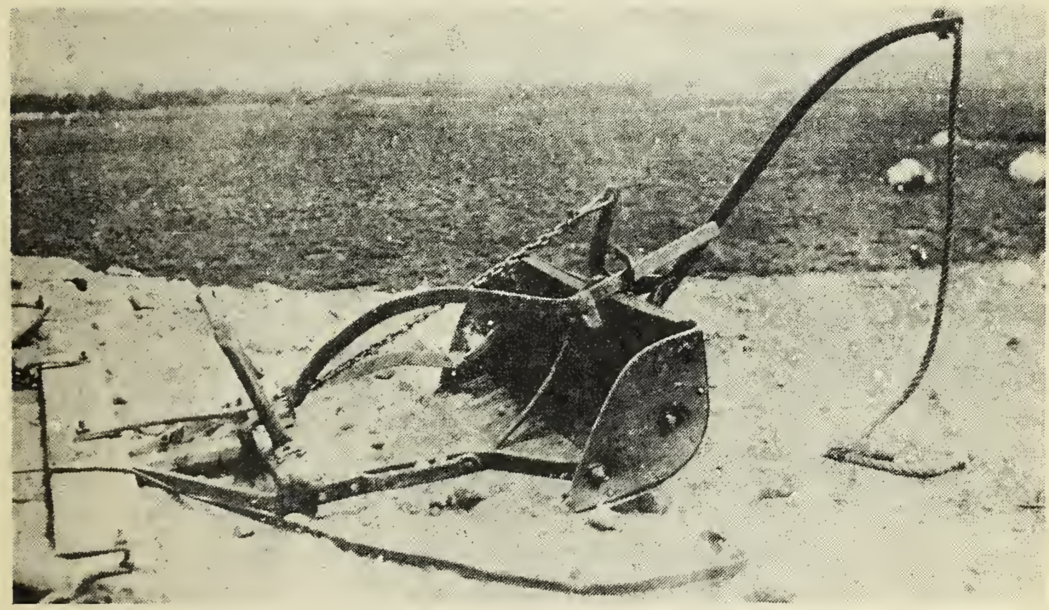
REBUILT FRESNO EFFECTIVE FOR LOOSE-ROCK HAUL

Compiled from a report submitted by John D. Slye of District 3.

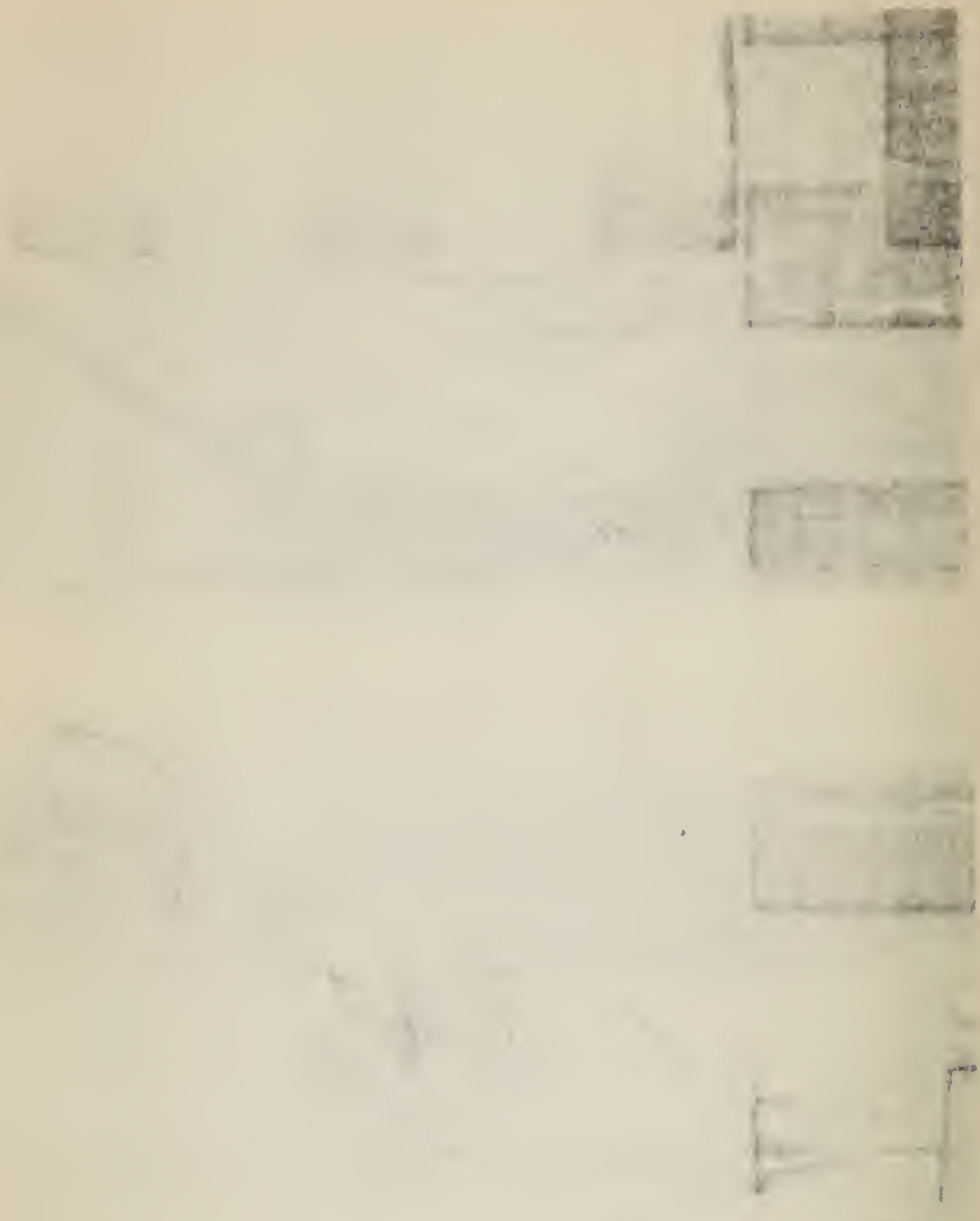
A rebuilt fresno for hauling loose rock was found to be an effective piece of equipment in the grading work on Wyoming Federal-aid project No. 159-C. In this 10-mile job there were two cuts in which bowlders and loose rocks predominated. After the material was loosened, it was found to be difficult to load it into the ordinary fresnoes because the scrapers would slide and jump over the loose rock before they were fully loaded.

To overcome this tendency, the contractor in charge of the work rebuilt a number of the fresnoes as shown in the accompanying photograph. The principal feature of the rebuilt equipment consists of a curved iron bar fastened to the wooden frame with a swivel bolt and extending to the back of the fresno pan. There is also a chain fastened to the frame and joined to a post fixed to the pan. The function of the bar is to prevent the pan from tipping forward during the loading operation while the chain holds the pan in position and does away with this part of the work formerly accomplished by the teamster. The work of reconstructing the fresno was done entirely by the camp blacksmith.





Views of the loaded and unloaded rebuilt fresno which moved loose rock and bowlders efficiently on a Wyoming Federal-aid grading project



The loaded fresno is shown in the photograph. When the unloading position is reached, the bar is disengaged from the catch and swung around a quarter turn, then the chain is detached and the fresno is dumped in the usual manner. A number of the rebuilt fresnoes were in operation when the pictures were taken and were moving the classified material efficiently. Approximately 4,000 cubic yards of bowlders and loose rock had been moved from one cut.

STATUS OF U. S. HIGHWAY MARKERS AND SIGNS

Contributed by F. W. Mills of the Division of Design

(Not for release)

On September 1, nineteen States had completed the erection of the numbered markers and the danger and miscellaneous signs on all sections of the United States highways. These were: Georgia, Indiana, Iowa, Kansas, Maine, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Hampshire, North Carolina, Ohio, Oklahoma, Vermont, Washington, West Virginia, Wisconsin, and Wyoming. In addition to these complete installations, six States - Alabama, Colorado, Mississippi, New Mexico, Oregon, and Rhode Island had finished the installation of the numbered U. S. shields, and two States - Tennessee and Virginia - had completed the caution and miscellaneous signing. This information is based upon answers received from questionnaires sent to the State highway departments on August 5, 1927. The detailed answers are given in the following table:

State	Shield markers erected	Caution and miscellaneous signs erected	Expect to complete shield marking	Expect to complete miscellaneous signing
	Per cent	Per cent		
Alabama	100	-	-	-
Arizona	5	5	Jan. 1, 1929	Jan. 1, 1929
Arkansas	90	50	Sept. 1, 1928	Dec. 31, 1928
California	-	-	During 1927-28	
Colorado	100	50	-	June 1, 1928
Connecticut	30	30	July 1, 1928	July 1, 1928
Delaware	-	-	No action taken	
Florida	-	90	-	-

(CONTINUED FROM PRECEDING PAGE)

STATE	SHIELD MARKERS ERECTED	CAUTION AND MISCELLANEOUS SIGNS ERECTED	EXPECT TO COMPLETE SHIELD MARKING	EXPECT TO COMPLETE MISCELLANEOUS SIGNING
	PER CENT	PER CENT		
GEORGIA	100	100	-	-
IDAHO	60	40	NOV. 1, 1927	JULY 1, 1928
ILLINOIS	-	-	DURING FALL OF 1927.	
INDIANA	100	100	-	-
IOWA	100	100	-	-
KANSAS	100	100	-	-
KENTUCKY	59	64	-	-
LOUISIANA	-	-	CADO PARISH MARKED BY LOCAL AUTHORITY	
MAINE	100	100	-	-
MARYLAND	-	-	FALL OF 1927	-
MASSACHUSETTS	100	100	-	-
MICHIGAN	100	100	-	-
MINNESOTA	100	100	-	-
MISSISSIPPI	100	-	-	NOW UNDER CONTRACT
MISSOURI	100	100	-	-
MONTANA	-	-	-	-
NEBRASKA	100	100	-	-
NEVADA	50	60	DEC. 1, 1927	DEC. 1, 1927
NEW HAMPSHIRE	100	100	-	-
NEW JERSEY	-	-	HAS NOT RECOGNIZED SYSTEM	
NEW MEXICO	100	-	-	DEC. 31, 1927
NEW YORK	-	-	USE OWN STANDARDS	
NORTH CAROLINA	100	100	-	-
NORTH DAKOTA	85	85	-	-
OHIO	100	100	-	-
OKLAHOMA	100	100	-	-
OREGON	100	20	-	-
PENNSYLVANIA	-	-	-	-
RHODE ISLAND	100	98	-	-
SOUTH CAROLINA	60	70	DEC. 1, 1927	DEC. 1, 1927
SOUTH DAKOTA	80	-	DEC. 31, 1927	DEC. 31, 1927
TENNESSEE	-	100	JUNE 1, 1928	-
TEXAS	-	-	-	-
UTAH	-	-	PROJECT STATEMENT SUBMITTED	
VERMONT	100	100	-	-
VIRGINIA	-	100	-	-
WASHINGTON	100	100	-	-
WEST VIRGINIA	100	100	-	-
WISCONSIN	100	100	-	-
WYOMING	100	100	-	-

YADKIN RIVER BRIDGE TEST PROGRESSING

Contributed by A. L. Gemeny of the Division of Tests

(Not for release)

The first phase of the tests of the bridge over the Yadkin River between Albemarle and Mt. Gilead, N. C., - involving the structure as it stands - is now completed. Tests on the second phase with the continuity of the superstructure destroyed will be made shortly.

The purpose of the stress measurements is to determine the manner in which a full-sized concrete arch, built under normal conditions, deforms under determinate loads, and to compare these deformations and the stresses produced in the arch rib with the deformations and stresses as computed by the generally accepted elastic theory of arches and those derived from the tests of models by means of the Beggs Deformeter gages.

Procedure. - The loads are imposed by means of tanks of water placed at all possible positions on the span. These tanks are made of wood, 42 by 20 by 18 feet inside dimensions, and weigh, when full, 160 tons each.

The experiment is divided into the following phases:

1. - A complete series of loads on the bridge as it stands; using one loading tank.

2. - A complete series of loads on the bridge with the continuity of the superstructure destroyed, so as to approach as near as possible to the conditions generally assumed in designing arches; using one loading tank.

3. - Loading the bridge in the most critical positions, with two tanks, in an effort to cripple the arch rib.

