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THE NEWS LETTER

OF THE

BUREAU OF PUBLIC ROADS

VOL. 2, NO. 3

JANUARY, 1927

A.C. ROSE, EDITOR

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THE NEWS LETTER

BUREAU OF PUBLIC ROADS

1914

GENERAL RESEARCH COMMITTEE CREATED IN THE BUREAU
(NOT FOR RELEASE)

MEMORANDUM OF CHIEF OF BUREAU.

EFFECTIVE AT ONCE THERE IS CREATED A RESEARCH COMMITTEE ON SCOPE AND REPORTS OF HIGHWAY RESEARCH CONSISTING OF THE FOLLOWING:

H. S. FAIRBANK, CHAIRMAN	T. W. ALLEN
J. G. MCKAY	S. H. MCCRORY
E. F. KELLEY	C. D. CURTISS
E. W. JAMES	

SUBJECT TO THE DIRECTION OF THE CHIEF OF BUREAU, THE RESEARCH COMMITTEE WILL REVIEW PRIOR TO THEIR INITIATION ALL RESEARCH PROJECTS PROPOSED BY DIVISIONS AND FIELD OFFICES OF THE BUREAU CARRYING ON RESEARCH INCLUDING THE AGRICULTURAL ENGINEERING DIVISION; WILL PROGRAM RESEARCH FOUND TO BE NECESSARY, COORDINATE AND DETERMINE THE RELATIVE IMPORTANCE OF THE RESEARCH ACTIVITIES OF ALL DIVISIONS AND FIELD OFFICES, AND PASS UPON THE ADEQUACY OF ALL FINAL AND PROGRESS REPORTS OF RESEARCH SUBMITTED FOR PUBLICATION WITH A VIEW TO RECOMMENDING FINAL APPROVAL BY THE CHIEF OF BUREAU.

THE COMMITTEE WILL GIVE CONSIDERATION IMMEDIATELY TO THE CURRENT RESEARCH PROJECTS WITH A VIEW TO RECOMMENDING TO THE CHIEF OF BUREAU THE CONTINUANCE OR DISCONTINUANCE OF SUCH PROJECTS, THOSE TO WHICH PRIORITY OF EXECUTION SHOULD BE GIVEN, AND THOSE IN WHICH THE COOPERATION OF TWO OR MORE DIVISIONS OR FIELD OFFICES IS DESIRABLE.

ALL DIVISION CHIEFS AND FIELD OFFICERS OF THE BUREAU ARE REQUESTED TO COOPERATE FULLY WITH THE RESEARCH COMMITTEE IN THE FURTHERANCE OF ITS DUTIES AS PRESENTED ABOVE.

(SIGNED) THOS. H. MACDONALD,
CHIEF OF BUREAU.

DECEMBER 15, 1926

BUREAU EXHIBIT AT THE SESQUICENTENNIAL WINS MEDAL OF HONOR

IN A MEMORANDUM TO THE CHIEF OF THE BUREAU, DR. C. W. WARBURTON, DIRECTOR OF EXTENSION WORK OF THE DEPARTMENT, ADVISES THAT THE EXHIBIT OF THE BUREAU AT THE SESQUICENTENNIAL INTERNATIONAL EXPOSITION WAS AWARDED A MEDAL OF HONOR. THIS IS THE HIGHEST RECOGNITION GIVEN ANY SUBDIVISION OF THE DEPARTMENT. FOUR OTHER BUREAUS AND THE OFFICE OF EXHIBITS WERE SIMILARLY RECOGNIZED. DR. WARBURTON'S MEMORANDUM TRANSMITTED THE FOLLOWING LETTER FROM THE EXECUTIVE JURY OF AWARDS:

PHILADELPHIA,
DECEMBER 13, 1926.

DEAR ADMIRAL STICKNEY:

THIS IS TO NOTIFY YOU THAT THE INTERNATIONAL JURY OF AWARDS OF THE SESQUICENTENNIAL INTERNATIONAL EXPOSITION HAS AWARDED THE BUREAU OF PUBLIC ROADS, DEPARTMENT OF AGRICULTURE, A MEDAL OF HONOR FOR HISTORICAL PRESENTATION OF THE VALUE AND SERVICE OF GOOD ROADS AND ROAD CONSTRUCTION.

DIPLOMAS OF AWARD ARE BEING PREPARED AND IT IS HOPED TO HAVE THEM READY FOR DISTRIBUTION DURING THE EARLY PART OF THE COMING YEAR.

VERY TRULY YOURS,

(SIGNED) S. C. SIMMS, SECRETARY,
EXECUTIVE JURY OF AWARDS.

REAR ADMIRAL HERMAN O. STICKNEY,
UNITED STATES COMMISSIONER,
SESQUICENTENNIAL INTERNATIONAL EXPOSITION,
PHILADELPHIA, PENNA.

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This section contains several paragraphs of text, including what appears to be a list or set of instructions, though the details are illegible due to fading.

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FIGURE 1. - FEDERAL-AID HIGHWAY SYSTEM MAP WHICH WON A MEDAL OF HONOR AT THE
SESSQUICENTENNIAL INTERNATIONAL EXPOSITION



FIGURE 2. - HIGHWAY AND RURAL ENGINEERING BOOTH EXHIBITS OF THE BUREAU AT THE SEQUOIA CENTENNIAL INTERNATIONAL EXPOSITION

R. E. TOMS WINS FIRST PRIZE IN SUPERHIGHWAY CONTEST

R. E. TOMS, DISTRICT ENGINEER OF DISTRICT 8 OF THE BUREAU WITH HEADQUARTERS AT MONTGOMERY, ALABAMA, HAS BEEN AWARDED THE FIRST PRIZE OF \$1,000 FOR THE MOST PRACTICAL AND ORIGINAL PLAN FOR THE CONSTRUCTION OF SUPERHIGHWAYS IN THE METROPOLITAN AREA OF CHICAGO. THE AWARD WAS ANNOUNCED AT THE ANNUAL BANQUET OF THE AMERICAN ROAD BUILDERS ASSOCIATION CONVENTION AT CHICAGO ON JANUARY 12, 1927. THE SECOND PRIZE OF \$300 WAS GIVEN TO WILLIAM E. HOWDEN OF EDWARDSVILLE, ILLINOIS, AND THE THIRD PRIZE OF \$200 WENT TO ORAL B. DOLD, RALPH TOWERS, AND LEE VOGT OF WHEATON, ILLINOIS.

