

HIGHWAYS IN THE MAKING

A PAPER DELIVERED BY THOS. H. MACDONALD,
CHIEF OF THE BUREAU OF PUBLIC ROADS,
BEFORE THE
SIXTH ANNUAL PAVING CONFERENCE,
HELD AT ATLANTA, GEORGIA,
FROM
NOV. 28 TO DEC. 2, 1927.

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THERE ARE MANY PUBLIC ISSUES MERITING ATTENTION AND EQUITABLE ADJUSTMENT. A NUMBER OF THESE HAVE THE CHARACTER OF PUBLIC WORKS. DUE TO UNPRECEDENTED FLOODS, THE DEVASTATION OF BOTH PRIVATE AND PUBLIC PROPERTY, AND THE DESOLATION AND LOSS OF HUMAN LIFE, FLOOD CONTROL AND REHABILITATION IN BOTH THE MISSISSIPPI VALLEY AND THE NORTHEASTERN STATES, PARTICULARLY THE STATES OF VERMONT AND NEW HAMPSHIRE, ARE PROBLEMS OF FIRST IMPORTANCE. WATERWAY DEVELOPMENT SEEKS ADEQUATE ATTENTION. IN THE FIELD OF ECONOMIC ADJUSTMENT THE PROBLEMS OF TAXES AND TAX REDUCTION, OF INCOME FOR PUBLIC PURPOSES, AND OF AGRICULTURAL RELIEF, ALL HAVE A BACKGROUND OF SERIOUS IMPORT TO THE WELFARE AND PROSPERITY OF THE COUNTRY. HERE ARE ONLY A FEW OF THE MAJOR GROUPS OF PROBLEMS WITH WHICH THE FEDERAL AND STATE LEGISLATIVE BODIES, AND THE PUBLIC EXECUTIVES, MUST DEAL WISELY.

FOR THE PAST EIGHT YEARS HIGHWAY BUILDING HAS BEEN THE GREATEST SINGLE PUBLIC ACTIVITY IN THE UNITED STATES. THE EXPENDITURE FROM LOCAL, STATE AND FEDERAL FUNDS HAS TOTALED ANNUALLY ABOUT ONE BILLION DOLLARS. THIS FACT IS GENERALLY UNDERSTOOD, BUT MANY OTHER FACTS HAVING A VERY PERTINENT BEARING UPON THE WHOLE MATTER OF THE HIGHWAY FINANCIAL PROGRAM, ARE NOT SO GENERALLY UNDERSTOOD. SINCE PROVISION HAS BEEN MADE FOR THE CONTINUANCE OF THE FEDERAL-AID PROGRAM FOR THE NEXT FISCAL YEAR ONLY, AND THE MATTER OF THE FUTURE OF THE FEDERAL HIGHWAY PROGRAM COMES AGAIN BEFORE THE CONGRESS THIS WINTER, IT IS TIMELY TO PRESENT A RESUME OF PROGRESS AND SOME OF THE FACTS, BOTH OF THE FINANCES REQUIRED AND OF THE UTILIZATION OF HIGHWAY TRANSPORT, WHICH ARE DETERMINING FACTORS IN FUTURE POLICIES.

THERE IS, AT THE OUTSET, NO CONFLICT BETWEEN THE PUBLIC PROBLEMS HERE MENTIONED AND A CONTINUANCE OF THE GENERAL HIGHWAY PROGRAM, BUT PARTICULARLY THAT PORTION OF THE PROGRAM DIRECTED BY THE STATE HIGHWAY DEPARTMENTS. RATHER, A CLOSE RELATIONSHIP

EXISTS BETWEEN HIGHWAY IMPROVEMENT AND SOME OF THESE IMPORTANT PROBLEMS. IN THE FLOODED AREA OF THE MISSISSIPPI VALLEY AND THE NEW ENGLAND STATES, THE GREATEST PUBLIC LOSS HAS BEEN THE DAMAGE TO HIGHWAYS AND BRIDGES. VERMONT IS ONE OF THE SMALLEST STATES. ITS TOTAL AREA IS 9,124 SQUARE MILES. ONLY SIX STATES HAVE SMALLER AREAS. ONLY FOUR HAVE SMALLER POPULATIONS. YET THE PRELIMINARY ESTIMATE OF THE STANDARD CONSTRUCTION REPLACEMENT COSTS OF ROADS AND BRIDGES DAMAGED AND DESTROYED BY THE RECENT FLOODS, IS ABOUT \$7,500,000. IN PASSING, IT STRENGTHENS OUR CONFIDENCE IN THE ABILITY OF MODERN HIGHWAY CONSTRUCTION TO WITHSTAND THESE UNPRECEDENTED FLOOD CONDITIONS, TO KNOW THERE ARE 218 MILES OF COMPLETED FEDERAL-AID PROJECTS IN VERMONT, BUILT AT A COST OF APPROXIMATELY \$5,000,000. THE CONTRIBUTION FROM FEDERAL FUNDS WAS ABOUT \$2,900,000. THE PRELIMINARY ESTIMATE OF LOSS ON THESE PROJECTS IS, FIVE BRIDGES, FOR WHICH THE TOTAL FEDERAL-AID CONTRIBUTION WAS \$85,000, AND DAMAGE TO ROADS OF ABOUT \$65,000 FROM FEDERAL FUNDS - TOGETHER, ABOUT \$150,000 OUT OF A TOTAL EXPENDITURE OF \$2,900,000, OR A LOSS AGAINST FEDERAL FUNDS OF APPROXIMATELY 5 PER CENT.