The tanks are weighed by means of the deformation of supporting copper cylinders set in steel cylinders and receiving the load from closely-fitting pistons. Specially annealed copper cylinders (1/2 inch by 1/2 inch), accurately shaped, are placed in the cells so that they carry the entire weight of the tank placed on the pistons. The weight, a function of the deformation

OF THE COPPER CYLINDERS, IS TAKEN FROM CALIBRATION CURVES PREVIOUSLY DETERMINED IN THE LABORATORY. BY THIS MEANS THE EMPTY-TANK WEIGHT OF 47,000 POUNDS WAS CHECKED WITHIN 300 POUNDS OF THE COMPUTED WEIGHT AND OTHER CHECK MEASUREMENTS.

MEASUREMENTS. - THE FOLLOWING MEASUREMENTS ARE TAKEN FOR EACH OF THE FIRST TWO PHASES OF THE EXPERIMENT, WITH THE LOAD PLACED IN ALL POSSIBLE POSITIONS, AND THREE INCREMENTS OF WATER FOR EACH POSITION.

1. - THE DEFORMATION OF THE CONCRETE AND STEEL AT 24 POINTS ON THE ARCH RIB. FROM THESE MEASUREMENTS THE STRESS IS DETERMINED BY THE USE OF THE MODULUS OF ELASTICITY DERIVED FROM TESTS OF SPECIMENS TAKEN FROM THE BRIDGE.

INSTRUMENT. - THE DEFORMATION IS MEASURED BY ELECTRIC TELEMETERS WHICH ARE DESIGNED ON THE PRINCIPLE THAT THE ELECTRICAL RESISTANCE OF A CARBON PILE VARIES WITH THE PRESSURE ON THE PILE. THE INSTRUMENT IS ATTACHED TO STEEL PLUGS GROUTED IN THE CONCRETE ARCH RIB SO THAT THE DEFORMATION MOVEMENTS ARE TRANSMITTED AS PRESSURES UPON THE CARBON PILES. THE TELEMETERS ARE READ TO ONE TEN-THOUSANDTH OF AN INCH AND ESTIMATED TO ONE HUNDRED-THOUSANDTH OF AN INCH.

2. - THE ANGULAR ROTATION OF THE AXIS OF THE BRIDGE AT 9 POINTS.

INSTRUMENT. - THIS MEASUREMENT IS MADE BY MEANS OF A CLINOMETER, CONSISTING OF A STEEL BAR CARRYING A LEVEL BUBBLE AND LEVELING SCREW ATTACHED TO A DIAL READING TO ONE-THOUSANDTH OF AN INCH. THE INSTRUMENT IS PLACED AND LEVELED ON GAGE POINTS LOCATED 20 INCHES APART ON STEEL PLUGS IN THE ARCH RIB. THE RELATIVE DISPLACEMENT OF THE GAGE POINTS IS MEASURED, AND FROM THESE MEASUREMENTS THE ANGULAR ROTATION UNDER ANY INCREMENT OF LOAD IS DERIVED DIRECTLY.

3. - THE CHANGE IN THE LENGTH OF THE MIDDLE ORDINATES OF 5-FOOT ARCS OF THE AXIS AT 5-FOOT INTERVALS OVER THE ENTIRE LENGTH OF THE ARCH RIB.

INSTRUMENT. - THE MIDDLE-ORDINATE CHANGES ARE MEASURED BY MEANS OF A RADIUS METER. THIS INSTRUMENT CONSISTS OF A STEEL BAR 5 FEET LONG, CARRYING AT ITS CENTER A FEDERAL DIAL READING TO ONE TEN-THOUSANDTH OF AN INCH. GAGE POINTS AT THE ENDS OF

THE RADIUS METER ARE PLACED ON CORRESPONDING POINTS ON STEEL PLUGS IN THE ARCH AND THE NEEDLE OF THE DIAL IS ALLOWED TO REST ON THE SURFACE OF A SQUARE STEEL PLUG HALFWAY BETWEEN THE GAGE POINTS. THE MOVEMENTS OF THE SQUARE PLUG ARE TRANSFERRED TO THE NEEDLE AND READ ON THE DIAL.

4. - DEFLECTIONS AT EACH SPANDREL POINT OF THE ARCH.

INSTRUMENT. - THE DEFLECTIONS ARE MEASURED FROM A WIRE SUSPENDED OVER A PULLEY WITH A COUNTER WEIGHT AT ONE END TO MAINTAIN A CONSTANT TENSION AND SAG. POINTS ARE LOCATED IN THE CONCRETE AT THE TOP OF EACH SPANDREL COLUMN AND THE DEFLECTIONS ARE MEASURED FROM THESE POINTS TO THE WIRE.

5. - ROTATION OF THE PIERS AT THE END OF THE SPAN UNDER OBSERVATION.

INSTRUMENT. - THE PIER ROTATIONS ARE MEASURED BY CLINOMETERS IN THE SAME MANNER AS THE AXIAL ROTATIONS, THE GAGE POINTS BEING PLACED ON THE TOP OF EACH PIER. THESE ROTATION MEASUREMENTS ARE CHECKED BY MEANS OF TWO WIRES PLACED 5 FEET APART VERTICALLY AND SUSPENDED INDEPENDENTLY OF THE SPAN UNDER OBSERVATION. MOVEMENTS ARE SHOWN BY THE RELATIVE LONGITUDINAL DISPLACEMENTS OF FIXED POINTS, ON THE WIRES AND ON THE ENDS OF THE PIERS.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

MV-1/2 (1st. HALF 1927)
R. S. A.

MOTOR VEHICLE REGISTRATION AND RECEIPTS, FOR FIRST HALF YEAR, 1927 1/

STATES AND DISTRICT OF COLUMBIA	MOTOR VEHICLES REGISTERED, 2/ INDIVIDUALLY AND COMMERCIALLY OWNED: 1927 GRAND TOTAL MOTOR CARS AND TRUCKS	PASSENGER AUTOMOBILES TAXIS AND BUSSES	MOTOR TRUCKS AND ROAD TRACTORS	OTHER REGISTERED VEHICLES: TRAILERS	MOTOR-CYCLES	TAX-EXEMPT OFFICIAL CARS AS REPORTED	TOTAL GROSS RECEIPTS	DISPOSITION OF GROSS RECEIPTS (APPROXIMATELY ALLOCATED WHEN NOT REPORTED): COLLECTION AND ADMINISTRATION	FOR HIGHWAY PURPOSES: STATE HIGHWAYS	LOCAL ROADS	STATE AND COUNTY 4/ ROAD BONDS	FOR OTHER PURPOSES	1926 1st. SIX-MONTHS GRAND TOTAL MOTOR VEHICLE REGISTRATION	COMPARATIVE INCREASE OF 1927 REGISTRATION OVER 1926 (SIX-MONTHS) 3/: NUMBER	PER CENT	STATES AND DISTRICT OF COLUMBIA
ALABAMA	211,386	184,059	27,326	1,061	287	-	$ 2,863,482	$ 100,819	$ 1,112,060	$ 558,379	$ 1,092,224	-	197,602	13,783	7.0	ALABAMA
ARIZONA	69,699	59,599	10,000	-	260	1,000	409,443	-	409,443	-	-	-	64,165	6,434	8.6	ARIZONA
ARKANSAS	175,709	149,387	26,322	1,430	211	726	3,442,130	37,863	2,244,289	182,433	5/ 977,565	-	177,236	(1,526)	DECREASE,0.9	ARKANSAS
CALIFORNIA	1,584,723	1,386,884	198,829	29,670	8,122	9,293	7,882,541	6/1,738,841	3,061,850	3,061,850	-	-	1,459,670	125,153	8.8	CALIFORNIA
COLORADO	234,794	216,031	18,763	77	922	-	1,436,773	71,839	-	682,467	682,467	-	226,810	8,984	4.0	COLORADO
CONNECTICUT	262,035	222,627	39,408	320	2,862	1,765	8,174,232	-	8,174,232	-	-	-	238,727	23,308	9.8	CONNECTICUT
DELAWARE	42,784	34,705	8,079	204	261	-	775,699	-	775,699	-	-	-	40,303	2,481	8.1	DELAWARE
FLORIDA	373,482	315,009	58,473	-	1,069	3,387	5,510,715	589,647	3,626,050	1,296,018	-	-	7/ 376,700	7/ (2,218)	DECREASE,0.6	FLORIDA
GEORGIA	260,078	226,146	33,833	-	730	-	3,478,424	39,859	3,388,565	-	-	-	238,618	21,461	9.0	GEORGIA
IDAHO	89,006	81,181	7,846	133	378	1,174	1,351,986	-	136,199	1,216,787	-	-	84,161	4,845	6.8	IDAHO
ILLINOIS	1,366,060	1,192,286	173,774	3,063	6,318	-	14,301,788	-	9,471,998	-	4,829,790	-	1,217,285	148,795	12.2	ILLINOIS
INDIANA	745,000	641,881	103,119	6,318	2,689	3,917	6,027,737	190,573	4,837,164	-	-	-	690,704	54,296	7.9	INDIANA
IOWA	660,888	610,416	50,473	150	1,528	2,739	9,977,714	598,663	9,379,051	-	-	-	648,282	12,606	1.8	IOWA
KANSAS	454,685	406,606	48,080	-	847	2,198	3,406,129	228,967	3,178,162	-	-	-	433,561	21,124	4.9	KANSAS
KENTUCKY	254,586	227,776	26,819	-	535	1,679	4,093,126	78,700	3,576,455	438,971	-	-	247,104	7,481	3.0	KENTUCKY
LOUISIANA	210,000	178,500	31,500	-	450	-	3,954,306	-	3,954,306	-	-	-	218,500	(8,500)	DECREASE,3.0	LOUISIANA
MAINE	141,605	119,261	22,344	755	886	1,117	2,248,145	101,944	1,604,266	-	479,436	$ 62,500	128,466	13,139	10.2	MAINE
MARYLAND	249,883	239,862	10,021	547	2,007	965	2,567,324	256,732	1,797,127	-	-	8/ 513,465	227,491	22,392	9.8	MARYLAND
MASSACHUSETTS	697,404	611,747	85,657	409	6,395	800	10,870,798	1,160,000	8,630,798	-	1,090,000	-	627,738	69,668	11.1	MASSACHUSETTS
MICHIGAN	1,041,482	901,651	139,831	12,999	2,806	7,375	16,049,507	258,326	7,550,117	5,992,426	2,248,638	-	992,178	49,304	5.0	MICHIGAN
MINNESOTA	607,725	533,427	74,298	2,838	2,118	-	9,699,621	-	7,099,621	-	9/ 2,600,000	-	574,356	33,369	6.8	MINNESOTA
MISSISSIPPI	197,881	178,093	19,788	1,939	57	-	2,439,514	168,038	200,000	2,071,476	-	-	180,030	17,851	9.9	MISSISSIPPI
MISSOURI	609,849	547,479	62,370	-	1,468	1,661	7,500,000	1,001,000	2,067,223	-	4,431,777	-	582,450	28,399	4.5	MISSOURI
MONTANA	91,701	78,396	13,305	-	118	248	1,020,380	32,647	-	915,574	-	10/ 72,159	92,340	(639)	DECREASE,0.7	MONTANA
NEBRASKA	324,169	297,747	26,422	1,300	679	926	3,318,189	841,729	742,938	1,733,522	-	-	329,669	(5,500)	DECREASE,1.7	NEBRASKA
NEVADA	22,457	17,858	4,599	71	58	396	208,769	11,481	67,181	-	130,097	-	20,527	1,930	9.4	NEVADA
NEW HAMPSHIRE	86,618	76,200	10,418	477	1,059	-	1,005,769	67,000	938,769	-	-	-	78,979	7,639	9.7	NEW HAMPSHIRE
NEW JERSEY	639,339	524,550	114,789	1,598	5,504	6,400	11,582,566	368,256	11/ 8,100,000	3,114,300	-	-	575,237	64,102	11.1	NEW JERSEY
NEW MEXICO	50,656	49,315	1,241	109	172	619	495,100	48,707	297,596	148,798	-	-	46,671	3,985	8.6	NEW MEXICO
NEW YORK	1,704,987	1,421,562	283,426	5,635	13,096	10,670	28,852,931	1,117,116	20,801,861	6,933,954	-	-	1,562,492	142,495	9.1	NEW YORK
NORTH CAROLINA	418,271	381,338	36,933	1,276	1,020	2,452	5,894,449	397,288	3,890,603	-	1,606,558	-	371,353	46,918	12.6	NORTH CAROLINA
NORTH DAKOTA	145,383	133,973	11,410	-	228	-	1,413,894	170,000	556,947	556,947	-	12/130,000	144,079	1,304	0.9	NORTH DAKOTA
OHIO	1,459,845	1,299,606	160,209	10,466	8,284	5,600	8,784,204	-	4,392,102	4,392,102	-	-	1,370,756	89,059	6.6	OHIO
OKLAHOMA	459,429	415,929	43,500	-	835	-	5,300,000	-	2,120,000	3,180,000	-	-	13/ 441,000	18,429	4.2	OKLAHOMA
OREGON	204,895	189,756	14/ 15,139	14/	1,598	2,068	5,922,214	125,000	4,347,910	1,449,304	-	-	195,841	9,254	4.7	OREGON
PENNSYLVANIA	1,425,424	1,241,247	184,177	3,319	10,526	3,175	22,925,010	614,655	22,024,686	-	-	15/285,770	1,326,682	98,742	7.4	PENNSYLVANIA
RHODE ISLAND	103,533	86,503	17,030	42	995	665	1,804,790	100,000	1,704,790	-	-	-	96,652	6,881	7.1	RHODE ISLAND
SOUTH CAROLINA	174,378	157,087	17,291	1,176	297	3,268	1,976,239	121,450	1,854,789	-	-	-	161,012	23,366	15.5	SOUTH CAROLINA
SOUTH DAKOTA	152,069	138,855	13,214	-	159	800	2,346,854	46,937	1,173,427	1,128,490	-	-	155,763	(3,694)	DECREASE,2.4	SOUTH DAKOTA
TENNESSEE	265,842	243,443	22,399	-	643	3,238	3,461,293	41,544	3,409,749	-	-	-	227,775	38,067	16.7	TENNESSEE
TEXAS	950,110	853,881	96,229	6,980	2,335	-	14,236,439	674,783	8,833,676	4,727,980	-	-	904,050	48,060	5.1	TEXAS
UTAH	84,450	72,927	11,523	149	432	650	603,771	132,000	246,771	-	225,000	-	81,830	2,620	3.2	UTAH
VERMONT	69,058	63,951	6,207	119	449	-	1,702,168	44,633	1,657,535	-	-	-	62,899	6,159	9.8	VERMONT
VIRGINIA	299,924	256,358	43,566	285	1,023	-	4,849,833	87,141	4,782,692	-	-	-	277,126	22,799	8.2	VIRGINIA
WASHINGTON	348,628	298,639	49,989	1,451	1,914	4,434	6,676,974	88,172	4,650,968	937,834	-	-	326,500	22,128	6.8	WASHINGTON
WEST VIRGINIA	205,121	182,816	22,305	292	1,043	2,036	3,525,284	16/139,699	2,235,585	-	1,150,000	-	183,788	21,333	11.8	WEST VIRGINIA
WISCONSIN	626,452	548,324	78,128	-	2,211	391	8,961,029	540,000	6,200,000	3,221,029	-	-	590,797	36,655	8.0	WISCONSIN
WYOMING	46,198	40,822	5,376	-	106	247	478,330	-	228,661	-	261,779	-	44,367	1,831	4.1	WYOMING
DISTRICT OF COLUMBIA	91,873	80,183	11,690	-	814	1,915	344,931	-	-	-	-	17/344,931	89,857	2,018	2.2	DISTRICT OF COLUMBIA
TOTALS	20,991,333	18,414,767	2,576,566	25,558	96,789	88,884	$ 272,119,534	$ 12,452,069	$ 188,525,679	$ 47,937,841	$ 21,795,330	$1,408,825	18/ 19,818,755	1,374,578	7.0	TOTALS