THE CONTEST WAS CONDUCTED BY THE DUPAGE COUNTY AND METROPOLITAN SUPERHIGHWAY ASSOCIATION, AN ORGANIZATION COMPOSED OF PUBLIC-SPIRITED CITIZENS OF DUPAGE, COOK AND KANE COUNTIES, WHO ARE DESIROUS OF FURTHERING THE INTERESTS OF SUPERHIGHWAYS IN THE METROPOLITAN AREA AROUND CHICAGO.

THE PLANS SUBMITTED IN THE CONTEST WERE JUDGED BY D. H. BURNHAM, PRES. CHICAGO REGIONAL PLANNING ASSOCIATION; HUGO E. YOUNG, ENGR., CHICAGO PLANNING COMMISSION; MAJ. R. F. KELKER, CONSULTING ENGINEER; MAJ. GEO. A. QUINLAN, SUPT. OF HIGHWAYS OF COOK COUNTY; CLAUDE HANSON, SUPT. OF HIGHWAYS OF KANE COUNTY; E. L. GATES, SUPT. OF HIGHWAYS OF DUPAGE COUNTY; AND G. N. LAMB, STATE DISTRICT ENGINEER.

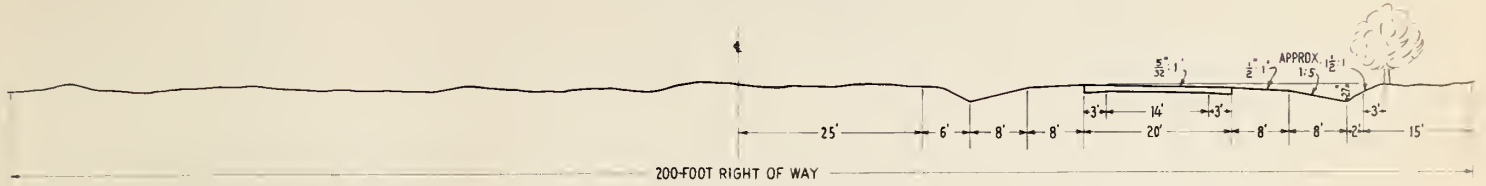
GENERAL

THE PRINCIPAL IDEA EMBODIED IN THE PLAN SUBMITTED BY MR. TOMS IS THAT OF PROGRESSIVE STAGE CONSTRUCTION WHEREBY EACH UNIT OF CONSTRUCTION IN ANY STAGE WILL BE UTILIZED WITHOUT CHANGE IN ALL SUCCEEDING STAGES OF DEVELOPMENT. THIS PRINCIPLE IS ALSO CARRIED OUT WITH RESPECT TO HIGHWAY GRADE SEPARATIONS AND RAILROAD GRADE SEPARATIONS. THE DEVELOPMENT OF THE HIGHWAY THROUGH THE SUCCESSIVE STAGES IS ILLUSTRATED BY THE ACCOMPANYING SKETCH REPRODUCED FROM THE PRIZE-WINNING PLANS.

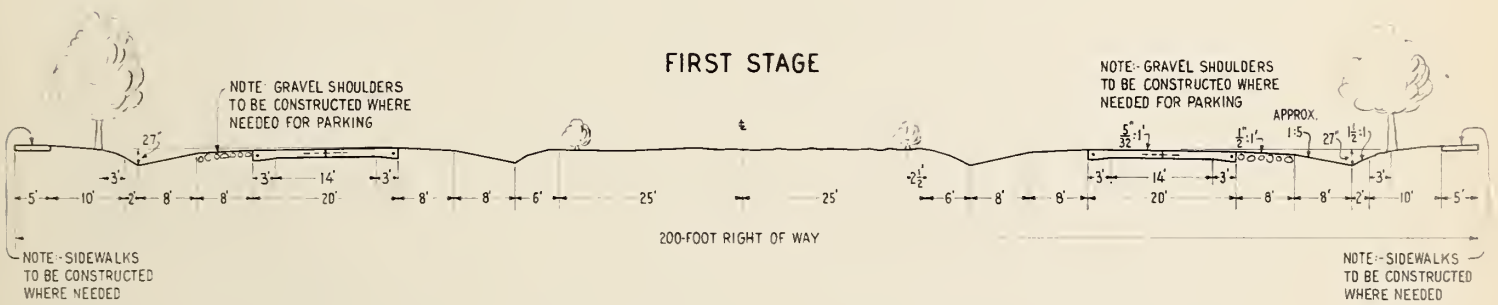
PRELIMINARY STAGE

THE CONSTRUCTION OF A SINGLE TRAFFIC UNIT OF 20-FOOT ROADWAY, ON ONE SIDE OF THE CENTER OF THE RIGHT OF WAY, IN A LOCATION WHERE IT WILL BE UTILIZED IN SUCCEEDING STAGES, WOULD CONSTITUTE THE PRELIMINARY STAGE OF CONSTRUCTION. THE LOCATION OF THIS UNIT HAS BEEN TAKEN AS NEAREST FUTURE SIDEWALK CONSTRUCTION IN PREFERENCE TO A LOCATION NEARER THE CENTER OF THE RIGHT OF WAY IN ORDER TO PROVIDE EASIER ACCESS FROM ADJACENT PROPERTY.