ROADS AND BRIDGES BUILT TO STATE AND FEDERAL STANDARDS IN THE MISSISSIPPI VALLEY WITHSTOOD THE CONTINUOUS FLOODS AND FLOODING REMARKABLY WELL. BUT THESE FACTS ONLY ACCENT THE DIRECT RELATIONSHIP BETWEEN REHABILITATION AND THE BUILDING TO ADEQUATE STANDARDS OF A SUFFICIENT MILEAGE OF HIGHWAYS TO SERVE THE AREA IN THOSE REGIONS WHERE FLOOD CONTROL IS ESSENTIAL. HIGHWAY IMPROVEMENT IN THE DEVASTATED AREAS IS A MAJOR PROBLEM OF REHABILITATION.

PERHAPS THE OUTSTANDING REACTION TO BE OBTAINED FROM A REVIEW OF THE SITUATION IN THESE SORELY AFFLICTED PORTIONS OF THE COUNTRY, OR A CONSIDERATION OF ANY OF THESE OTHER NATIONAL QUESTIONS, IS THE INEVITABLENESS OF THE WORKING OF THE PRINCIPLE OF COMMUNITY INTEREST. THE MORE SECURELY ARE THE COMPONENT PARTS OF THE NATION KNIT TOGETHER, THE MORE ACUTELY IS THE COMMUNITY OF INTERESTS FELT IN ITS EVERY PART. IT IS BECAUSE OF THE CUMULATIVE STRENGTH AND CONTINUING SUPPORT OF COMMUNITY EFFORT THAT LARGE UNDERTAKINGS ARE POSSIBLE. THE ANTITHESIS COULD BE EASILY ILLUSTRATED BY KNOWN PROJECTS OF LARGE DIMENSIONS IN OTHER COUNTRIES WHICH WERE STARTED IN A BIG

WAY BUT WHICH HAVE FAILED FOR WANT OF NATIONAL UNITY. THERE NEED BE NO FEAR OF UNDERTAKING LARGE ENTERPRISES AS COMMUNITY ENTERPRISES PROVIDED ONLY THEY ARE CAREFULLY SCHEDULED AS TO TIMELINESS. THIS SEEMS TO BE THE IMPORTANT CONSIDERATION, AND WHEN THE ANSWER IS IN THE AFFIRMATIVE THERE NEED BE NO FEAR BUT THAT THE NATIONAL SUPPORT WILL FOLLOW AND THE RESULTS WILL ADD SO TREMENDOUSLY TO THE NATIONAL WEALTH THAT THE COST WILL BE EASILY ABSORBED.

THE PROGRESS OF THIS NATION IN BUILDING HIGHWAYS HAS HAD NO PARALLEL IN ALL PAST HISTORY. BUT WE HAVE BEEN ENGAGED IN A BIG WAY LESS THAN A DECADE. THERE ARE MANY TODAY WHO WERE ENGAGED IN THE HIGHWAY FIELD PRIOR TO THE ADVENT OF THE AUTOMOBILE. TWENTY YEARS AGO IMPROVED RURAL HIGHWAYS SEEMED VERY IMPORTANT. THE YEARLY PROGRESS TOWARD BETTER ROADS THEN SEEMED SLOW AND INADEQUATE. IT IS UNDOUBTEDLY TRUE THAT LARGER SUMS MIGHT WELL HAVE BEEN EXPENDED AND CERTAINLY, AFTER THE EXPERIENCE OF TWO DECADES, IT WOULD BE POSSIBLE TO UTILIZE THE FUNDS TO BETTER ADVANTAGE. BUT ON THE WHOLE WE WERE THEN BUILDING AND MAKING FAIR PROGRESS IN IMPROVING THE TYPES AND MILEAGES OF ROADS THAT COULD BE UTILIZED. IT WAS A FAVORED ARGUMENT FOR GOOD ROADS THAT IN EARLIER TIMES OTHER NATIONS HAD BUILT EXTENSIVE SYSTEMS OF IMPROVED ROADS. PROBABLY MORE FREQUENT REFERENCE HAS BEEN MADE IN HIGHWAY LITERATURE TO THE EARLY ROMAN ROADS THAN TO ANY OTHER SINGLE TOPIC. AS A MATTER OF FACT, THE SYSTEM OF ROMAN ROADS HAD PRACTICALLY NO BEARING UPON THE SITUATION HERE AFTER THE STAGE COACH DISAPPEARED. THE ROMAN ROADS WERE BUILT FOR SERVING THE INTERNAL TRANSPORTATION NEEDS OF THE ROMAN EMPIRE AND CORRESPONDED TO OUR RAILROADS; WITH THE RAILROADS, SUPPLEMENTED BY THE AVAILABLE WATERWAYS, THERE WAS NO DETERMINING REASON FOR THE NATION TO THROW ITS SUPPORT BEHIND THE BUILDING OF A GREAT NATIONAL SYSTEM OF HIGHWAYS. THE BUILDING OF HIGHWAYS AS A GREAT NATIONAL PROBLEM WAS NOT YET TIMELY.