NOTES:
1/ REGISTRATION SHOWN FOR 6 MONTHS IN ALL STATES EXCEPT NORTH CAROLINA WHICH REPORTS FULL YEAR DATA, AS REGISTRATION YEAR ENDS JUNE 30TH.
2/ THESE FIRST THREE COLUMNS RECORD THE REGULARLY REGISTERED MOTOR CARS AND TRUCKS, EXCULDING WHERE POSSIBLE THE NON-RESIDENT REGISTRATIONS AND RE-REGISTRATIONS OF SAME VEHICLE.
3/ SOME STATES REPORT DECREASES UNDER PREVIOUS YEAR, INDICATED BY PARENTHESES FOLLOWED BY "DECREASE".
4/ INTEREST AND RETIREMENT PAYMENTS ON STATE ROAD BONDS EXCEPT AS NOTED BELOW.
5/ ON STATE ROAD BONDS $82,611,REMAINDER ON COUNTY ROAD BONDS.
6/ INCLUDES UNDISTRIBUTED FUNDS.
7/ FORMERLY REPORTED AS 407,777: THE REVISED FIGURE ELIMINATES NON-RESIDENT REGISTRATIONS INCLUDED IN 1926 DATA.
8/ FOR BALTIMORE CITY STREETS.
9/ INTEREST AND RETIREMENT OF COUNTY BONDS.
10/ FOR AUTO-THEFT BUREAU.
11/ INCLUDES $1,000,000 FOR BRIDGE AND TUNNEL COMMISSION.
12/ FOR AUTO-THEFT LAW ENFORCEMENT.
13/ FORMERLY REPORTED AS 490,000: THE REVISED FIGURE ELIMINATES RE-REGISTRATIONS INCLUDED IN 1926 PUBLISHED DATA.
14/ TRAILERS INCLUDED WITH TRUCKS.
15/ HIGHWAY MOTOR PATROL.
16/ INCLUDES REFUNDS. $23,392.
17/ TO U. S. TREASURY FROM WHICH STREET APPROPRIATIONS ARE MADE FOR DISTRICT OF COLUMBIA.
18/ REVISED TOTAL DUE TO REVISIONS IN FLORIDA AND OKLAHOMA AS NOTED.

Compiled from reports of State authorities.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

G-1/2 (1st. HALF, 1927)
R. S. A.

GASOLINE TAXES FOR FIRST HALF YEAR, 1927

TOTAL TAXES EARNED ON MOTOR VEHICLE FUEL, REFUNDS ON GROSS TAX, DISPOSITION OF FUND, RATES, AND GALLONS OF GASOLINE CONSUMED BY MOTOR VEHICLES TAXED

STATES AND DISTRICT OF COLUMBIA	GROSS TAX ASSESSED PRIOR TO DEDUCTION OF REFUNDS	EXEMPTION REFUNDS: (DEDUCTED FROM GROSS TAX)	TOTAL TAX EARNINGS ON FUEL FOR MOTOR VEHICLES 2/	DISPOSITION OF TOTAL GASOLINE TAX EARNINGS 1/					TAX RATES, 6 MONTHS 1927			NET GALLONS OF GASOLINE TAXED AND USED BY MOTOR VEHICLES	ESTIMATED ADDITIONAL GALLONS (NOT TAXED) USED BY MOTOR VEHICLES	STATES AND DISTRICT OF COLUMBIA
				COLLECTION COSTS (HALF YEAR)	CONSTRUCTION & MAINTENANCE ON RURAL ROADS		STATE AND COUNTY ROAD BOND PAYMENTS	FOR MISCELLANEOUS PURPOSES	CENTS PER GALLON		DATE OF RATE CHANGE			
					STATE HIGHWAYS	LOCAL ROADS			JAN. 1st.	JUNE 30th.				
ALABAMA	$ 2,653,637	-	$ 2,653,637	$ 10,302	$ 1,300,778	$ 1,342,557	-	-	2	4	1/25	68,096,599	-	ALABAMA
ARIZONA	662,729	$ 144,130	518,599	-	259,300	259,299	-	-	3	3	-	17,286,541	-	ARIZONA
ARKANSAS	1,741,088	180,527	1,560,559	46,817	358,929	171,661	3/$ 983,152	-	4	5	6/9	39,013,981	-	ARKANSAS
CALIFORNIA	9,677,342	641,408	9,035,934	19,918	4,508,008	4,508,008	-	-	2	2	4/	451,796,661	-	CALIFORNIA
COLORADO	1,237,359	43,282	1,194,077	6/	730,359	463,718	-	-	2	3	5/1	57,701,371	-	COLORADO
CONNECTICUT	1,307,024	-	1,307,024	-	1,307,024	-	-	-	2	2	-	65,351,209	-	CONNECTICUT
DELAWARE	273,203	6,112	267,091	-	267,091	-	-	-	2	3	3/24	10,329,754	-	DELAWARE
FLORIDA	5,355,219	-	5,355,217	2,100	4,014,838	1,338,279	-	-	4	4	6/	133,880,422	-	FLORIDA
GEORGIA	3,071,528	-	3,071,528	2,100	2,192,448	876,980	-	-	3½	3½	-	87,757,935	-	GEORGIA
IDAHO	637,373	30,679	606,694	5,203	601,491	-	-	-	3	4	2/28	15,750,489	-	IDAHO
ILLINOIS	-	-	-	-	-	-	-	-	0	0 7/	No Tax	-	286,900,000	ILLINOIS
INDIANA	4,697,106	132,395	4,564,711	7,398	3,038,209	1,519,104	-	-	3	3	-	152,157,038	-	INDIANA
IOWA	2,865,439	88,256	2,777,183	4,956	924,076	1,848,151	-	-	2	2	8/	138,859,170	-	IOWA
KANSAS	2,217,334	326,089	1,991,245	9/	1,640,500	250,745	-	-	2	2	-	94,562,249	-	KANSAS
KENTUCKY	2,472,015	-	2,472,015	-	2,472,015	-	-	-	5	5	-	49,348,018	-	KENTUCKY
LOUISIANA	1,411,554	-	1,411,554	10/	1,411,554	-	-	-	2	2	-	70,577,705	-	LOUISIANA
MAINE	761,073	18,148	742,925	5,341	368,792	368,792	-	-	3	3	-	24,461,721	-	MAINE
MARYLAND	1,831,699	57,257	1,774,442	1,250	11/ 1,418,554	-	-	12/$ 354,638	2	4	4/1	57,069,042	-	MARYLAND
MASSACHUSETTS	-	-	-	-	-	-	-	-	0	0	No Tax	-	148,200,000	MASSACHUSETTS
MICHIGAN	5,414,065	380,267	5,033,798	14,718	2,994,725	1,024,355	13/1,000,000	-	2	2	14/	251,689,674	-	MICHIGAN
MINNESOTA	2,367,545	93,218	2,274,327	15/	2,274,327	-	-	-	2	2	-	115,891,613	-	MINNESOTA
MISSISSIPPI	2,136,296	-	2,136,296	1,800	1,003,006	1,068,244	-	16/ 63,246	4	4	-	51,826,257	-	MISSISSIPPI
MISSOURI	2,968,788	47,723	2,921,065	24,017	2,897,048	-	-	-	2	2	-	146,053,264	-	MISSOURI
MONTANA	443,439	15,076	428,363	3,150	425,213	-	-	-	3	3	1/1	14,278,756	-	MONTANA
NEBRASKA	1,477,472	7,408	1,470,064	3,639	1,466,425	-	-	-	2	2	-	73,503,208	-	NEBRASKA
NEVADA	217,604	18,107	199,497	-	99,749	99,748	-	-	4	4	-	4,987,419	-	NEVADA
NEW HAMPSHIRE	421,366	7,785	413,581	-	413,581	-	-	-	2	3	5/1	18,310,415	-	NEW HAMPSHIRE
NEW JERSEY	-	-	-	-	-	-	-	-	0	017/	No Tax	-	137,500,000	NEW JERSEY
NEW MEXICO	18/ 614,200	-	18/ 614,200	11,590	602,610	-	-	-	3	5	3/7	14,081,758	-	NEW MEXICO
NEW YORK	-	-	-	-	-	-	-	-	0	0	No Tax	-	375,100,000	NEW YORK
NORTH CAROLINA	4,108,931	176,387	3,932,544	8,218	1,705,745	-	19/2,218,581	-	4	4	-	98,313,590	-	NORTH CAROLINA
NORTH DAKOTA	467,210	71,277	395,933	-	395,933	-	-	-	2	2	-	19,796,669	-	NORTH DAKOTA
OHIO	7,722,220	182,394	7,539,826	-	4,739,600	1,272,830	-	20/1,527,396	2	3	5/25	336,902,146	-	OHIO
OKLAHOMA	3,208,634	12,258	3,196,376	-	2,130,919	1,065,457	-	-	3	3	-	110,262,328	-	OKLAHOMA
OREGON	1,690,893	77,684	1,613,209	4,149	1,609,060	-	-	-	3	3	-	54,084,297	-	OREGON
PENNSYLVANIA	6,101,696	-	6,101,696	21/	4,067,797	2,033,399	-	-	2	2	22/	305,084,825	-	PENNSYLVANIA
RHODE ISLAND	326,848	25,877	300,971	23/	253,953	-	47,018	-	1	2	6/1	25,395,311	-	RHODE ISLAND
SOUTH CAROLINA	2,214,215	3,579	2,210,636	24/	1,360,794	849,842	-	-	5	5	-	44,212,717	-	SOUTH CAROLINA
SOUTH DAKOTA	1,095,630	135,000	960,630	2,783	957,847	-	-	-	3	3	25/	32,616,933	-	SOUTH DAKOTA
TENNESSEE	1,983,139	-	1,983,138	19,831	1,963,308	-	-	-	3	3	-	66,104,639	-	TENNESSEE
TEXAS	5,975,553	-	5,975,553	-	4,481,665	-	-	26/1,493,888	1	3	3/16	271,417,466	-	TEXAS
UTAH	567,794	-	567,794	5,375	27/ 212,419	-	28/ 350,000	-	3½	3½	-	16,222,709	-	UTAH
VERMONT	275,536	-	275,536	-	275,536	-	-	-	2	3	6/1	12,130,292	-	VERMONT
VIRGINIA	3,298,685	176,167	3,122,518	29/	2,081,679	1,040,839	-	-	4½	4½	-	69,259,098	-	VIRGINIA
WASHINGTON	1,734,604	103,378	1,631,226	-	1,631,226	-	-	-	2	2	-	81,561,285	-	WASHINGTON
WEST VIRGINIA	1,458,314	42,257	1,416,057	30/	1,416,057	-	30/ -	-	3½	3½	31/	40,458,768	-	WEST VIRGINIA
WISCONSIN	2,618,397	92,339	2,526,058	32/	1,085,000	1,441,058	-	-	2	2	-	126,302,901	-	WISCONSIN
WYOMING	257,275	367	256,908	34/ 8	256,900	-	-	-	2½	3	3/1	9,244,481	-	WYOMING
DIST. OF COLUMBIA	551,405	2,800	548,605	-	-	-	-	33/ 548,605	2	2	-	27,430,267	-	DIST. OF COLUMBIA
TOTALS	———	———	$ 101,250,841	$ 204,663	$ 69,616,088	$ 22,843,566	$ 4,598,751	$ 3,987,773	AVER. 2.55 CENTS		—	3,971,423,311	947,700,000	TOTALS