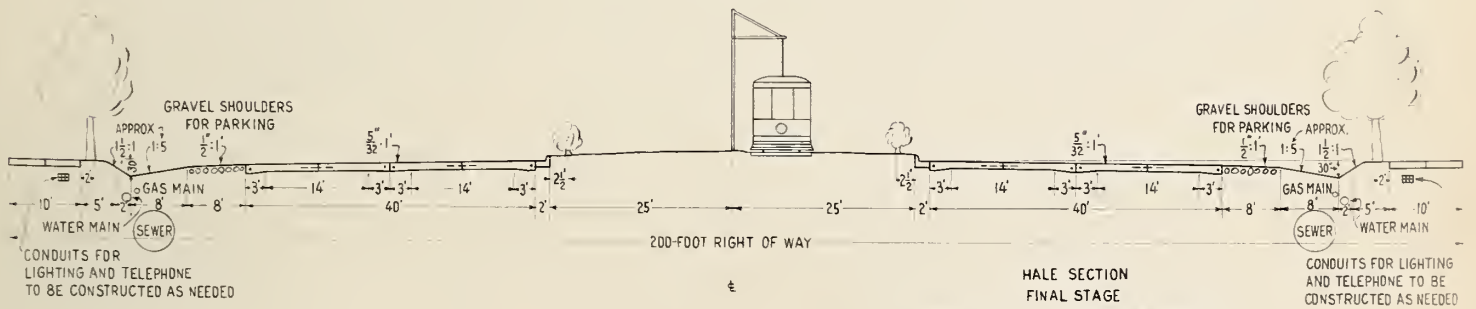
PRELIMINARY STAGE



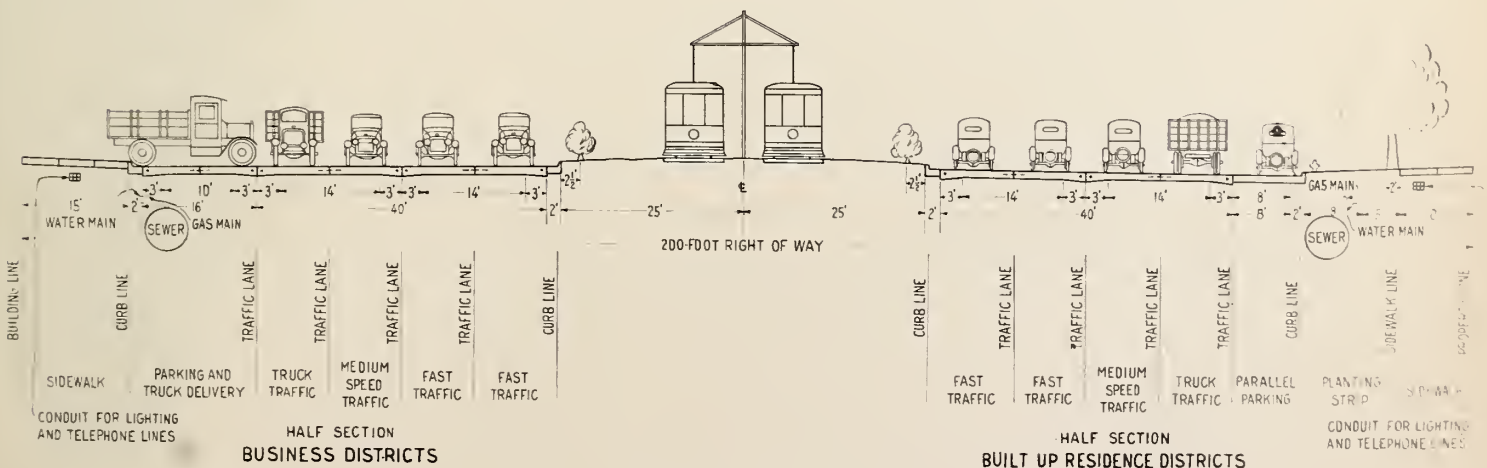
FIRST STAGE



SECOND STAGE



FINAL STAGE



FIRST STAGE

THE SECOND TRAFFIC UNIT CONSISTING OF ONE 20-FOOT ROADWAY IS INDICATED TO BE CONSTRUCTED ON THE OPPOSITE SIDE OF THE CENTER LINE OF THE RIGHT OF WAY FROM THE ORIGINAL CONSTRUCTION. THIS PLAN IS BELIEVED TO BE BETTER THAN TO CONSTRUCT THE SECOND TRAFFIC UNIT OF 20-FOOT ROADWAY ADJACENT TO THE FIRST UNIT CONSTRUCTED FOR THE REASON THAT CONSTRUCTION ON THE OPPOSITE SIDE OF THE CENTER LINE WILL TEND TO ENCOURAGE PROPERTY DEVELOPMENT EQUALLY ON BOTH SIDES OF THE RIGHT OF WAY INSTEAD OF ON ONE SIDE. OPINIONS DIFFER IN REGARD TO THE TRAFFIC-CARRYING CAPACITY OF TWO SEPARATED ROADWAYS AS COMPARED WITH THE CAPACITY OF A ROADWAY EQUAL TO THE TOTAL WIDTH OF THE SEPARATED UNITS. THE PLAN SUBMITTED IS SUFFICIENTLY FLEXIBLE, HOWEVER, TO PERMIT EITHER PROCEDURE.

THE FIRST STAGE OF SIDEWALK CONSTRUCTION CONSISTING OF A 5-FOOT WIDTH OF WALK ADJACENT TO THE RIGHT-OF-WAY LINE IS INDICATED FOR CONSTRUCTION IN THIS STAGE AT SUCH POINTS AS MAY BE NECESSARY.

PLANTING IS TO BE UNDERTAKEN IN THIS STAGE ALONG ALL SECTIONS OF THE IMPROVEMENT WHERE THE GRADING OPERATIONS FOR WORK ON SUCCESSIVE STAGES WILL NOT DAMAGE THE SHRUBS OR TREES. LOW SHRUBBERY IS INDICATED FOR THE OUTLINE OF THE CENTER PARKWAY, WHILE SHADE TREES WOULD BE USED IN THE PLANTING STRIPS ADJACENT TO THE SIDEWALKS.