THROUGHOUT HISTORY HIGHWAY TRANSPORTATION OVER ANY KIND OF ROADS WAS SLOW AND INADEQUATE, BASED ON MODERN STANDARDS, BECAUSE OF ITS DEPENDENCE UPON MUSCULAR POWER. OUR KNOWLEDGE OF HISTORY GOES BACK PERHAPS 4,000 YEARS B.C. THERE ARE EVIDENCES OF CENTURIES UPON CENTURIES BEFORE. ADD TO THIS 1927 YEARS MORE AND OUR RANGE OF MORE OR LESS CERTAIN KNOWLEDGE COVERS 5,000 YEARS.

IN ALL OF THIS TIME, EXCEPT FOR LESS THAN 20 YEARS, THE SERVICEABILITY OF HIGHWAYS WAS DEPENDENT UPON MUSCULAR POWER AND THE DAILY RANGE IN MILEAGE THIS KIND OF POWER GAVE THE INDIVIDUAL. THE CHANGE HAS BEEN TOO ABRUPT FOR US TO COMPREHEND FULLY THE DIFFERENCE IN THE UTILIZATION OF HIGHWAYS BEFORE THE COMING OF THE MECHANICAL POWER, AND AFTER. THE MOTOR VEHICLE IS NOW RESPONSIBLE FOR THE VALUE OF HIGHWAYS TO THE NATION BECAUSE OF THEIR INCREASED POTENTIAL AND ACTUAL UTILITY, AND THE OPERATION OF THE MOTOR VEHICLE IS DEPENDENT IN TURN UPON IMPROVED HIGHWAYS. THE CUMULATIVE LOSS TO THE NATION NOW OF INADEQUATE HIGHWAYS IS PROHIBITIVE. IN THE ADVANCE OF CIVILIZATION THE BUILDING OF IMPROVED HIGHWAYS AS A NATIONAL NECESSITY HAS BECOME TIMELY.

THIS DISCUSSION MAY SEEM TO HAVE SOME OF THE EAR MARKS OF SOME OF THE ORATORICAL EFFORTS IN SUPPORT OF COUNTY BOND ISSUES OF TWENTY YEARS AGO. RATHER IT IS A STATEMENT OF A MUCH MORE SERIOUS PROBLEM. IN UNDERSTANDING LIES COMMUNITY STRENGTH, SO IT IS IMPORTANT THAT THE PEOPLE OF THE UNITED STATES, AND PARTICULARLY THOSE DIRECTLY INTERESTED IN THE HIGHWAY FIELD, SHALL UNDERSTAND THE ACTUAL AND RELATIVE DIMENSIONS OF THE WHOLE PUBLIC HIGHWAY UNDERTAKING. AT THE END OF THIS YEAR WE ESTIMATE THERE WILL BE IN SERVICE ON THE HIGHWAYS ABOUT 23,300,000 MOTOR VEHICLES, AN INCREASE OF ABOUT 5 PER CENT OVER LAST YEAR. THERE WILL HAVE BEEN CONSUMED DURING THE YEAR, ACCORDING TO OUR PRESENT ESTIMATES, 10,720,000,000 GALLONS OF GASOLINE, AN INCREASE OF 9 PER CENT OVER LAST YEAR. IF THERE WAS AN AVERAGE OPERATION OF 12 MILES PER GALLON, THE COMBINED RURAL HIGHWAY AND CITY STREET COSTS FOR THE YEAR WERE ABOUT ONE CENT PER VEHICLE-MILE. AT A RETAIL PRICE OF TWENTY CENTS PER GALLON, THE VALUE OF THE FUEL CONSUMED IS \$2,144,000,000, WHICH IS MORE THAN ONE-THIRD OF THE GROSS OPERATING REVENUE, FOR THE FISCAL YEAR ENDED LAST JUNE, OF ALL THE FIRST-CLASS RAILROADS OF THE UNITED STATES, CONSTITUTING 95 PER CENT OF THE TOTAL RAILROAD MILEAGE. ALSO IT IS DOUBLE THE INCOME FOR ALL RURAL HIGHWAY PURPOSES. THE USE OF GASOLINE BY THE INDIVIDUAL MOTOR CAR IS ESTIMATED NOW AT 460 GALLONS FOR THE YEAR, AN INCREASE OF 3.6 PER CENT OVER LAST YEAR. IT APPEARS, THEREFORE, THAT IN ADDITION TO A 5 PER CENT INCREASE IN THE NUMBER OF VEHICLES IN USE, THE USE OF THE VEHICLES THEMSELVES IS INCREASING.