NOTES:

1/ DISPOSITION DATA IS ESTIMATED IN SOME CASES, AND IS APPROXIMATELY ALLOCATED ACCORDING TO MOTOR FUEL LAWS OF THE VARIOUS STATES.
2/ THIS TOTAL TAX SHOWS THE ACTUAL AVAILABLE AMOUNT FOR DISPOSAL, AND EXCLUDES REFUNDS.
3/ ON STATE HIGHWAY BONDS, $78,028: REMAINDER ON DISTRICT ROAD BONDS.
4/ NEW 3 CENT TAX EFFECTIVE JULY 29, 1927.
5/ PAID FROM OIL INSPECTION FUND.
6/ NEW 5 CENT TAX EFFECTIVE JULY 1, 1927.
7/ NEW 2 CENT TAX EFFECTIVE AUGUST 1, 1927.
8/ NEW 3 CENT TAX EFFECTIVE JULY 4, 1927.
9/ PAID FROM STATE GENERAL FUND, $4,500.
10/ COLLECTION COST OF $3,750 FROM LEGISLATIVE APPROPRIATION.
11/ INCLUDES $125,742 FOR ELIMINATION OF GRADE CROSSINGS.
12/ ASSIGNED TO BALTIMORE CITY, INCLUDES $31,435 FOR ELIMINATION OF GRADE CROSSINGS.
13/ STATE HIGHWAY BOND RETIREMENTS.
14/ NEW 3 CENT TAX EFFECTIVE SEPTEMBER 4, 1927.
15/ COLLECTION COSTS, $2,300 FROM INSPECTION OIL FUND.
16/ FOR SEAWALL TO PROTECT HIGHWAY; COLLECTED BY AN EXTRA TAX OF 2 CENTS IN HARRISON COUNTY AND 1 CENT IN HANCOCK COUNTY.
17/ NEW 2 CENT TAX EFFECTIVE JULY 1, 1927.
18/ INCLUDES $ 4,402 FOR LICENSE FEES FOR GASOLINE DISTRIBUTING STATIONS.
19/ APPROXIMATED BY PRO-RATING MOTOR VEHICLE FEES AND GASOLINE TAXES FOR INTEREST ON ROAD BONDS.
20/ FOR MAINTENANCE OF STREETS IN MUNICIPALITIES.
21/ PAID FROM GENERAL FUND; APPROXIMATELY $40,000.
22/ NEW 3 CENT TAX EFFECTIVE JULY 1, 1927.
23/ LEGISLATIVE APPROPRIATION $5,000 FOR THE YEAR.
24/ STATE APPROPRIATION OF $5,000 FOR THE YEAR.
25/ NEW 4 CENT TAX EFFECTIVE JULY 1, 1927.
26/ FOR FREE SCHOOL FUND.
27/ NOT AVAILABLE FOR ROAD USE UNTIL 1928.
28/ ON STATE ROAD BONDS.
29/ COSTS OF $3,228 PAID FROM APPROPRIATION FROM STATE REVENUES.
30/ COLLECTION COSTS AND INTEREST OF STATE ROAD BONDS CHARGEABLE TO THIS FUND BUT AMOUNTS NOT REPORTED.
31/ NEW 4 CENT TAX EFFECTIVE JULY 1, 1927.
32/ APPROPRIATION BY STATE OF $5,000 FOR HALF YEAR.
33/ ASSIGNED BY LAW FOR USE ON WASHINGTON STREETS.
34/ EXCLUDES $600 COSTS NOT CHARGED TO TAX.

NEW TRAFFIC-FLOW RECORDER IN USE ON CLEVELAND TRAFFIC SURVEY

Contributed by J. G. McKay, Chief of the Division of
Highway Economics, and L. W. Teller, Division of Tests

(Not for release)

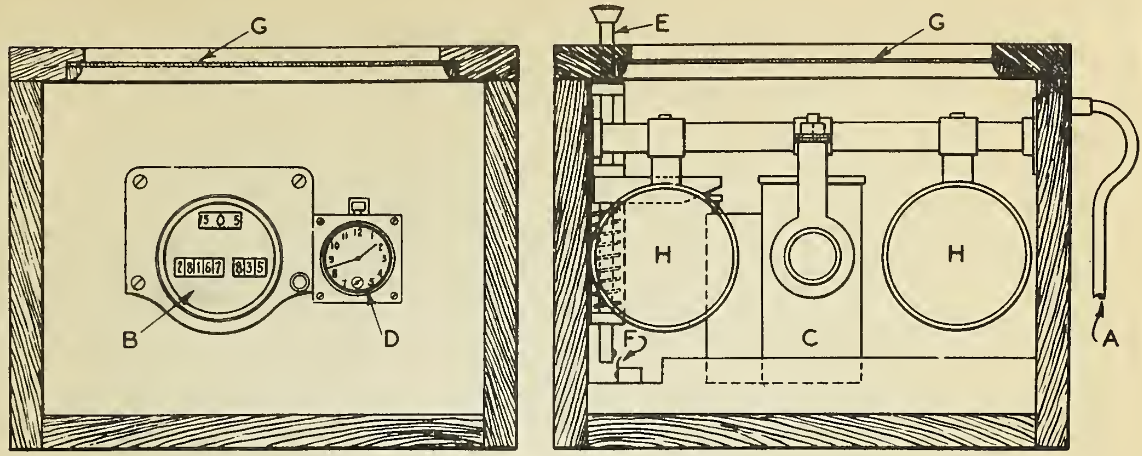
A new device, designed to measure and record the speed of a vehicle at any instant during a run or trip, and simultaneously to record the elapsed time and distance since the beginning of the run, is being used by the Bureau in connection with the highway-planning survey now in progress in cooperation with the County Commissioners of Cuyahoga County, Ohio, in the Cleveland Metropolitan Region.

The device consists essentially of a clock, a speedometer, and an odometer - the three so mounted as to be within the field of a motion-picture camera with which they can be photographed simultaneously at any time when illuminated by two flash lights which also form a part of the device. The entire apparatus is enclosed in a box approximately two feet long and one foot square. A plan of the device is shown in Figure 1.

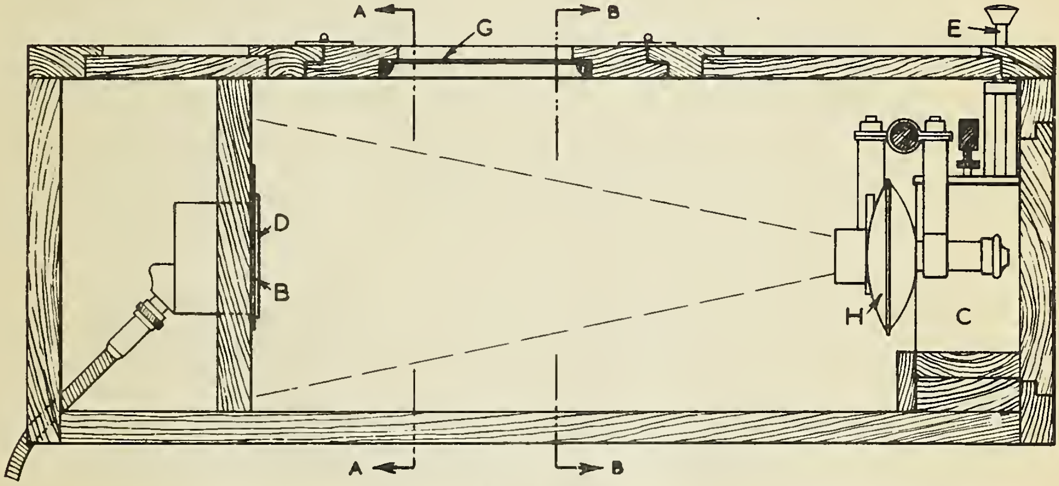
The apparatus may be installed in any car by making the necessary connection to the speedometer, and the only other equipment required is a 6-8 volt storage battery to provide current for the flash lights.

The operation of the instrument is extremely simple. A small knob on the top of the box is pressed when a record is to be made. This action first turns on the flash lights and almost immediately actuates the camera exposing the film for one-sixtieth of a second and moving it forward for the next picture. The camera is loaded with 18 feet of standard motion-picture film which provides for 250 exposures.

Installed in an automobile as above described, this device is used to measure and record the variable speed of highway traffic by so operating the test car as to "float" with the traffic. The simultaneous records of time, speed, and distance which can be made at any instant during a run or whenever the speed of the car is changed for any reason will provide the data necessary for a variety of studies of flow of traffic, the effect of traffic obstructions and congestion, the time required to travel over sections of a route, etc.



SECTION A-A SECTION B-B



LONGITUDINAL SECTION

A-BATTERY CABLE
B-SPEEDOMETER
C-CAMERA
D-CLOCK
E-OPERATING ROD
F-LAMP SWITCH
G-WINDOW
H-LAMP

FIGURE 1.- SKETCH OF THE NEW SPACE-TIME RECORDER.

The operating crew consists of three men - a driver, an instrument operator and observer, and a recorder. A window in the top of the instrument box permits the operator and observer to note the odometer figure at the instant of photographic exposure, and this figure and the reason for the exposure are given to the recorder who notes them on the recording form. An enlarged reproduction of three of the photographic records is shown in Figure 2, and a sample record form is shown in Figure 3.

In making a run with traffic, the initial exposure is made at the instant the car is put in motion, another when it attains the predetermined speed, and others when it is "floating" with the average speed of the traffic on the road. Thereafter, other exposures are made when for any reason the speed is altered appreciably. In this manner, a series of photographic records are obtained, which can be used subsequently to determine the effect upon the speed of the test car (and consequently of the traffic with which it is "floated") of traffic congestion, slow vehicles, traffic lights, street cars, street car loading platforms, railroad crossings, narrow pavements and bridges, curves, grades, etc.

One form in which the data thus obtained may be plotted, for purposes of analysis, is shown in Figure 4. In this graph speed is plotted against distance, and each up and down change in the direction of the graph represents a change in speed occurring at a particular distance from the starting point, the entire graph constituting a record of the variable speed of the test car in operation over a section of highway. Superimposed upon the speed record in this case, as an indication of the various combinations possible, is a record of the density of traffic on the road at the time of the run, the width of the road surface, and the roughness of the surface as determined by roughometer readings.