SECOND STAGE

FOR BALANCED SERVICE THE SECOND STAGE OF IMPROVEMENT WOULD REQUIRE THE ADDITION OF A 20-FOOT ROADWAY ON EACH SIDE OF THE CENTER LINE OF THE RIGHT OF WAY ADJACENT TO THE CONSTRUCTION DONE IN PRECEDING STAGES. SHOULDERS OF AMPLE WIDTH ARE INDICATED FOR PARKING AND PROVISION IS MADE FOR GRAVEL SHOULDERS IN FRONT OF ALL RESIDENCES OR DEVELOPED SECTIONS OF THE HIGHWAY IN ORDER THAT THE FULL WIDTH OF PAVING CONSTRUCTION MIGHT ALWAYS BE AVAILABLE FOR TRAFFIC-CARRYING PURPOSES. PROVISION IS ALSO MADE IN THIS STAGE FOR THE EXTENSION OF THE SIDEWALK WIDTH OF 10 FEET BY THE CONSTRUCTION OF A SECOND UNIT OF 5-FOOT WALK IN LOCATIONS WHERE THIS WIDTH IS NECESSARY.

PUBLIC UTILITIES WOULD BE ADDED DURING THIS STAGE AND EXTENDED AS PROPERTY DEVELOPMENT REQUIRED.

FINAL STAGE

THE FINAL STAGE OF THE IMPROVEMENT CONTEMPLATES ITS LOCATION THROUGH A CLOSELY BUILT UP RESIDENTIAL SECTION OR A HIGHLY DEVELOPED BUSINESS DISTRICT. IN THE CLOSELY BUILT UP RESIDENTIAL SECTION A CURB AND GUTTER HAS BEEN ADDED AND THE PAVEMENT EXTENDED IN ORDER TO PROVIDE FOR PARALLEL PARKING ADJACENT TO THE CURB. IN THE HIGHLY DEVELOPED BUSINESS DISTRICTS THE SIDEWALK WIDTHS HAVE BEEN EXTENDED TO 15 FEET, A CURB AND GUTTER ADDED, AND THE ENTIRE WIDTH BETWEEN CURB AND GUTTER AND ORIGINAL ROADWAY PAVED. THIS PROVIDES A PAVED WIDTH OF 17-1/2 FEET WHICH WOULD BE UTILIZED FOR DIAGONAL PARKING AND FOR TRUCK DELIVERY. THIS WIDTH WOULD PERMIT TRUCKS TO BACK TO THE CURB FOR LOADING AND UNLOADING WITHOUT OBSTRUCTING THE NORMAL FLOW OF TRAFFIC ON THE MAIN PORTION OF THE HIGHWAY.

HIGHWAY GRADE SEPARATION WOULD BE ACCOMPLISHED IN THE FINAL STAGE OR IN ANY PRECEDING STAGE, AT POINTS WHERE THE VOLUME OF CROSS TRAFFIC WOULD ENDANGER THE TRAFFIC ON THE SUPERHIGHWAY OR MATERIALLY REDUCE ITS CARRYING CAPACITY BECAUSE OF THE NECESSITY FOR STOPPING TRAFFIC TO PERMIT CROSS TRAFFIC.

ECONOMIC CONSTRUCTION

AN OUTSTANDING FEATURE OF THE PLAN SUBMITTED IS ITS ECONOMIC CONSTRUCTION. NOTHING NEED BE CONSTRUCTED IN ADVANCE OF ACTUAL NEEDS AND NOTHING ONCE CONSTRUCTED WILL BE DESTROYED OR FAIL TO BE UTILIZED IN THE FINAL IMPROVEMENT. THERE WOULD BE NO LARGE INITIAL FINANCIAL BURDEN FOR THE CONSTRUCTION OF A FINISHED PROJECT. CONSTRUCTION COULD BE UNDERTAKEN AS FUNDS ARE AVAILABLE AND TRAFFIC NEEDS REQUIRE. THE PRINCIPLE OF UNIT CONSTRUCTION IS EMPLOYED THROUGHOUT. SIDEWALKS ARE CONSTRUCTED IN 5-FOOT UNITS. ROADWAYS ARE CONSTRUCTED IN 20-FOOT UNITS. GRAVEL SHOULDERS ARE USED FOR PARKING AND ONLY GIVE WAY TO THE CONSTRUCTION OF ADDITIONAL PAVEMENT AND CURB AND GUTTER WHERE DEVELOPMENT JUSTIFIES THIS PROCEDURE. RAILROAD GRADE SEPARATIONS ARE ACCOMPLISHED BY UNIT CONSTRUCTION IN WHICH THE FIRST UNIT IS USED THROUGHOUT THE PRELIMINARY AND FIRST STAGE OF THE SUPERHIGHWAY DEVELOPMENT. AT NO STAGE IN THE PROPOSED DEVELOPMENT WOULD CAPITAL BE TIED UP IN WHAT MIGHT BE CONSIDERED AS UNPRODUCTIVE INVESTMENT. AT NO STAGE OF ITS PROGRESS WOULD THE PROJECT BE OVERBUILT.

PUBLIC UTILITIES

PROVISION IS MADE FOR SEWERS, GAS, WATER, AND CONDUITS FOR WIRING AND TELEPHONE SERVICE. THESE UTILITIES ARE LOCATED SO THAT DURING ALL STAGES OF DEVELOPMENT, OPENINGS FOR SERVICE CONNECTIONS AND REPAIRS CAN BE MADE WITHOUT TEARING UP ANY PORTION OF THE PAVEMENT ORIGINALLY CONSTRUCTED. THIS CONDITION OBTAINS UP TO THE FINAL STAGE OF DEVELOPMENT IN BUSINESS DISTRICTS WHERE, ON ACCOUNT OF THE DESIRABILITY AND NECESSITY FOR INCREASED SIDE-WALK WIDTH AND SPACE FOR PARKING AND DELIVERY SERVICE, IT WOULD BE NECESSARY TO PAVE DIRECTLY OVER THE UTILITIES. IN THIS LATTER CASE, HOWEVER, OPENINGS FOR SERVICE CONNECTIONS AND REPAIRS WOULD CAUSE INCONVENIENCE ONLY TO PARKING AND TRUCK DELIVERY AND WOULD NOT CAUSE ANY INTERFERENCE WITH THE NORMAL MOVEMENT OF TRAFFIC ON THE MAIN BODY OF THE HIGHWAY.