THE INDICATED TOTAL UTILIZATION OF OUR RURAL HIGHWAYS AND OUR CITY STREETS APPROXIMATES FOR THIS YEAR 128 BILLION VEHICLE MILES, A TOTAL SO FAR BEYOND OUR COMPREHENSION THAT IT FAILS TO ASSIST US GREATLY IN VISUALIZING THE PHYSICAL

DIMENSIONS OF THE HIGHWAY CONSTRUCTION AND MAINTENANCE NECESSITIES. BUT IT IS DESIRABLE TO DIRECT OUR THINKING ALONG CONCRETE LINES THAT OUR EFFORTS MAY BE EXERTED UPON COMMON OBJECTIVES.

THE DIMENSIONS AND ORGANIZATION OF NATIONAL HIGHWAYS.

(ALL FIGURES AS OF JAN. 1, 1926)

AT THE RISK OF BEING ELEMENTARY, THE PHYSICAL HIGHWAY PROBLEM IS HERE STATED. IT SHOULD BE NOTED THAT THE STATISTICS USED HAVE BEEN GATHERED WITH PAINSTAKING CARE OVER MANY YEARS BY THE BUREAU OF PUBLIC ROADS AND THE ATTENTION GIVEN TO THEIR COLLECTION AND CONSOLIDATION HAS BEEN CONSTANTLY INCREASED. ORIGINAL SOURCES ARE USED INSOFAR AS POSSIBLE AND, IN GENERAL, THE STATISTICS FOR THE STATE ACTIVITIES ARE SUFFICIENTLY ACCURATE AND ARE SUPPORTED BY STATE RECORDS. THE STATISTICS FOR THE LOCAL ACTIVITIES ARE LESS ACCURATE AND MUCH LESS FULLY SUPPORTED BY RECORDS OF AN ADEQUATE CHARACTER. ON THE WHOLE, HOWEVER, WE MAY OBTAIN A SUFFICIENTLY ACCURATE NATIONAL HIGHWAY PICTURE.

THERE ARE IN THE UNITED STATES 3,006,081 MILES OF PUBLIC HIGHWAYS. THESE ARE DIVIDED INTO TWO GENERAL CLASSES:

- (A) THOSE UNDER THE JURISDICTION OF THE STATE HIGHWAY DEPARTMENTS, OR STATE HIGHWAYS, AND
- (B) LOCAL HIGHWAYS UNDER THE JURISDICTION OF COUNTY OR TOWNSHIP AUTHORITIES. IN SOME CASES THIS CLASS IS DIVIDED INTO COUNTY AND TOWNSHIP ROADS. IN THE NEW ENGLAND STATES IT IS COMPOSED OF TOWN ROADS.

IN A FEW STATES THERE IS SOME GENERAL SUPERVISION EXTENDED BY THE STATE HIGHWAY DEPARTMENTS OVER LOCAL ROADS AND, IN A FEW, STATE FINANCIAL AID IS EXTENDED TO LOCAL ROADS IN A LIMITED WAY. IN SOME STATES THE LOCAL ORGANIZATIONS HAVE PRIMARY JURISDICTION OVER THE SO-CALLED STATE ROADS UNDER THE SUPERVISION OF THE STATE HIGHWAY DEPARTMENTS. WITH THESE GENERAL QUALIFICATIONS THE PRESENT STATISTICAL DATA IS AS FOLLOWS:

TOTAL MILEAGE OF PUBLIC ROADS IN U. S.	3,005,081
PER CENT OF TOTAL MILEAGE SURFACED	17.4
MILEAGE OF STATE HIGHWAYS	274,910
MILEAGE OF STATE HIGHWAYS SURFACED	144,854
PER CENT OF STATE HIGHWAYS SURFACED	52.5

MILEAGE OF STATE HIGHWAYS, BY TYPES

TRANSITORY

<u>TYPE</u>	<u>MILEAGE</u>	<u>PER CENT</u>
UNIMPROVED	103,271	37.5
GRADED AND DRAINED	25,783	9.7
SAND-CLAY AND TOPSOIL	11,023	4.0
GRAVEL	68,771	25.0
WATER-BOUND MACADAM (TREATED AND UNTREATED)	16,709	6.1
TOTAL TRANSITORY	226,563	82.3