One of the interesting studies in connection with the Cleveland survey, for which this device is employed, is that of determining the traffic capacity of pavements of various widths. A number of sections of highway ranging in pavement width from 18 to 50 feet have been selected for study. Traffic on the several sections varies from 2,000 to more than 30,000 vehicles per day and, in composition, forms an exclusively passenger-car movement to a combined passenger-car and truck traffic in which the trucks constitute upwards of 15 per cent.

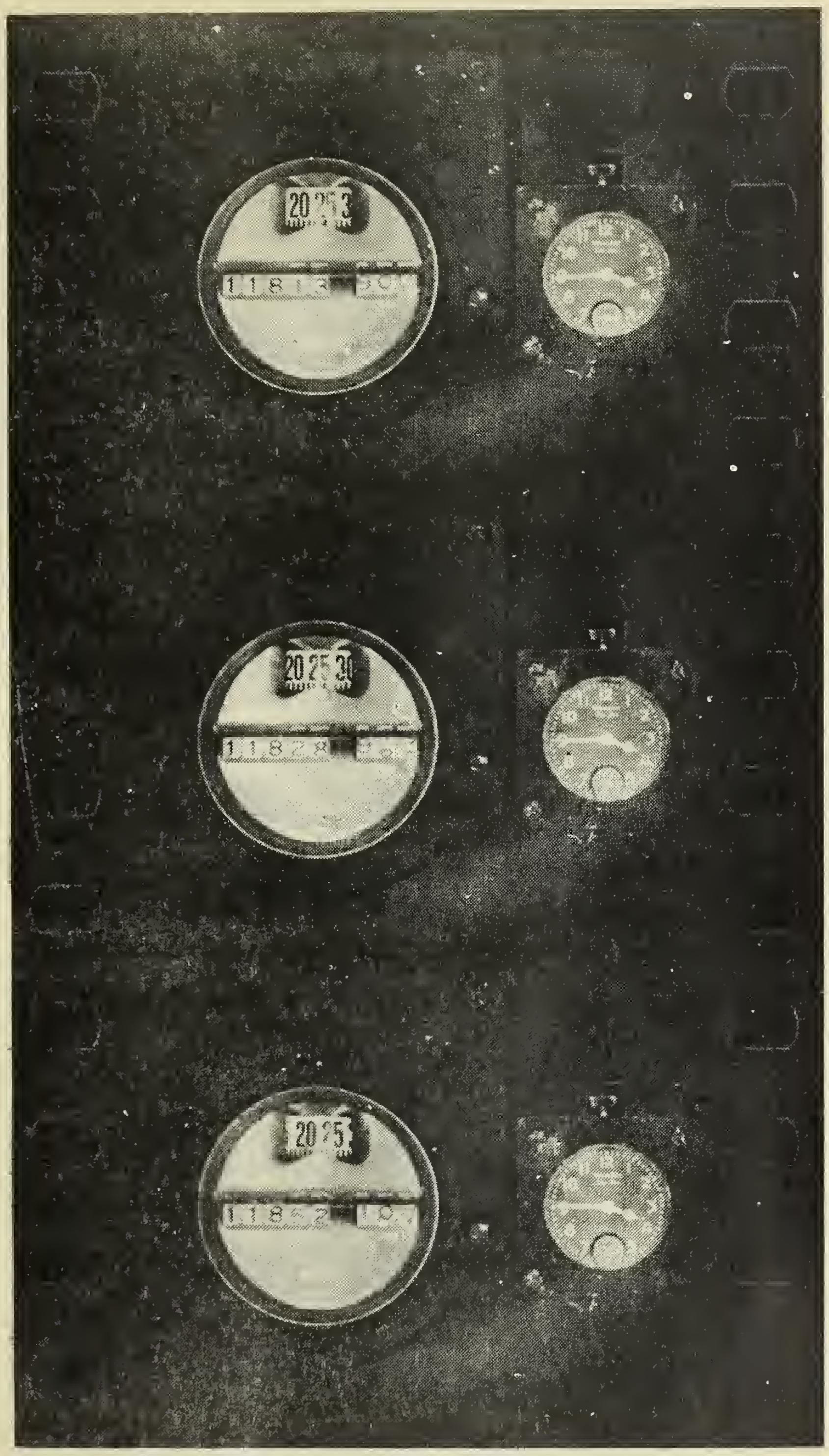
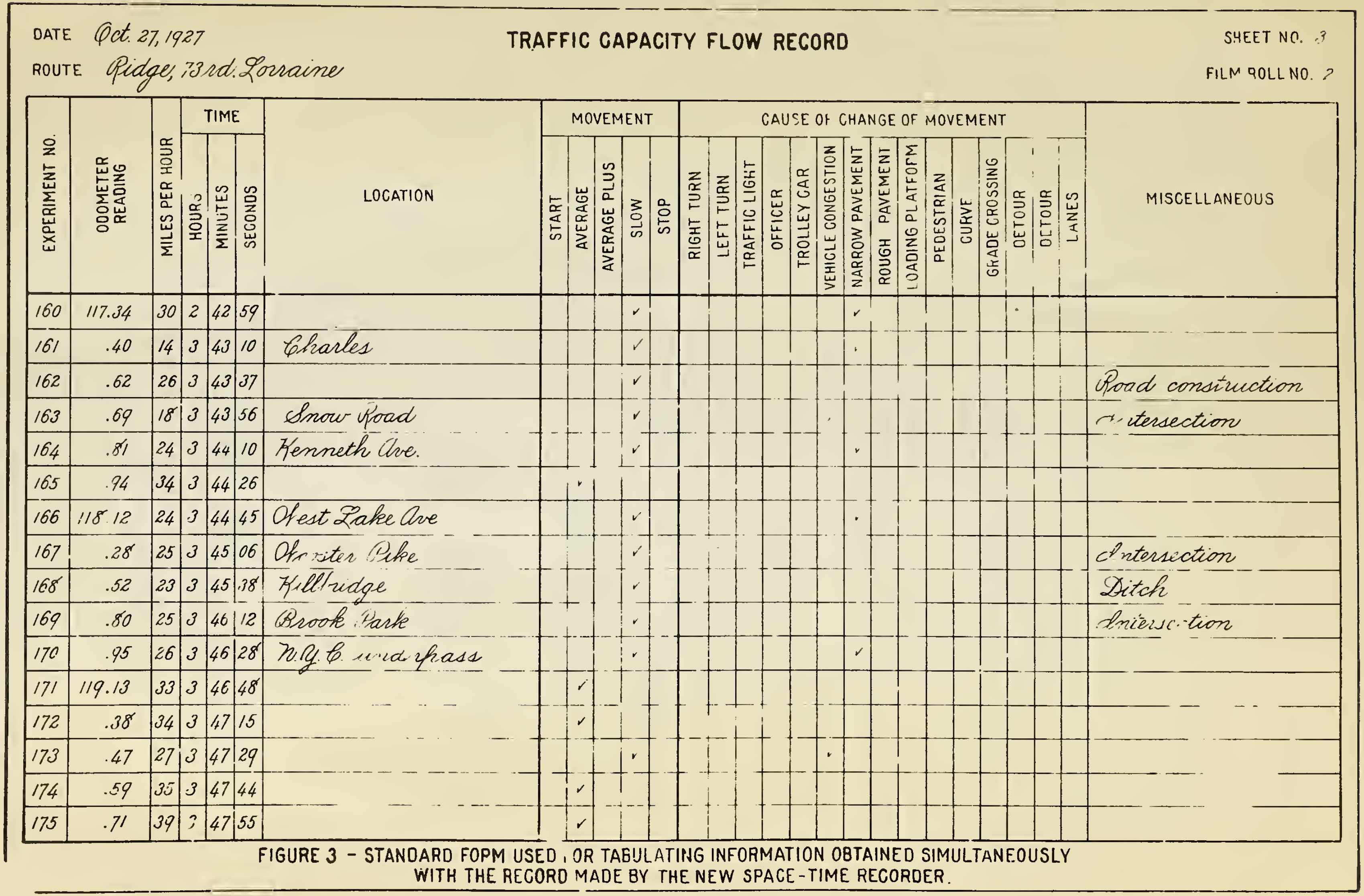


Figure 2. - Enlarged reproduction of a portion of the photographic record



DATE *Oct. 27, 1927*

ROUTE *Ridge, 73rd. Lorraine*

TRAFFIC CAPACITY FLOW RECORD

SHEET NO. *3*

FILM ROLL NO. *2*

EXPERIMENT NO.	ODOMETER READING	MILES PER HOUR	TIME			LOCATION	MOVEMENT					CAUSE OF CHANGE OF MOVEMENT															MISCELLANEOUS
			HOURS	MINUTES	SECONDS		START	AVERAGE	AVERAGE PLUS	SLOW	STOP	RIGHT TURN	LEFT TURN	TRAFFIC LIGHT	OFFICER	TROLLEY CAR	VEHICLE CONGESTION	NARROW PAVEMENT	ROUGH PAVEMENT	LOADING PLATFORM	PEDESTRIAN	CURVE	GRADE CROSSING	DETOUR	DETOUR	LANES	
160	117.34	30	2	42	59					✓								✓									
161	.40	14	3	43	10	Charles				✓								✓									
162	.62	26	3	43	37					✓																	Road construction
163	.69	18	3	43	56	Snow Road				✓							✓										Intersection
164	.81	24	3	44	10	Kenneth Ave.				✓								✓									
165	.94	34	3	44	26			✓																			
166	118.12	24	3	44	45	West Lake Ave				✓								✓									
167	.28	25	3	45	06	Wooster Pike				✓																	Intersection
168	.52	23	3	45	38	Hillridge				✓																	Ditch
169	.80	25	3	46	12	Brook Park				✓																	Intersection
170	.95	26	3	46	28	N.Y.C. underpass				✓								✓									
171	119.13	33	3	46	48			✓																			
172	.38	34	3	47	15			✓																			
173	.47	27	3	47	29					✓							✓										
174	.59	35	3	47	44			✓																			
175	.71	39	3	47	55			✓																			

FIGURE 3 – STANDARD FORM USED FOR TABULATING INFORMATION OBTAINED SIMULTANEOUSLY WITH THE RECORD MADE BY THE NEW SPACE-TIME RECORDER.

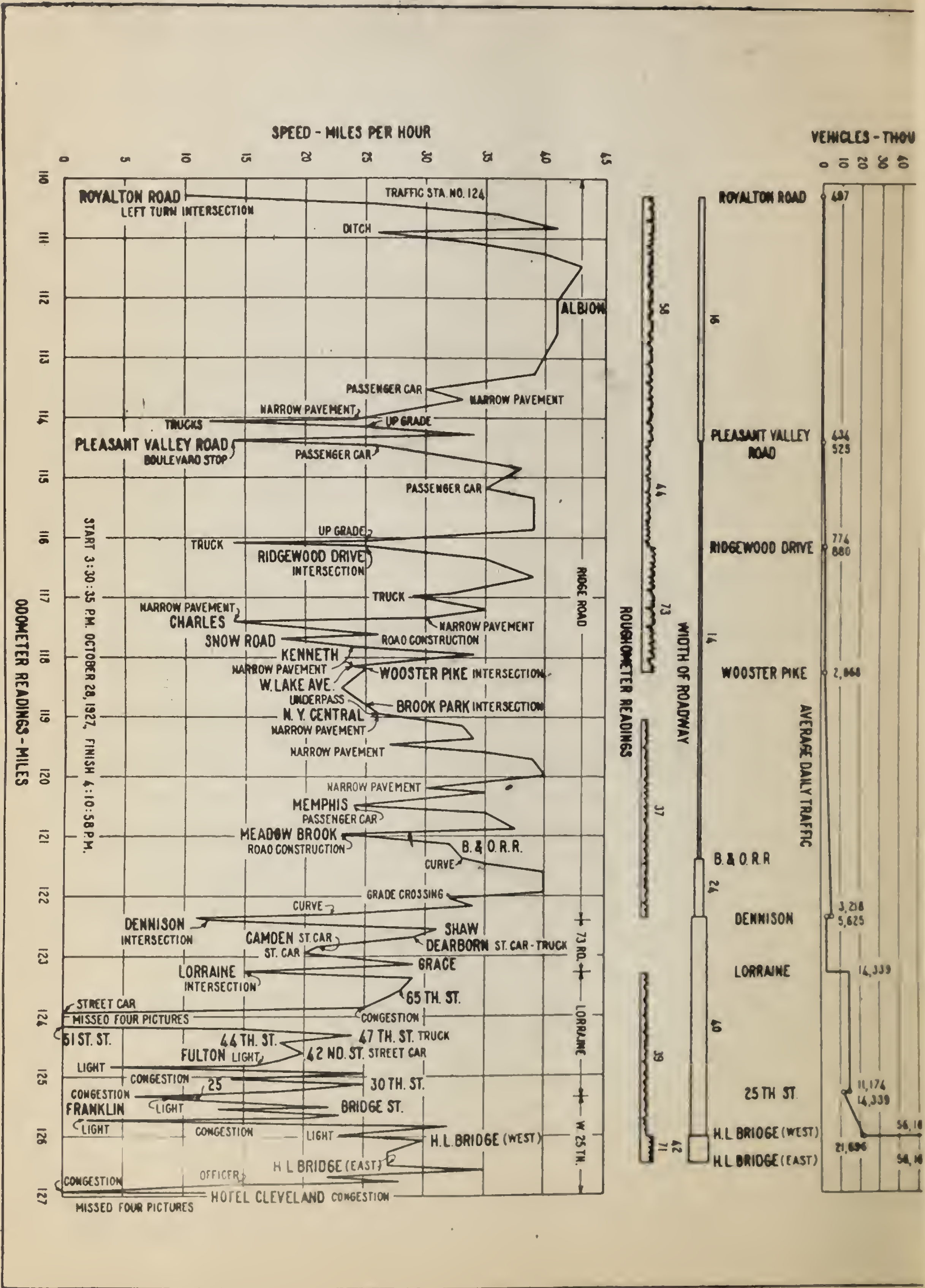


FIGURE 6 - TRAFFIC-CAPACITY-FLOW GRAPH PLOTTED FROM THE RECORDS MADE BY THE NEW SPACE-TIME RECORDER.