HIGHWAY GRADE SEPARATIONS

THE HIGHWAY GRADE SEPARATION IS A DETAIL OF THE GENERAL PLAN WHICH IS ESSENTIAL IF THE MAXIMUM VALUE IN TRAFFIC SERVICE IS TO BE RECEIVED FROM THE INVESTMENT IN THE CONSTRUCTION OF WIDE HIGHWAYS. THE PURPOSE OF THE SUPERHIGHWAY IS TO PROVIDE UNEXCELLED TRAFFIC SERVICE. THIS CAN BE ACCOMPLISHED ONLY BY PERMITTING THE FEWEST POSSIBLE OBSTACLES TO THE FREE MOVEMENT OF TRAFFIC OVER THESE WIDE HIGHWAYS. THE HIGHWAY GRADE SEPARATION PLAN SUBMITTED CONTEMPLATES A GRIDIRON DEVELOPMENT OF APPROXIMATELY ONE CITY BLOCK ON EITHER SIDE OF AND PERPENDICULAR TO A HIGHWAY GRADE SEPARATION STRUCTURE. THE METHOD OF HANDLING TRAFFIC ACROSS THIS HIGHWAY GRADE SEPARATION STRUCTURE WOULD BE ALMOST IDENTICAL TO THE HANDLING OF TRAFFIC AT GRADE IN CITIES AT INTERSECTIONS WHERE NO TURNS ARE PERMITTED. TRAFFIC DESIRING TO CROSS THE SUPERHIGHWAY OR TO MAKE A LEFT TURN WOULD BE REQUIRED TO GO AROUND THE BLOCK, BUT INSTEAD OF CROSSING AT GRADE WOULD USE THE OVERHEAD STRUCTURE. IT IS A SCHEME WHICH IS UNUSUALLY SIMPLE, PRACTICAL, AND FLEXIBLE. ITS FIRST USE WOULD UNDOUBTEDLY BE AT INTERSECTIONS WITH SECTION-LINE ROADS. THERE ORDINARILY IS SOME COMMUNITY DEVELOPMENT AT THESE LOCATIONS AND IT WOULD BE A COMPARATIVELY SIMPLE MATTER TO DEVELOP THE GRIDIRON SYSTEM WHICH WOULD BE NECESSARY IN ORDER TO SEPARATE THE HIGHWAY GRADES. THE WIDTH OF THE HIGHWAY GRADE SEPARATION STRUCTURE WOULD VARY ACCORDING TO THE VOLUME OF CROSS TRAFFIC WHICH WOULD HAVE TO BE ACCOMMODATED. THE WIDTH, HOWEVER, SHOULD NOT OCCUPY MORE THAN 30 TO 40 PER CENT OF THE PAVEMENT WIDTH OF THE CROSS STREET SO AS TO PERMIT STREET-LEVEL ACCESS TO STORES AND HOUSES ON THE CROSS STREETS. FOR ORDINARY CROSSINGS A 20-FOOT WIDTH OF ROADWAY WOULD PROBABLY BE ALL THAT WOULD

BE NECESSARY. IN THIS CONNECTION, PROVISION SHOULD ALSO BE MADE FOR CANTILEVER SIDEWALKS AND STAIRS TO AND FROM THE GROUND SIDEWALK SO THAT PEDESTRIAN TRAFFIC, AS WELL AS VEHICULAR TRAFFIC, WOULD CROSS THE SUPERHIGHWAY OVERHEAD. WHEN THIS STAGE IS REACHED, THERE WOULD BE NO CROSSING OF THE SUPERHIGHWAY AT GRADE AND THE TWO INSIDE LANES OF MOTOR TRAFFIC NEAREST THE CENTER LINE OF THE RIGHT OF WAY COULD BE UTILIZED FOR HIGH-SPEED TRAFFIC IN WHICH THE MECHANICAL PERFECTION OF THE VEHICLE AND THE SKILL OF THE DRIVER WOULD REGULATE THE SPEED. THE THIRD LANE WOULD BE USED FOR MEDIUM-SPEED TRAFFIC, BOTH AUTOMOBILES AND TRUCKS. THE FOURTH LANE FOR SLOW TRUCK TRAFFIC. TRAFFIC DESIRING TO TURN TO THE RIGHT OFF OF THE SUPERHIGHWAY WOULD FIRST MANEUVER INTO THE MEDIUM-SPEED TRAFFIC LANE, THENCE TO THE SLOW-TRUCK LANE, OR IF THE SLOW TRUCK TRAFFIC PERMITTED, WOULD CROSS THE TRUCK LANE FROM THE MEDIUM-SPEED TRAFFIC LANE IN TURNING TO THE RIGHT. THE SAFETY FEATURE OF SUCH A SCHEME CAN NOT BE OVEREMPHASIZED. THE LOCATION OF GRADE SEPARATION-STRUCTURES WOULD BE DETERMINED BY THE AMOUNT OF CROSS-TRAFFIC. WHEN PROPERTY ADJACENT TO THE SUPERHIGHWAY REACHES A STAGE OF DEVELOPMENT EXTENDING FOR SEVERAL BLOCKS ON EITHER SIDE, IT MAY BE NECESSARY TO CONSTRUCT HIGHWAY GRADE SEPARATIONS EVERY SIXTEEN, EIGHT, OR FOUR BLOCKS. THE SCHEME IS SUFFICIENTLY FLEXIBLE SO THAT STRUCTURES OF THIS CHARACTER COULD BE USED EVERY SECOND BLOCK IF REQUIRED TO HANDLE THE TRAFFIC.