DURABLE

BITUMINOUS MACADAM	12,105	4.4
SHEET ASPHALT	853	0.3
BITUMINOUS CONCRETE	4,530	1.7
PORTLAND CEMENT CONCRETE	27,644	10.1
BRICK AND OTHER BLOCK PAVEMENTS	3,185	1.2
TOTAL DURABLE	48,347	17.7
GRAND TOTAL	274,910	100.0

MILEAGE OF LOCAL ROADS	2,731,171
MILEAGE OF LOCAL ROADS SURFACED	378,406
PER CENT OF LOCAL ROADS SURFACED	13.8

MILEAGE OF LOCAL ROADS, BY TYPES

TRANSITORY

<u>TYPE</u>	<u>MILEAGE</u>	<u>PER CENT</u>
UNIMPROVED	2,111,326	77.3
GRADED AND DRAINED	243,440	8.9
SAND-CLAY AND TOPSOIL	58,210	2.1
GRAVEL	222,512	8.1
WATERBOUND MACADAM	51,448	1.9
GRAVEL AND WATERBOUND		
MACADAM, TREATED	15,680	0.6
TOTAL TRANSITORY	2,702,616	98.9

DURABLE

BITUMINOUS MACADAM	10,490	0.4
SHEET ASPHALT	1,921	0.1
BITUMINOUS CONCRETE	3,420	0.1
PORTLAND CEMENT CONCRETE	10,106	0.4
BRICK AND OTHER BLOCK PAVEMENTS	2,618	0.1
TOTAL DURABLE	28,555	1.1
GRAND TOTAL	2,731,171	100.0

THE FEDERAL HIGHWAY SYSTEM CONSISTS OF 185,772 MILES RUNNING COINCIDENTLY WITH THE STATE HIGHWAY SYSTEM, AND SINCE THE STATE HIGHWAYS CONSTITUTE THE LARGEST SYSTEM, FOR THE PURPOSE OF THIS DISCUSSION THE TWO ARE NOT SEPARATED. HIGHWAYS, TO BE SUITABLE FOR CONTINUOUS USE OF MOTOR VEHICLES, MUST BE SURFACED. IT WILL BE NOTED THAT 47.2 PER CENT OF THE STATE HIGHWAYS HAVE YET TO RECEIVE INITIAL SURFACING, AND THAT WITH ALL THE WORK THAT HAS BEEN DONE, 82.3 PER CENT ARE STILL UNSURFACED OR SURFACED WITH TYPES THAT MUST BE CONSIDERED TRANSITORY OR IN THE PROCESS OF STAGE IMPROVEMENT. THIS INDICATES IN A FAIRLY ADEQUATE MANNER THE DIMENSIONS OF THE JOB AHEAD IN THE IMPROVEMENT OF THE STATE HIGHWAYS, WITHOUT CONSIDERING THE AMOUNT OF WIDENING AND SUPPLEMENTARY CONSTRUCTION THAT WILL BE NECESSARY ON NOT LESS THAN 50 PER CENT OF THE MILEAGE OF THE MORE DURABLE TYPES.

IN THE LOCAL CLASSIFICATION, ATTENTION IS AT ONCE RIVETED UPON THE LARGE FIGURE OF UNIMPROVED, OR ONLY PARTIALLY IMPROVED EARTH ROADS. THIS TREMENDOUS MILEAGE OF 2 MILLION MILES IS COMPOSED LARGELY OF ROADS FOUND ALONG THE SECTION LINES PRINCIPALLY IN THE AGRICULTURAL STATES ESTABLISHED BY LAW WHEN THE LAND WAS ORIGINALLY DIVIDED INTO GEOMETRIC PARCELS. THERE IS NO QUESTION NOW BUT THAT A VERY LARGE PART OF THIS MILEAGE COULD BE TURNED BACK INTO FARM LANDS, WITH CORRESPONDING PUBLIC AND PRIVATE BENEFITS. THIS IS NOT RASHLY, OR WITHOUT DUE CONSIDERATION ADVOCATED. THE EXACT FIGURES CANNOT BE GIVEN WITHOUT MORE DETAILED STUDIES OF EACH SITUATION, BUT AS A GENERAL STATEMENT IT MAY BE SAID THAT ALL THE LAND TAXES AND ALL THE GAS AND MOTOR VEHICLE TAXES ORIGINATING FROM THE LANDS ALONG THE GREATER PERCENTAGE OF THIS CLASS OF ROAD WOULD NOT BE SUFFICIENT TO MAINTAIN THEM, TO SAY NOTHING OF BUILDING THEM TO AN ADEQUATE STANDARD. FURTHER, THE TRAFFIC OVER THE ROADS DOES NOT JUSTIFY THEIR EXISTENCE AS PUBLIC HIGHWAYS, AND THERE IS THAT MUCH LOSS OF AGRICULTURAL LANDS.