It is assumed that the traffic capacity of a pavement of any particular width is that traffic volume which it will discharge without undue congestion; and it is taken for granted that congestion is invariably reflected in a retardation of the speed of vehicles. Acting on these assumptions an effort will be made to determine the traffic capacity of each of the test pavements in the following manner.

The pavement will be marked transversely at one-foot intervals, and by this means a study will be made of the lateral distribution of the traffic throughout the day, segregating in the record the observations made during every 15-minute period. A traffic count, similarly subdivided, will show the variation in traffic density throughout the day; and, once in each 15-minute period, a run will be made with the test car equipped with the traffic-flow recorder over a designated section of the highway, past the traffic-counting and transverse-distribution stations.

As there is invariably a wide range of traffic density during the course of a day, there will be obtained in this way data which will show, for various densities of traffic, the corresponding speed of the traffic and the distribution of the traffic transversely over the pavement, the latter serving as a measure of the degree to which the available width is utilized.

As the roads selected are those upon which there appears to be congestion at the peak hours, it will be possible, by using the traffic speed as a guide, to ascertain the density of traffic at which the congestion first makes itself felt, and the various degrees of congestion associated with greater densities, utilizing the transverse-distribution data to determine whether or not the available width of pavement is fully used.

3,118 GRADE CROSSINGS ELIMINATED ON FEDERAL-AID PROJECTS SINCE 1921

Contributed by the Division of Design

(Not for release)

Since the passage of the Federal Highway Act in 1921, the approved plans for Federal-aid projects, completed or in progress on November 11, 1927, have provided for the elimination of 3,118 railroad grade crossings.

The projects, on which these crossings have been or will shortly be eliminated, are all those which have been initiated since 1921, aggregating 48,000 miles. Before the improvement which has been completed or planned, there were 5,635 grade crossings on these highways. This number has been reduced to 2,517; and the resulting improvement in safety of transportation is even greater than the mere reduction in numbers of hazards indicated, since, on the whole, it is the more dangerous crossings that have been eliminated.

Of the 3,118 crossings thus removed from the path of highway users, 1,966 have been eliminated by the construction of grade-separating structures, and the remaining 1,152 have been avoided by relocation of the highway.

What has been accomplished in each of the States - the number of crossings on the roads before improvement, and the numbers eliminated by structures and relocation - is shown in the following table. It will be noted that, in each case, the data are tabulated separately for primary and secondary routes of the Federal-aid system.

ELIMINATION OF RAILROAD GRADE CROSSINGS WITH FEDERAL AID, FROM NOVEMBER 9, 1921 TO NOVEMBER 11, 1927

STATE	NUMBER OF GRADE CROSSINGS BEFORE FEDERAL-AID IMPROVEMENT		NUMBER OF GRADE CROSSINGS ELIMINATED BY STRUCTURES		NUMBER OF GRADE CROSSINGS ELIMINATED BY RELOCATION OF ROADS	
	PRIMARY ROADS	SECONDARY ROADS	PRIMARY ROADS	SECONDARY ROADS	PRIMARY ROADS	SECONDARY ROADS
ALABAMA	84	54	40	29	28	20
ARIZONA	8	26	0	7	0	5
ARKANSAS	54	66	5	4	0	2
CALIFORNIA	66	17	38	3	14	2
COLORADO	55	23	24	6	12	6
CONNECTICUT	10	2	4	2	0	0
DELAWARE	4	12	0	0	0	0
FLORIDA	18	10	3	4	1	0
GEORGIA	121	180	37	116	23	99
HAWAII	1	7	0	4	0	4
IDAHO	59	8	30	1	18	1
ILLINOIS	103	87	10	12	3	7
INDIANA	68	17	7	3	2	1
IOWA	119	91	54	32	30	17
KANSAS	141	89	24	29	13	16
KENTUCKY	58	56	17	11	7	7
LOUISIANA	45	67	11	9	7	6
MAINE	18	38	8	13	6	10
MARYLAND	8	9	2	5	0	2
MASSACHUSETTS	34	17	7	3	2	1
MICHIGAN	77	41	19	9	6	5
MINNESOTA	188	112	83	40	53	22
MISSISSIPPI	64	73	32	15	14	8
MISSOURI	114	59	28	9	14	2
MONTANA	55	43	27	25	19	22
NEBRASKA	119	118	31	22	24	16
NEVADA	31	19	23	7	14	6
NEW HAMPSHIRE	11	29	5	7	0	4
NEW JERSEY	31	22	13	4	8	1
NEW MEXICO	15	31	3	13	0	10
NEW YORK	58	82	19	19	5	10
NORTH CAROLINA	75	62	42	25	12	17
NORTH DAKOTA	107	98	30	4	13	3

(CONTINUED FROM PRECEDING PAGE)

STATE	NUMBER OF GRADE CROSSINGS BEFORE FEDERAL-AID IMPROVEMENT		NUMBER OF GRADE CROSSINGS ELIMINATED BY STRUCTURES		NUMBER OF GRADE CROSSINGS ELIMINATED BY RELOCATION OF ROADS	
	PRIMARY ROADS	SECONDARY ROADS	PRIMARY ROADS	SECONDARY ROADS	PRIMARY ROADS	SECONDARY ROADS
OHIO	81	89	18	20	9	15
OKLAHOMA	42	78	12	27	2	13
OREGON	22	16	14	1	8	0
PENNSYLVANIA	103	96	36	37	19	24
RHODE ISLAND	6	10	3	1	0	0
SOUTH CAROLINA	142	77	77	27	66	17
SOUTH DAKOTA	82	84	28	9	14	9
TENNESSEE	45	25	15	10	1	5
TEXAS	180	263	82	139	14	106
UTAH	28	25	22	6	16	4
VERMONT	9	17	7	3	6	2
VIRGINIA	51	44	26	21	13	8
WASHINGTON	49	21	23	5	9	4
WEST VIRGINIA	29	27	10	10	3	7
WISCONSIN	99	64	51	33	33	26
WYOMING	26	21	12	13	6	13
TOTAL	3,013	2,622	1,112	854	567	585
GRAND TOTAL	5,635		1,966		1,152	

BURLAP CONCRETE-PAVEMENT COVERING SPREAD BY MECHANICALLY-OPERATED ROLL

COMPILED FROM A REPORT SUBMITTED BY C. A. WELTON OF DISTRICT 5.

A MECHANICALLY-OPERATED ROLL FOR SPREADING THE BURLAP COVERING, DURING THE CURING PERIOD, WAS USED, IN THE CONSTRUCTION OF THE CEMENT CONCRETE PAVEMENT ON MISSOURI FEDERAL-AID PROJECT 233-C G. THE CONTRIVANCE, WHICH IS SHOWN IN THE ATTACHED ILLUSTRATION, WAS DEVISED BY A MEMBER OF THE CONTRACTING FIRM AND CONSISTS OF A REVOLVING STEEL CYLINDER SUPPORTED UPON A STEEL FRAME THAT IS MOUNTED ON FOUR WHEELS RUNNING UPON THE TOP OF THE SIDE FORMS.

THE HOLLOW STEEL ROLL IS 19 FEET LONG BY 12 INCHES IN DIAMETER. THE FRAME WAS FABRICATED FROM SMALL, ANGLE AND FLAT BAR STEEL. THE ROLL IS ROTATED AND THE FORWARD MOVEMENT OF THE FRAME IS ACCOMPLISHED BY A HAND-OPERATED WINCH CONNECTED THROUGH CHAINS, SPROCKETS, AND GEARS TO THE ROLL AND THE WHEELS. THE ENTIRE CONTRIVANCE WEIGHED ABOUT 400 POUNDS AND COULD BE KNOCKED DOWN FOR CONVENIENT SHIPMENT.

AS THE MACHINE IS MOVED FORWARD THE BURLAP COVERING IS SPREAD AND REWINDING IS ACCOMPLISHED BY THE REVERSE MOVEMENT. THE CYLINDER HOLDS ABOUT 1,200 LINEAL FEET OF COVER MATERIAL. THE BURLAP IS WOUND ON THE CYLINDER AFTER THE ORIGINAL STRIPS HAVE BEEN SEWED TOGETHER INTO A SHEET 18-1/2 FEET WIDE AND OF THE REQUIRED LENGTH. AS SOON AS THE CONCRETE HAS HARDENED SUFFICIENTLY, TWO MEN PUSH THE MACHINE FORWARD AND UNROLL THE BURLAP COVERING SMOOTHLY AND EVENLY UPON THE NEWLY-LAID SURFACE.

THE FOLLOWING ADVANTAGES OF THE MACHINE OVER THE MANUAL PLACING OF THE BURLAP ARE NOTED:

1.- SPEED IN COVERING AND REMOVING BURLAP.

2.- ELIMINATES THE NECESSITY OF OVERLAPPING THE BURLAP STRIPS AND THEREBY REDUCES THE AMOUNT REQUIRED.

3.- SINGLE SHEET OF BURLAP IS LESS EASILY DISTURBED BY THE WIND THAN THE STRIPS. THIS ELIMINATES THE PROBABILITY OF THE TOO RAPID DRYING ON UNCOVERED AREAS.

4.- PROVIDES FOR IMMEDIATE COVERING OF THE SLAB SO AS TO PREVENT TOO RAPID DEHYDRATION OF THE CONCRETE. DIFFICULTY IN THIS RESPECT IS OFTEN ENCOUNTERED WITH THE HAND-PLACED BURLAP STRIPS.

The mechanically-operated roll in position on the steel side forms. In this case about 500 lineal feet of burlap covering remains on the cylinder

ORD FINISHER USED FOR SHAPING BITUMINOUS SURFACING

Compiled from Reports Submitted by V. G. Watson, and C. F. Rogers
of the Division of Control

(Not for release)

The use of an Ord concrete-pavement finishing machine for shaping the surface of an asphaltic concrete pavement, prior to the rolling operation, is believed to be a novel departure from the commonly accepted methods of bituminous pavement construction. The process, which is illustrated in the accompanying photographs, was devised by Superintendent Holstrom of the Griffith Company, on their county-road contract near Placentia, Orange County, Calif. An unaltered Ord concrete finishing machine was used throughout this project with such success that it attracted the attention of highway engineers of the State.

Believing that a modification of the machine would expedite the construction of the bituminous surfacing on Federal-aid project 161-E at Formosa, Calif.; the State Highway Commission bought a new machine and remodeled it in the Sacramento shops. Although the reconstructed finisher is still in the experimental stage, it produces a smoother surface than it has been possible to obtain by the customary hand-raking method. The vialog reading on the first half-mile of machine-finished pavement - in spite of the experimentation and frequent adjustments of the device - was found to be 9.5. This establishes a new low record for the smoothness of asphaltic concrete pavement in the State. The average for all other roads of the type built in 1926 being 22.0, and the lowest previous record 15.0.