RAILROAD GRADE SEPARATIONS

THE PRINCIPLE OF UNIT CONSTRUCTION IS FOLLOWED THROUGHOUT THE CONSTRUCTION OF RAILROAD GRADE SEPARATIONS. ECONOMY IN FIRST COST IS ALSO THE DOMINATING FEATURE AS IT WOULD BE DIFFICULT TO ENLIST THE COOPERATION OF THE RAILROAD COMPANIES IN THE CONSTRUCTION OF SEPARATIONS OF MUCH GREATER WIDTH THAN WOULD BE IMMEDIATELY NECESSARY TO PROVIDE FOR THE HIGHWAY TRAFFIC. THE FIRST UNIT OF THE GRADE CROSSING STRUCTURE WOULD PROVIDE FOR A SINGLE PLATE-GIRDER SPAN OF APPROXIMATELY 65 FEET ON CONCRETE OPEN-END BENTS WITH CREOSOTED TIMBER TRESTLE APPROACHES. THE INITIAL GRADE-SEPARATION STRUCTURE OF THIS SPAN WILL ACCOMMODATE TWO 20-FOOT ROADWAYS AND EVENTUALLY WOULD BE USED AS A UNIT IN THE FINAL GRADE-SEPARATION STRUCTURE WHEN THE ENTIRE 200-FOOT RIGHT OF WAY IS DEVELOPED TO ITS FINAL STAGE. TRAFFIC UTILIZATION OF THIS STRUCTURE BY THE SECOND 20-FOOT UNIT OF CONSTRUCTION LOCATED ON THE OPPOSITE SIDE OF THE RIGHT-OF-WAY OF THE SUPERHIGHWAY WOULD BE ACCOMPLISHED BY INTRODUCING A JOG INTO THE ALIGNMENT IN THE VICINITY OF THE UNDERPASS SO AS TO UTILIZE THE UNDERPASS OPENING. CURVES OF 400 TO 500-FOOT RADIUS COULD BE UTILIZED IN MAKING THIS JOG. WHEN THE CONSTRUCTION OF

TWO ADDITIONAL TRAFFIC UNITS OF 200-FOOT ROADWAY BECOMES NECESSARY, A DUPLICATION OF THE FIRST UNIT OF RAILROAD GRADE SEPARATION WOULD BE REQUIRED ON THE OTHER SIDE OF THE CENTER-LINE OF THE RIGHT OF WAY. WHEN THIS IS ACCOMPLISHED, THE PAVEMENT FORMING THE TWO CURVES OF THE JOG WOULD HAVE TO BE REMOVED.

CONCLUSION

THE PLAN SUBMITTED IS INTENSELY PRACTICAL, ECONOMICALLY SOUND, AND HIGHLY FLEXIBLE. THE PRINCIPLE OF PROGRESSIVE STAGE CONSTRUCTION SHOULD BE PARTICULARLY APPEALING TO COMMUNITIES WHICH DO NOT HAVE AT HAND SUFFICIENT FUNDS TO UNDERTAKE IN ONE OPERATION THE CONSTRUCTION OF A FINISHED IMPROVEMENT ON A SCALE TO WHICH THE MODERN SUPERHIGHWAY SHOULD BE BUILT.

COOPERATIVE RESEARCH AGREEMENT ON SUBGRADE SOILS

ON NOVEMBER 1, 1926, THE BUREAU ENTERED INTO A COOPERATIVE RESEARCH AGREEMENT WITH THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY WHICH HAD FOR ITS GENERAL PURPOSE THE SECURING AND DEVELOPMENT OF FACTS AND INFORMATION WHICH MAY ADVANCE THE SCIENCE OF HIGHWAY ENGINEERING IN REGARD TO SUBGRADES. THE IMMEDIATE PURPOSE OF THE AGREEMENT IS TO STUDY THE INFLUENCE OF ACCIDENTAL FACTORS UPON THE RESULTS OF THE STANDARD TESTS FOR SUBGRADE SOILS AND TO INVESTIGATE THE POSSIBILITIES FOR IMPROVING THE EXISTING TESTING METHODS. THE WORK OF THE INSTITUTE WILL BE CONFINED ENTIRELY TO THE LABORATORY ASPECTS OF THE SUBGRADE PROBLEM.

REPORT OF THE SUBCOMMITTEE ON MAINTENANCE OF THE A.A.S.H.O.
(NOT FOR RELEASE)

THE SUBCOMMITTEE ON MAINTENANCE OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS SUBMITTED AN INTERESTING REPORT AT THE PINEHURST, NORTH CAROLINA, MEETING OF THE ASSOCIATION HELD FROM NOVEMBER 8 TO 12, 1926. THE REPORT WAS TENDERED TO THE COMMITTEE ON STANDARDS AFTER BEING REGULARLY ADOPTED BY THE SUBCOMMITTEE. THE COMMITTEE ON STANDARDS WILL REVIEW THE REPORT AND MAKE RECOMMENDATIONS TO THE ASSOCIATION AT THE EARLIEST CONVENIENT OPPORTUNITY. THE REPORT WAS SIGNED BY THE CHAIRMAN OF THE SUBCOMMITTEE, MR. J. T. DONAGHEY, STATE HIGHWAY ENGINEER OF WISCONSIN. THE SUBJECT MATTER IS OF PARTICULAR CURRENT INTEREST SINCE THERE ARE DESCRIBED VARIOUS BITUMINOUS TREATMENTS FOR MAINTAINING GRAVEL SURFACES. THE GROWING TRAFFIC COUPLED WITH INSUFFICIENT FUNDS TO MEET THE DEMANDS FOR HIGH-TYPE SURFACES HAS CAUSED A DECIDED TREND TOWARD THE LOW-COST SURFACE TREATMENTS IN MANY SECTIONS OF THE COUNTRY, ESPECIALLY IN THE WEST.

THE ASSOCIATION AT ITS LAST ANNUAL MEETING OUTLINED THE SCOPE OF WORK FOR THE SUBCOMMITTEE ON MAINTENANCE FOR 1926 AS FOLLOWS:

FIRST: CONTINUE TO STUDY METHODS AND COSTS OF MAINTAINING GRAVEL SURFACES WITH BITUMINOUS SURFACE TREATMENTS.

SECOND: CONTINUE A STUDY TO DETERMINE THE BEST SPECIFICATIONS FOR ASPHALT AND TAR FILLERS FOR CONCRETE PAVEMENT REPAIR IN VARIOUS SECTIONS OF THE COUNTRY.

THIRD: STUDY PRACTICAL METHODS AND DESIGNS FOR PATCHING CONCRETE SURFACES.

FOURTH: CONTINUE THE STUDY OF SNOW-REMOVAL EQUIPMENT.

FIFTH: CONTINUE THE STUDY OF DETERMINING IF POSSIBLE THE UNITS OF COMPARATIVE WEAR IN ORDER TO SHOW MAINTENANCE COSTS FOR SUCH UNITS ON VARIOUS REPRESENTATIVE ROADS OF DIFFERENT TYPES.