SURFACING HAS BEEN APPLIED TO 274,910 MILES. OF THIS 22.3 PER CENT IS OF THE LOWER TYPES WHICH MAY OR MAY NOT FOR THESE ROADS BE TRANSITORY. IN THIS CLASS LIE MANY MILES OF ROADS WITHIN METROPOLITAN DISTRICTS WHICH WILL HAVE TO BE IMPROVED TO A HIGH TYPE.

THERE CAN BE NO INTELLIGENT DISCUSSION OF THE ULTIMATELY NECESSARY LOCAL MILEAGE UNTIL THERE IS EXCLUDED A VERY LARGE MILEAGE OF LEGALLY DESIGNATED PUBLIC ROADS WHICH ARE NOT ACTUALLY NEEDED AS HIGHWAYS, AND WHICH CAN NOT POSSIBLY BE IMPROVED IN ANY FORESEEN TIME WITH THE FUNDS NOW AVAILABLE. IT MUST BE EVIDENT FROM THIS DISCUSSION THAT TWO GENERAL POLICIES ARE SORELY NEEDED IN THE MANAGEMENT OF LOCAL ROADS:

FIRST. PLANNING COMMISSIONS FOR METROPOLITAN AREAS TO LAY OUT A SYSTEM OF ROADS FOR THE AREA AS A WHOLE, ALTHOUGH THERE WILL BE FOUND IN SUCH AREAS AN ASTONISHING NUMBER OF CIVIL JURISDICTIONS. THE COOK COUNTY, ILLINOIS, AND CUYAHOGA COUNTY, OHIO, TRANSPORT SURVEYS AMPLY SUSTAIN THIS FACT.

SECOND. RURAL PLANNING COMMISSIONS ARE NEEDED TO WORK IN CONJUNCTION WITH THE STATE HIGHWAY DEPARTMENTS IN THE PLANNING OF COUNTY AND FEEDER ROADS FOR THE PURPOSE OF PLANNING A SYSTEM OF PUBLIC HIGHWAYS THAT WILL REACH AND SERVE THE AGRICULTURAL POPULATION WITH A MINIMUM POSSIBLE MILEAGE.

THAT THIS LATTER STATEMENT MAY BE GUARDED AGAINST MISUNDERSTANDING OR AGAINST MIS-QUOTATION, IT IS REPEATED. IT IS POSSIBLE BY PROPER PLANNING OF RURAL COMMUNITY AND LOCAL HIGHWAY SYSTEMS TO REDUCE MATERIALLY THE MILEAGE AND CONSEQUENT ACREAGE OF LAND NOW DEDICATED TO PUBLIC HIGHWAYS AND YET GIVE MORE ADEQUATE SERVICE TO THE RURAL SECTIONS THAN IS NOW ENJOYED. BUT SUCH A DESIRABLE CONDITION CANNOT BE ESTABLISHED EXCEPT BY INTELLIGENT AND PAINSTAKING PLANNING.

THE SURFACING OF THE STATE SYSTEM IS PROCEEDING AT THE RATE OF APPROXIMATELY 20,000 MILES PER ANNUM, AND THE SURFACING OF THE LOCAL ROADS IS PROCEEDING AT THE RATE OF ABOUT 25,000 MILES PER ANNUM, BUT THE PERCENTAGES OF THE TYPES ARE NOT CHANGING MATERIALLY.

THE ANNUAL COST OF THE HIGHWAY PROGRAM FOR 1926, BASED ON THE 1926 RETURNS FROM THE STATE HIGHWAY SYSTEMS AND THE 1925 RETURNS FROM THE LOCAL HIGHWAY SYSTEMS, WAS \$1,291,558,816, DIVIDED AS FOLLOWS:

EXPENDITURES FOR STATE HIGHWAYS \$621,744,210.

EXPENDITURES FOR LOCAL ROADS \$639,814,606.

FOR PURPOSES OF THIS DISCUSSION, HOWEVER, IT IS NOT DESIRABLE TO GO INTO DETAILS OF FINANCING SINCE, IF AN ORDERLY PLAN IS ADOPTED, THE INDICATED FINANCIAL PROGRAM WILL BE THE RIGHT ONE.