In rebuilding the machine, the side frame was lengthened 1½ feet, as shown in Figure 1, and the rear wheels were moved back until they supported the ends of the extended frame. Then the rear screed was placed in the position formerly occupied by the back wheels, and in its original position there was suspended a framework carrying raking teeth set in two rows 7½ inches apart with 3 inches between adjacent teeth in each row. The teeth were made of 7/8-inch square steel and each was tapered to a 45-degree angle on the side toward the rear. Finally, in order to convert the screeds into striking templates, 1½-inch plates were placed under the two ends of each where they would ride the forms, and iron plates extending 1½ inches below the bottoms of the original screeds were bolted to their vertical faces. These vertical plates thus constituted the striking templates.

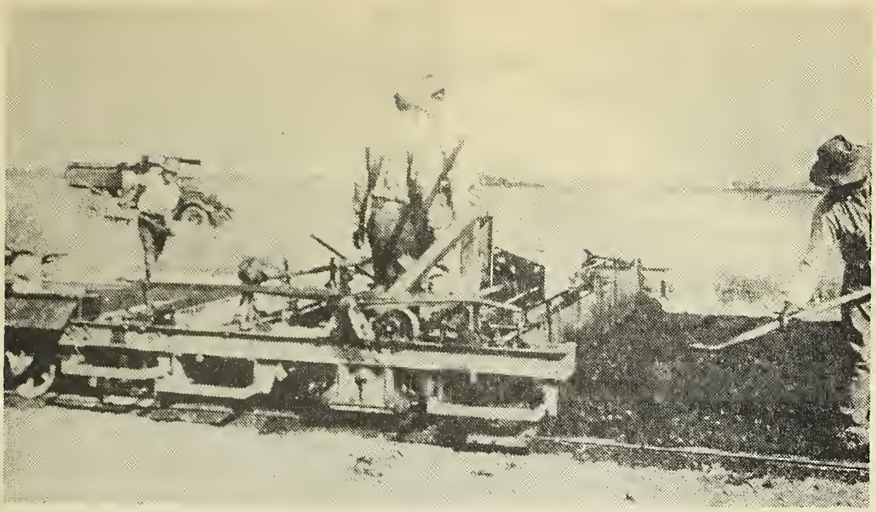


Figure 1. - Close-up view of the remodeled concrete-finishing machine

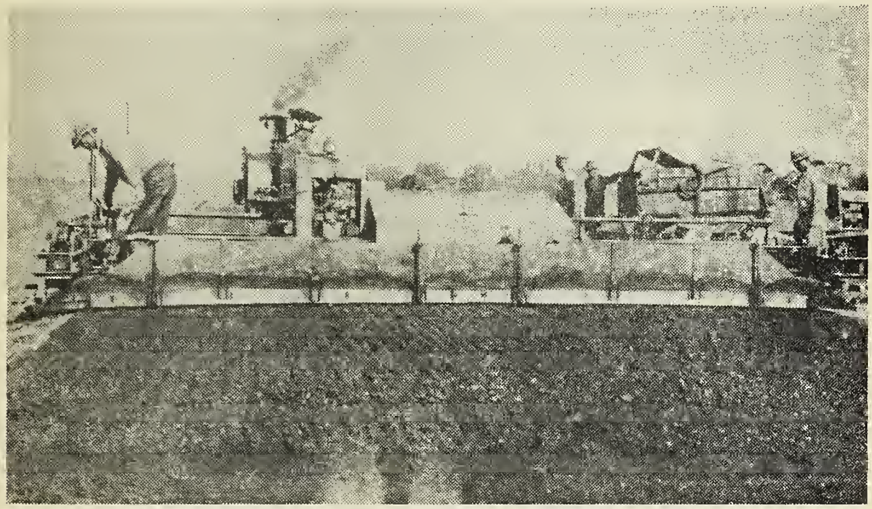


Figure 2. - A view of the front of the machine' showing the extension plate on the front screed

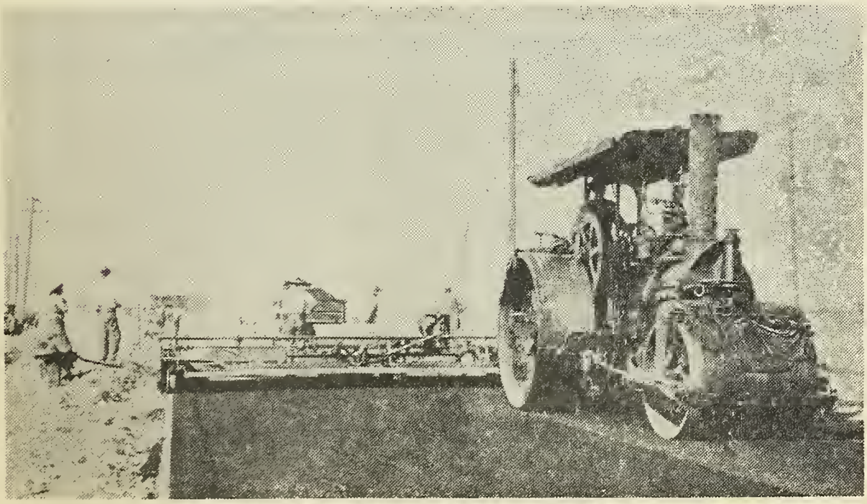


Figure 3. - The leveling course remains high near the side forms because of the sidewise motion of the screed

THE FIRST TRIAL WAS MADE ON THE LEVELLING COURSE OF A PAVEMENT, USING THE FRONT AND REAR SCREEDS BOTH SET TO STRIKE OFF THE MATERIAL FLUSH WITH THE TOP OF THE FORMS, WITH THE RAKE BETWEEN THEM, THE PURPOSE OF THE LATTER BEING TO LOOSEN TRAMPLED MATERIAL AND EFFECT A MORE UNIFORM DISTRIBUTION.

IT WAS FOUND AT ONCE THAT THE THREE-INCH SPACING OF THE RAKE TEETH WAS TOO CLOSE. THE RAKE SIMPLY CARRIED ALL THE MATERIAL AHEAD OF IT. ACCORDINGLY EVERY OTHER TOOTH IN BOTH ROWS WAS TAKEN OUT AND THIS DIFFICULTY WAS LARGELY OVERCOME.

THE NEXT DEFECT CAME TO LIGHT WHEN THE LEVELLING COURSE WAS ROLLED AND IT WAS FOUND TO BE IMPOSSIBLE TO COMPRESS THE MATERIAL, WHICH HAD BEEN STRUCK OFF FLUSH WITH THE FORMS, SUFFICIENTLY TO PROVIDE FOR A $1\frac{1}{2}$-INCH TOP COURSE. THIS DIFFICULTY WAS OVERCOME BY ABANDONING THE RAKE AND REAR SCREED IN THE LEVELLING-COURSE TREATMENT, AND ALTERING THE FRONT SCREED SO AS TO STRIKE-OFF THE MATERIAL THREE-QUARTERS OF AN INCH BELOW THE FORMS. THIS WAS DONE BY ADDING AN EXTENSION PLATE, WHICH WAS MADE ADJUSTABLE IN ORDER THAT THE SCREED COULD ALSO BE USED ON THE SURFACE COURSE. THE ADJUSTMENT WAS EFFECTED BY PROVIDING FOUR THREADED BOLTS WITH WHICH TO RAISE AND LOWER THE EXTENSION PLATE AND FOUR GUIDES WITH WHICH TO KEEP IT RIGIDLY IN POSITION WHEN IN USE. (SEE FIG. 2)

WHEN USED FOR SPREADING THE TOP COURSE IT WAS NECESSARY TO RAISE THE HEIGHT OF THE FORMS BY NAILING TO THEM 1/2-INCH PLATES, IN ORDER TO PROVIDE FOR COMPRESSION UNDER THE ROLLER.

ON THE WORK DONE THUS FAR, BOTH SCREEDS AND THE RAKE HAVE BEEN USED ON THE SURFACE COURSE; BUT IT IS A QUESTION WHETHER THE RAKE SHOULD NOT BE ABANDONED ALTOGETHER. ONE OBJECTION TO IT IS THAT IT LEAVES MARKS WHICH ARE VISIBLE IN THE COMPLETED PAVEMENT; ALTHOUGH A CLOSE EXAMINATION FAILS TO SHOW THAT ANY DEPRESSION REMAINS AFTER ROLLING. AS NEARLY AS CAN BE DETERMINED THESE MARKS ARE THE RESULT OF A SEGREGATION OF THE MATERIAL, THERE BEING A TENDENCY FOR THE COARSER MATERIAL TO FALL INTO THE GROOVES LEFT BY THE TEETH. A FURTHER OBJECTION IS THAT THE RAKE RETARDS THE FORWARD MOTION OF THE MACHINE; AND THIS IS PARTICULARLY SERIOUS IN DEALING WITH THE TOP COURSE BECAUSE OF THE LARGE AREA OVER WHICH A LOAD OF THE HOT MATERIAL MUST BE DISTRIBUTED. AS WITH REASONABLE CARE, IT MAY APPARENTLY BE POSSIBLE TO OBTAIN A SMOOTHNESS OF 12, AS MEASURED WITH THE VIALOG, AND AS THIS IS LOWER THAN THE RECORD OF 15 OBTAINED WITH HAND METHODS, THERE IS SOME QUESTION,

AS STATED ABOVE, WHETHER THE BENEFITS OF THE RAKING FROM THE STANDPOINT OF SMOOTHNESS ARE WORTH WHAT THEY COST IN DELAYED OPERATION.

ONE OTHER DEFECT WHICH HAS NOT YET BEEN ELIMINATED IS ILLUSTRATED IN FIGURE 3. IT WILL BE OBSERVED THAT THE LEVELLING COURSE, WHICH IS SHOWN IN THE PHOTOGRAPH AFTER PASSAGE OF THE MACHINE, IS LEFT HIGH AT THE EDGES. THIS OCCURS ONLY IN THE DISTRIBUTION OF THE LEVELLING COURSE, AND IS CAUSED BY THE FACT THAT THE LENGTH OF THE EXTENSION PLATE ON THE FRONT SCREED MUST BE LESS THAN THE DISTANCE BETWEEN THE FORMS BY AN AMOUNT SUFFICIENT TO PERMIT THE SIDEWISE MOTION OF THE SCREED. THE RESULT IS THAT WHEN THE SCREED MOVES AWAY FROM ONE SIDE OF THE ROAD IT LEAVES BEHIND IT NEXT TO THE FORMS A ROW OF MATERIAL WHICH IS STRUCK DOWN TO THE LEVEL OF THE FORMS BY THE HORIZONTAL $1\frac{1}{2}$-INCH BEARING PLATE AS IT PASSES OVER. AS YET NO MEANS HAVE BEEN DEVISED TO OVERCOME THIS DEFECT.

JOHN G. ROSE

(Not for release)

John G. Rose, assistant highway engineer in District 3, died at 12:30 A.M., Friday, October 28, 1927, at the St. Luke's Hospital in Denver, Colo., following an operation for appendicitis. It is possible that the attack was brought on by two automobile accidents in which he had the misfortune to participate, on Saturday and Sunday October 23 and 24, while on a Federal-aid road inspection trip. Returning to Denver from Cheyenne, Wyo., - near where the last accident occurred - Mr. Rose was taken with an acute attack of appendicitis at 2:00 A.M. Monday morning and was hurried to the St. Luke's Hospital, where an operation was performed nine hours later. He never rallied from the severe operation and passed away at 12:30 A.M., Friday morning. He had been suffering for some time with intermittent appendicitis and it is probable that the shock of the accidents so aggravated his condition as to cause his immediate death.

John G. Rose was born at Hutchinson, Kans., on April 14, 1878, and after the usual elementary schooling was graduated from the scientific course of Nickerson College, with the degree of B.A., in 1903. In 1911, he received a B.S. in C.E. degree from the University of Colorado. After the customary miscellaneous engineering experience - the most important engagements being with the Atchison, Topeka and Santa Fe Railway and the U.S. Reclamation Service - he entered the Bureau, in April 1919, as a Chief of Road Survey Party. His early activities with our organization included forest and Federal-aid road work. Because of his thoroughness and accuracy with regard to details, he was promoted, in January 1923, to the position of materials engineer in District 3 and in June, 1924, was given the title of Assistant Highway Engineer. In preparation for the materials assignment, he was detailed to the headquarters office for two weeks during the early part of 1923, in order to become familiar with the procedure developed by the Division of Tests.