SUBJECT NO. 1. - THE STUDY OF METHODS AND COSTS OF MAINTAINING GRAVEL SURFACES WITH BITUMINOUS SURFACE TREATMENTS. THE NECESSITY FOR PROTECTING GRAVEL SURFACES BY SURFACE TREATMENTS WAS DISCUSSED AT LENGTH AT THE 1925 MEETING, AND IT WAS

FOUND THAT WHEN TRAFFIC REACHES AN AVERAGE OF 400 OR MORE VEHICLES PER DAY SOME FORM OF SURFACE TREATMENT IS NECESSARY FOR THE FOLLOWING REASONS:

- (A) CONSERVATION OF MATERIALS.
- (B) SAFETY AND COMFORT BY ELIMINATING THE DUST NUISANCE.
- (C) ECONOMY.

SEVERAL STATES REPORTED ON METHODS AND RESULTS OBTAINED PREVIOUS TO THE 1925 MEETING AND THESE WERE BRIEFLY OUTLINED IN LAST YEAR'S REPORT. QUITE A NUMBER OF THE OTHER STATES HAVE FOUND IT NECESSARY TO SURFACE-TREAT THEIR GRAVEL ROADS DUE TO THE INCREASE IN TRAFFIC, AND SOME NEW METHODS HAVE BEEN DEVISED WHICH GIVE PROMISE OF SOLVING THE GRAVEL ROAD PROBLEM.

METHODS: A NEW METHOD WHICH WAS NOT REPORTED ON LAST YEAR AND WHICH HAS BEEN USED BY OHIO DURING THE PAST THREE YEARS IS AS FOLLOWS:

THE FIRST TREATMENT OF LIGHT TAR IS APPLIED AT ABOUT 100 DEGREES F., MORE OR LESS, AFTER THE SURFACE HAS BEEN SWEEPED CLEAN OF DUST. THIS IS ALLOWED TO PENETRATE THE SURFACING FOR A PERIOD OF TWO TO SIX HOURS, WHEN A COVERING OF CLEAN, COARSE, SAND OR STONE CHIPS IS APPLIED AT THE RATE OF 50 TO 65 POUNDS PER GALLON OF TAR USED. THIS TREATMENT IS ALLOWED TO STAND UNDER TRAFFIC FOR ONE SEASON, AFTER WHICH A TREATMENT OF HOT ASPHALT IS ADMINISTERED. TO ACCOMPLISH THIS THE SURFACE IS SWEEPED CLEAN AND THEN, WITH THE USE OF A PRESSURE DISTRIBUTOR, THE ASPHALT IS APPLIED AT THE RATE OF ABOUT ONE-FOURTH GALLON PER SQUARE YARD. THIS IS FOLLOWED IMMEDIATELY WITH A COVERING OF STONE CHIPS VARYING IN SIZE FROM ONE-QUARTER INCH TO THREE-QUARTERS INCH OR EVEN TO ONE INCH. THIS COVERING IS APPLIED AT THE RATE OF ABOUT 25 POUNDS PER SQUARE YARD AND A 5-TON ROLLER IS USED TO THOROUGHLY IMBED THE CRUSHED STONE IN THE BITUMINOUS MATERIAL. UNDER THE ROLLING OPERATIONS THE CRUSHED STONE IS FORCED INTO THE BITUMEN AND A SOLID MAT IS FORMED. DURING THE FIRST SEASON THIS TREATMENT PRESENTS A RATHER ROUGH LOOKING SURFACE BUT IT GRADUALLY IRONS OUT UNDER TRAFFIC AND TURNS DARK AS TIME GOES ON. SOME TREATMENTS OF THIS KIND HAVE BEEN DOWN FOR THREE YEARS AND ARE GIVING VERY EXCELLENT RESULTS, AND IT IS BELIEVED THAT, WITH AN ADDITIONAL LIGHT APPLICATION OF BITUMEN EVERY SECOND YEAR, THIS TYPE OF ROAD CAN BE MAINTAINED ALMOST INDEFINITELY FOR MEDIUM TRAFFIC.

MARYLAND, AS WELL AS SOME OF THE OTHER STATES, HAS BEEN USING A LIGHT TAR FOR BOTH THE FIRST AND SECOND APPLICATIONS AND THE RESULTS OBTAINED HAVE BEEN MOST SATISFACTORY.

THE STATE OF NORTH CAROLINA HAS USED WITH SUCCESS SUBSTANTIALLY THE SAME METHOD AS ABOVE OUTLINED. THEY HAVE ALSO HAD EXCELLENT RESULTS FROM THE FOLLOWING METHODS: A PRIME COAT OF 0.25 OF A GALLON OF LIGHT TAR (TC-1)^{1/} PER SQUARE YARD IS APPLIED, WHICH SHOULD BE ALLOWED NOT LESS THAN 36 HOURS FOR PENETRATION. A SECOND TREATMENT OF CUT-BACK ASPHALT (AC-2 AND AC-3) OF ABOUT 0.30 OF A GALLON PER SQUARE YARD IS THEN APPLIED, WHICH IS COVERED WITH 25 TO 30 POUNDS OF COARSE SAND. AS SOON AS POSSIBLE A BROOM DRAG PULLED BY A LIGHT TRUCK IS RUN OVER THE SURFACE TO EVENLY DISTRIBUTE THE SAND AND FILL IN THE LOW PLACES, THUS INSURING A BETTER RIDING SURFACE. THE COST OF THIS METHOD WILL VARY FROM APPROXIMATELY \$750.00 TO \$1,000.00 PER MILE OF 18-FOOT WIDTH AND EXCLUSIVE OF SURFACE PREPARATION.