THE FOLLOWING IS QUOTED FROM AN EARLIER ARTICLE UPON THE GENERAL PLAN OF A BUDGET:

"IT HAS BECOME MORE AND MORE APPARENT, PARTICULARLY AS THE DISCUSSION OF ANNUAL BUDGETS HAS BECOME COMMON, THERE ARE TWO KINDS OF BUDGETING; THE BUDGET THAT IS PREPARED WITH REFERENCE TO THE EXPECTED INCOME, AND THE BUDGET THAT IS PREPARED WITH REFERENCE TO THE PHYSICAL CONDITION AND NECESSITIES OF THE HIGHWAYS. THEY MIGHT BE TERMED THE FISCAL BUDGET AND THE PHYSICAL BUDGET. THE FIRST TYPE OF BUDGET IS OPEN TO A GREAT DEAL OF MISMANAGEMENT NO MATTER HOW CORRECT THE FISCAL INFORMATION. THE SECOND TYPE OF BUDGET IS THE ONLY PLAN THAT EVENTUALLY WILL WORK FOR ECONOMY."

APPLYING THIS SYSTEM OF BUDGETING THE PHYSICAL NEEDS OF THE HIGHWAYS, IN VIEW OF THE PHYSICAL CONDITION SET FORTH ABOVE, THERE ARE CERTAIN LOGICAL CONCLUSIONS OF PARTICULAR INTEREST TO THE ASPHALT INDUSTRY WHICH MAY BE SUMMARIZED AS FOLLOWS:

(1) BASED ON AN ANNUAL UTILIZATION OF THE HIGHWAYS OF 128 BILLION VEHICLE MILES, THE ANNUAL PASSENGER MILEAGE IS APPROXIMATELY 2,880,000,000 MILES. THIS IS NOT LESS THAN 8 TIMES THE PASSENGER MILEAGE OF THE STEAM RAILROADS IN 1925 AND IS INDICATIVE OF THE PREDOMINANT USE OF THE HIGHWAYS BY PEOPLE. THE ANNUAL LOSS OF SURFACING FROM THE LOW-TYPE ROADS, PLUS THE DUST NUISANCE, MEANS THAT MORE EFFECTIVE METHODS MUST BE FOUND AND MORE LARGELY UTILIZED, BOTH FOR HOLDING THESE SURFACES AND FOR DUST SUPPRESSION. THIS IS A FIELD FOR BITUMINOUS CONSTRUCTION.

(2) THERE IS SUCH A TREMENDOUS MILEAGE OF ROADS INITIALLY IMPROVED, ON WHICH THE SURFACE IS NOT NOW ADEQUATE, THAT A LOW TYPE OF SUPPLEMENTAL CONSTRUCTION MUST BE DEVELOPED WHICH CAN BE ADEQUATELY MAINTAINED. AS INDICATIVE OF THE POSSIBILITIES IN THIS FIELD, WE HAVE A DEMONSTRATION OF THE FINE-CRUSHED-ROCK SURFACES IN THE WEST. THE PROCESSING WITH BITUMINOUS TREATMENTS GIVES PROMISE OF HIGH-CLASS SERVICE UNDER MODERATE TRAFFIC AT A REASONABLE ANNUAL MAINTENANCE COST. FURTHERMORE, A TYPE OF MAINTENANCE IS POSSIBLE THAT RENEWS THE ORIGINAL SMOOTH-RIDING QUALITIES OF THE ROAD. IT HAS ALREADY BEEN DEMONSTRATED THAT THESE SURFACES CAN BE SCARIFIED AND A SMALL AMOUNT OF ADDITIONAL MATERIAL ADDED, THAT THE WORK CAN BE DONE ON A QUANTITY BASIS, AND, WHICH IS ALL IMPORTANT, AT A LOW COST. THERE MAY BE DIFFICULTIES WITH THIS TYPE OF CONSTRUCTION, BUT IT GIVES SUCH PROMISE THAT THE ASPHALT INDUSTRY, BOTH ENGINEERS AND CONTRACTORS, CAN WELL AFFORD TO DEVOTE THOUGHT AND EFFORT TO ITS PERFECTION.

(3) THERE ARE LONG MILEAGES OF ROADS ON BOTH THE STATE HIGHWAY AND LOCAL HIGHWAY SYSTEMS, PARTICULARLY IN THE REGIONS WEST OF THE MISSISSIPPI RIVER, ON WHICH THE ONLY HOPE NOW APPARENT OF FIRST CLASS HIGHWAY SERVICE LIES IN THE DEVELOPMENT OF BITUMINOUS CONSTRUCTION. WITHOUT CRITICIZING THE EFFORTS THAT ARE BEING MADE TOWARD THE PERFECTION IN DETAIL OF THE STANDARD ASPHALTIC MIXTURES FOR PAVEMENT CONSTRUCTION, THE ATTENTION OF THE INDUSTRY IS DIRECTED TOWARD THE DESIRABILITY AND NECESSITY OF DEVELOPING TYPES OF CONSTRUCTION THAT CAN BE LAID MORE CHEAPLY THAN THE STANDARD TYPES AND THAT WILL PROVE ADEQUATE. THIS MAY VERY WELL MEAN MAKING A

LARGER PERCENTAGE OF THE PRODUCT AVAILABLE FOR USE IN THE LOWER TYPES OF CONSTRUCTION, AND TO DO THIS NOT ONLY THE PROCESSES BUT THE EQUIPMENT, AND EVEN THE MATERIAL ITSELF, MUST BE ADAPTED TO THIS PURPOSE.