Mr. Rose leaves behind him a wide circle of friends who will always remember his quiet, genial personality. He was given a Masonic burial by his Denver lodge - Union No. 7 - of the order of Ancient Free and Accepted Masons. He is survived by his wife and four children.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

B.P.R.-F.A.-A-1
16-October 1927 - A-1

STATUS OF CURRENT FEDERAL AID ROAD WORK

FOR THE FISCAL YEAR ENDING JUNE 30, 1928

AS OF OCTOBER 31, 1927

STATES	BALANCE OF FEDERAL AID FUND AVAILABLE FOR NEW PROJECTS	* UNDER CONSTRUCTION			APPROVED FOR CONSTRUCTION			AMOUNT PAID STATES DURING FISCAL YEAR	COMPLETED AND PAID DURING FISCAL YEAR			AGREEMENTS NOW IN FORCE			P. S. & E. RECOMMENDED FOR APPROVAL BY DISTRICT ENGINEER			STATES
		Federal Aid	Mileage		Federal Aid	Mileage			Federal Aid	Mileage		Federal Aid	Mileage		Federal Aid	Mileage		
			Original	Stage		Original	Stage			Original	Stage		Original	Stage		Original	Stage	
ALABAMA	$ 2,224,191.39	$ 4,016,666.59	469.4	1.9	$			$ 827,961.54	$ 46,723.98	0.2		$ 3,291,448.96	406.2	1.6	$ 735,210.73	53.2		ALABAMA
ARIZONA	2,928,204.24	1,299,686.44	67.7	4.4	17,264.44	0.3	0.6	153,741.13	192,919.61	14.1		1,088,686.44	67.7	4.4	17,264.44	0.3	0.6	ARIZONA
ARKANSAS	1,232,561.25	1,880,883.63	223.6		156,899.73	7.3		18,654.41	26,122.64	0.1		1,643,259.09	230.8		396,534.27	0.4		ARKANSAS
CALIFORNIA	3,371,134.93	3,390,067.88	148.6	0.4	17,486.53	0.1		718,998.32	610,515.86	49.3		3,068,231.71	130.5	0.4	339,312.68	18.2		CALIFORNIA
COLORADO	2,449,713.61	3,246,327.97	264.8	12.4	24,498.97	3.2		422,732.54	48,486.64	0.6		3,009,264.32	262.9	9.2	260,562.52	25.1	3.2	COLORADO
CONNECTICUT	395,795.63	1,460,489.75	61.9		150,731.24	7.0		144,837.91	355,549.84	17.7		1,401,039.20	58.7		210,181.79	11.0		CONNECTICUT
DELAWARE	7,919.16	385,371.18	31.1	2.1				126,920.22	126,920.22	14.6		295,434.18	26.7		68,937.00	4.4	2.1	DELAWARE
FLORIDA	790,769.66	2,361,795.95	176.3		289,730.00	18.0		537,116.01	734,206.79	32.7	24.7	3,241,414.53	170.0		590,101.42	24.3		FLORIDA
GEORGIA	229,475.96	3,215,866.71	223.9	77.3	30,152.85	0.1		955,658.28	1,834,341.18	153.2	63.6	3,048,355.57	206.4	77.3	200,746.99	18.6		GEORGIA
IDAHO	26,427.80	1,465,082.31	154.8	44.2	562,232.94	66.9	34.5	558,182.13	155,549.79	57.4		1,344,512.35	146.3	24.4	682,802.90	75.4	54.3	IDAHO
ILLINOIS	1,874,714.36	7,087,767.86	507.3		1,462,638.16	102.4	2.3	1,387,895.81				6,274,797.37	485.7		2,256,598.64	144.0	2.3	ILLINOIS
INDIANA	454,558.31	8,184,818.48	518.8		241,195.05	32.2	0.6	947,831.49	211,984.75	13.3		[illegible]654,025.32	487.7		771,998.22	63.3	0.6	INDIANA
IOWA	71,264.64	8,475,755.95	801.4	236.6	91,390.58	6.9	2.9	1,170,338.96	436,539.00	114.3	[illegible]	6,371,148.61	507.0	225.6	196,008.00		12.2	IOWA
KANSAS	202,745.92	6,022,427.83	807.0	14.8	130,280.53	47.8		1,002,290.67	366,559.34	35.6		5,595,403.15	766.0	14.2	617,306.21	89.6	0.3	KANSAS
KENTUCKY	14,774.97	4,758,677.05	434.7	77.8	94,611.10	9.2	1.8	355,457.82	262,003.09	27.5		4,426,953.39	412.4	57.8	416,329.80	31.5	21.8	KENTUCKY
LOUISIANA	257,968.40	1,530,288.40	96.6	7.5	961,255.78	76.4		301,121.29	442,315.21	37.9		1,500,464.24	95.6	7.6	991,077.94	78.4		LOUISIANA
MAINE	1,066,929.74	689,118.44	48.0		196,499.27	16.9		155,765.35	346,521.96	33.2		801,639.44	58.1		82,978.27	8.8		MAINE
MARYLAND	8,352.09	1,026,865.64	104.6					93,138.35				829,865.64	82.6		197,000.00	21.7		MARYLAND
MASSACHUSETTS	1,753,808.66	1,749,024.45	107.7		70,800.00	4.7		159,254.74	159,724.74	9.5		1,483,125.51	[illegible]		335,698.94	22.1		MASSACHUSETTS
MICHIGAN	552,270.93	6,794,274.75	412.4	12.6	700,394.50	33.7	6.5	1,299,593.48	[illegible]	31.6		5,072,269.35	346.[illegible]	12.6	2,422,395.90	105.2	6.5	MICHIGAN
MINNESOTA	112,876.43	2,339,298.90	390.4	107.5	21,000.00	46.3		1,155,209.67	193,[illegible].00	25.5	8.2	1,932,538.90	368.4	107.5	427,800.00	58.3		MINNESOTA
MISSISSIPPI	632,933.92	3,118,235.78	340.2	27.0	137,547.93	23.4		841,937.55	[illegible]	63.5		2,843,594.39	315.2	15.1	426,089.32	49.4	11.9	MISSISSIPPI
MISSOURI	398,064.26	3,912,657.34	286.4	37.7				633,157.25	[illegible]	78.3	6.7	3,369,749.46	262.8	27.6	542,907.88	23.6	11.2	MISSOURI
MONTANA	4,063,729.20	2,425,302.79	254.6	7.5	1,047,186.66	195.4	4.3	594,841.70	152,[illegible].59	25.3	1.6	3,305,320.24	430.6	7.5	166,163.20	23.4	4.3	MONTANA
NEBRASKA	415,095.34	6,646,819.21	1,334.9	592.8	396,795.25	73.8	90.9	1,095,271.53	1,022,[illegible]	209.1	224.4	6,323,581.23	1,230.9	563.8	718,932.23	117.8	119.9	NEBRASKA
NEVADA	218,538.25	1,468,560.08	171.5	31.9	279,239.82	17.8		237,351.42	146,[illegible].20	49.5	5.6	1,534,581.88	179.9	31.0	213,217.99	9.5		NEVADA
NEW HAMPSHIRE	3,131.53	662,133.16	45.0		28,110.00	1.9		22,226.97	55,814.27	4.4		635,407.14	42.0		54,836.01	4.9		NEW HAMPSHIRE
NEW JERSEY	2.96	1,544,398.66	100.8					362,285.00	362,255.00	24.2		1,442,176.56	94.1		101,220.00	6.7		NEW JERSEY
NEW MEXICO	1,519,256.49	2,486,129.33	233.7					797,352.86	[illegible]	19.1		2,486,129.33	233.7					NEW MEXICO
NEW YORK	3,313,029.56	10,452,378.95	656.1		1,399,347.80	89.2	8.6	1,861,388.62	155,7[illegible].34	56.2		11,601,433.95	722.5		246,292.50	12.8	8.6	NEW YORK
NORTH CAROLINA	565,245.17	1,740,015.62	97.1	36.9	121,500.00	21.0		731,567.10	454,948.15	36.2		1,355,108.32	66.8	28.8	506,407.20	52.3	7.1	NORTH CAROLINA
NORTH DAKOTA	126,035.01	2,733,483.81	865.4	359.6	215,663.74	67.1	72.2	530,126.54	1,056,133.96	166.2	56.2	2,419,149.48	856.9	346.8	529,997.87	79.6	84.9	NORTH DAKOTA
OHIO	2,333,076.18	4,644,337.74	335.4	4.2	1,442,248.00	79.2		306,153.13	543,969.36	41.3		3,921,097.74	292.7	4.2	2,365,486.00	121.9		OHIO
OKLAHOMA	152,872.84	1,863,108.24	308.4	13.8	1,308,471.72	131.1	11.3	522,587.13	372,754.99	9.6	17.3	1,638,774.16	284.4	20.7	1,522,886.80	155.1	4.4	OKLAHOMA
OREGON	523,474.31	1,292,493.27	74.1	36.0	111,744.98	4.8		227,[illegible]	92,383.50	0.2		1,404,238.25	78.9	35.8				OREGON
PENNSYLVANIA	1,[illegible]6,359.34	5,927,068.82	372.2	3.0	765,467.49	39.8	3.2	1,365,021.11	577,970.63	45.1		5,663,108.59	354.9		1,029,417.72	57.1	6.2	PENNSYLVANIA
RHODE ISLAND	425,707.53	332,349.74	21.2		128,538.67	7.6		148,020.00	148,320.00	9.9		355,103.74	22.7		105,883.67	6.1		RHODE ISLAND
SOUTH CAROLINA	114,247.80	2,387,480.78	251.2	93.8	65,989.94	5.2	21.2	444,365.71	151,794.70	19.3	5.5	2,092,343.06	159.6	24.4	361,137.64	56.8	90.6	SOUTH CAROLINA
SOUTH DAKOTA	9,333.67	2,446,193.10	734.8	113.4	250,058.06	99.2	83.6	324,994.51	61,737.63	44.1		2,492,726.60	760.8	173.4	205,530.36	72.9	23.6	SOUTH DAKOTA
TENNESSEE	479,135.74	3,955,685.21	243.8	33.7	276,334.83	25.7		474,450.[illegible]	632,743.67	24.5	26.6	2,619,347.81	178.4	33.7	1,412,672.23	91.1		TENNESSEE
TEXAS	3,340,626.88	6,868,382.98	433.8	192.8	1,873,874.85	137.7	128.5	1,557,094.16	2,453,957.84	187.6	81.4	5,390,533.85	416.5	184.4	2,351,723.98	155.0	136.9	TEXAS
UTAH	197,867.30	2,005,007.34	180.5	3.4	397,593.56	37.9	11.1	359,657.65	290,136.85	35.9		1,993,449.62	192.5		409,151.28	25.9	14.5	UTAH
VERMONT	12,487.93	1,003,794.57	59.7					352,403.15	268,933.49	11.9		1,002,699.05	59.7		1,036.52			VERMONT
VIRGINIA	16,846.98	2,193,151.16	117.3	4.0	79,535.23	6.0		549,460.34	117,551.38	8.2		2,232,952.67	120.3	4.0	39,733.72	2.0		VIRGINIA
WASHINGTON	735,419.73	1,330,606.00	65.5		489,000.00	58.6		143,063.52	415,736.32	5.3		1,425,606.00	76.6		394,000.00	48.3		WASHINGTON
WEST VIRGINIA	25,189.72	2,929,734.08	238.2	12.0	617,476.22	48.7	7.1					3,226,456.24	266.2	12.0	320,754.03	20.7	7.1	WEST VIRGINIA
WISCONSIN	1,978,747.6[illegible]	4,279,049.97	331.9	43.1	140,000.00	11.5		1,133,239.86	1,053,613.32	111.7	0.9	3,903,569.42	291.7	39.7	515,480.5[illegible]	51.[illegible]	3.4	WISCONSIN
WYOMING	227,560.00	1,862,296.04	224.1	119.1	127,616.10	35.1		411,715.91	143,801.81	24.3		1,795,196.56	227.1	119.1	194,717.[illegible]	32.1		WYOMING
HAWAII *	805,978.36	491,922.64	25.0					138,238.58	70,440.00	4.7		491,922.64	25.0					HAWAII
TOTALS	44,158,351.25	152,542,490.20	14,168.7	2,361.6	16,945,502.19	1,700.6	490.8	30,585,859.91	20,845,365.12	2,014.4	533.3	142,534,620.45	13,722.8	2,214.9	26,953,37[illegible].94	2,146.5	637.6	TOTALS

* Includes projects reported completed (Final vouchers not yet paid) totaling - Federal aid $50,334,503.28 - Mileage. Original 4,703.1 - Stage 956.2