(4) AGAIN, WITHOUT THOUGHT OF OVERLOOKING THE DESIRABILITY OF THE MORE DURABLE TYPES OF CONSTRUCTION WHICH HAVE LONG BEEN ESTABLISHED AS STANDARD, THE ATTENTION OF THE INDUSTRY IS DIRECTED TOWARD THE OVERWHELMING PHYSICAL PROBLEM CONFRONTING THE COUNTRY, WHICH CANNOT BE MET QUICKLY BY THE RELATIVELY SMALL MILEAGES OF THE HIGH-COST CONSTRUCTION THAT MAY BE BUILT WITH THE PRESENT INCOME FROM YEAR TO YEAR. IT DOES NOT APPEAR IMPOSSIBLE TO DEVELOP PROCESSES, AND THE BITUMINOUS PROCESSES SEEM MOST ADAPTABLE FOR THE PURPOSE, THAT LEND THEMSELVES TO A COMPLETE OVERHAULING AT INTERVALS, AND THROUGH SUCH OVERHAULING LARGELY RESTORE THE ROAD TO ITS ORIGINAL CONDITION WITHOUT IMPOSSIBLE EXPENSE. STUDENTS OF HIGHWAY FINANCE MUST BE IMPRESSED WITH THE FACT THAT IT IS THE ANNUAL COST OF PROVIDING ADEQUATE HIGHWAY SERVICE THAT IS THE IMPORTANT ITEM, AND THE FIELD OF POSSIBILITIES IN BITUMINOUS CONSTRUCTION HAS BEEN ONLY PARTIALLY DEVELOPED.

(5) FINALLY THE PERFORMANCE OF MANY OF THE OLDER BITUMINOUS MACADAM ROADS, PARTICULARLY IN THE NORTHEASTERN STATES, AND ABROAD, PROVIDES CONFIDENCE THAT THIS TYPE OF CONSTRUCTION CAN BE USED UNDER HEAVY TRAFFIC PROVIDED THE DESIGN AND MAINTENANCE ARE ADEQUATE. IN THIS FIELD THERE SEEMS TO LIE THE POSSIBILITY OF MORE CLOSELY CONTROLLED MANUFACTURING PROCESSES, COUPLED WITH CHANGES IN DESIGN, THAT WOULD INSURE MORE UNIFORM AND MORE SATISFACTORY RESULTS.

IN CLOSING, THIS ARTICLE HAS BEEN PREPARED UPON THE GENERAL PREMISE THAT THE PHYSICAL DIMENSIONS OF THE HIGHWAY PROBLEM IN THIS COUNTRY ARE SO ENORMOUS THAT WE MUST, THROUGH THE DEVELOPMENT OF NEW PROCESSES AND NEW METHODS, GIVE ADEQUATE SERVICE OVER GREATER MILEAGES THAN WE ARE DOING NOW. SINCE SUCH A LARGE PERCENTAGE OF THE NECESSARY EXPENDITURES ARE DERIVED FROM THE MOTOR VEHICLE ITSELF, AND SINCE WE HAVE A CONSTANTLY INCREASING USE OF THE MOTOR VEHICLE, IT SEEMS APPARENT THAT THESE COSTS HAVE NOT YET BECOME GURDENSOME. THIS, OF COURSE, IS QUALIFIED BY THE FACT THAT THE COUNTRY HAS EXPERIENCED AN UNPRECEDENTED PERIOD OF PROSPERITY,

EXCEPT IN THE AGRICULTURAL DISTRICTS, AND HERE THE MOTOR VEHICLE HAS BECOME ESSENTIAL TO THE BUSINESS. THAT WE ARE OBTAINING SO MUCH SERVICE FROM EVEN POORLY-BUILT ROADS WHICH HAVE BEEN REHABILITATED WITH BITUMINOUS TREATMENTS, AND THAT PROGRESS HAS BEEN MADE IN THE DEVELOPMENT OF NEW BITUMINOUS TYPES OF GREAT PROMISE, ARE FACTS WHICH INDICATE THAT IN THIS FIELD OF BITUMINOUS CONSTRUCTION LIES THE HOPE OF LARGE MILEAGES OF HIGHWAYS THAT MAY RENDER SATISFACTORY SERVICE WITHIN REASONABLE COSTS. THE NEED IS PRESSING AND THE FIELD IS LARGE. IT IS CERTAINLY ONE IN WHICH THE ASPHALT INDUSTRY MAY RENDER A BIG SERVICE TO THE PUBLIC.