SEVERAL STATES HAVE USED THE MIXING OR "MULCH METHOD."^{1/} IN THIS METHOD THE BITUMEN IS THOROUGHLY MIXED IN THE TOP LAYER OF LOOSE GRAVEL BY THE USE OF A BLADE GRADER. ABOUT TWO-THIRDS OF A GALLON PER SQUARE YARD OF LIGHT TAR (TC-1) IS USED IN TWO SEPARATE APPLICATIONS OF ABOUT ONE-THIRD GALLON EACH. THE FIRST APPLICATION IS PLACED ON THE SURFACE GRAVEL AND ALLOWED TO PENETRATE FOR AN HOUR OR TWO. THE BLADE GRADER THEN PUSHES THE TOP INCH OF MATERIAL TOWARD THE CENTER OF THE ROAD AND THE SECOND APPLICATION IS APPLIED ON THE NEW GRADE. THE MATERIAL IS THEN MOVED BACK OVER THE SECOND APPLICATION AND THE OTHER HALF OF THE ROAD IS TREATED IN THE SAME MANNER, AFTER WHICH A THOROUGH MIXING OF THE ENTIRE SURFACE IS EFFECTED BY THE USE OF THE BLADE GRADER. IN THIS TREATMENT A BITUMINOUS TOP OF ABOUT 1-1/2 TO 2 INCHES IS OBTAINED, MAKING A VERY DURABLE TOP FOR A GRAVEL SURFACE.

THE MATTER OF SALVAGING OLD GRAVEL SURFACES MAY NOT PROPERLY COME WITHIN THE SCOPE OF SUBJECTS ASSIGNED TO THIS SUBCOMMITTEE, BUT IT IS THOUGHT TO BE SUFFICIENTLY ALLIED TO THE STUDY OF SURFACE-TREATING GRAVEL ROADS AND CERTAINLY PERTINENT ENOUGH TO JUSTIFY ITS BEING MENTIONED IN THIS REPORT.

^{1/} THESE BITUMINOUS DESIGNATIONS ARE THOSE PRESCRIBED BY THE AMERICAN SOCIETY FOR TESTING MATERIALS.

SOME STATES ARE SALVAGING OLD MACADAM AND GRAVEL SURFACES BY BUILDING A BITUMINOUS TOP OF ABOUT 2 INCHES IN THICKNESS. THE ROAD MUST HAVE A FIRM BASE FREE FROM SAND POCKETS AND SOFT PLACES. CRUSHED STONE OR GRAVEL RANGING IN SIZE FROM 1/2 INCH TO 1-1/2 OR 2 INCHES IS DEPOSITED ON THE ROAD AND SPREAD TO THE DESIRED DEPTH WITH A GRADER OR PLANER. A 5-TON ROLLER IS THEN USED TO EFFECT A MECHANICAL BOND IN THE TOP COURSE. CARE SHOULD BE TAKEN NOT TO ROLL THE STONE TOO MUCH AS THIS MAY DESTROY THE BOND. BITUMEN IS THEN APPLIED AT THE RATE OF 3/4 GALLON PER SQUARE YARD BY A PRESSURE DISTRIBUTOR. THE SURFACE IS THEN ROLLED AGAIN. ONE-HALF INCH SCREENINGS ARE THEN APPLIED AND ROLLED IN TO FILL THE SURFACE VOIDS. THE ROAD IS THEN THROWN OPEN TO TRAFFIC.

SUBJECT No. 2. - CONTINUANCE OF STUDY TO DETERMINE THE BEST SPECIFICATIONS FOR ASPHALT AND TAR FILLERS FOR CONCRETE PAVEMENT REPAIR IN VARIOUS SECTIONS OF THE COUNTRY.

A CANVASS OF THE SEVERAL STATES SHOWS THAT OPINIONS ARE ABOUT EQUALLY DIVIDED AS TO THE MERITS OF TARS AND ASPHALTS FOR CRACK FILLERS. BOTH ARE EXTENSIVELY USED WITH VARYING RESULTS.

THE PENNSYLVANIA DEPARTMENT OF HIGHWAYS IS USING AS A FILLER FOR CONCRETE PAVEMENT REPAIR, ASPHALTIC CEMENT IMPREGNATED WITH MINERAL FILLER. THE PENETRATION RANGES FROM 85 TO 110. INDIANA HAS BEEN USING EMULSIFIED ASPHALT (AE-1) WITH SUCCESS. IT IS APPLIED COLD AND SEEMS TO STAY IN CRACKS VERY WELL. CONNECTICUT USES ASPHALT COLD-PATCH MIXED WITH SAND, WITH 16 TO 18 GALLONS OF ASPHALT TO ONE CUBIC YARD OF SAND. EXPANSION-JOINT MATERIAL HAS BEEN USED IN SOME CASES BUT THIS IS NOT ENTIRELY PRACTICAL.

MANY STATES REPORT EXPERIMENTS IN PROGRESS, WITH THE POSSIBILITY OF REPORTING RESULTS AT NEXT YEAR'S MEETING. NO DEFINITE RECOMMENDATION CAN BE MADE AT THIS TIME FROM THE INFORMATION AT HAND.

SUBJECT No. 3. - A STUDY OF PRACTICAL METHODS AND DESIGNS FOR PATCHING CONCRETE SURFACES.

EACH YEAR BRINGS A LARGER NUMBER OF FAILURES IN OLD CONCRETE SURFACES. THE MAINTENANCE AND REPAIR OF THESE ARE OF PRIME IMPORTANCE INASMUCH AS THIS PAVEMENT IS USUALLY FOUND ON THE MOST HEAVILY TRAVELLED HIGHWAYS. COMMON FAILURES ARE: (1) BREAKING OF CORNERS; (2) SINKING OR HEAVING OF SLABS; (3) HOLES AND DEPRESSIONS; (4) CRACKS; AND (5) DISINTEGRATION.

IN THE REPAIR OF BROKEN CORNERS, OPINION SEEMS TO BE GENERALLY AGREED ON THE FOLLOWING METHOD: FIRST, REMOVE BROKEN PARTS. THEN EXCAVATE SUBGRADE FOR A DISTANCE AND DEPTH OF ABOUT 8 INCHES UNDER THE OLD SLAB AND ADJACENT TO THE EDGE OF THE PAVEMENT. THE EDGE OF THE BREAK SHOULD BE CHISELED AND THEN THOROUGHLY WETTED. A RICH CONCRETE MIX SHOULD THEN BE PLACED, USING A QUICK-HARDENING CEMENT TO REDUCE THE SETTING TIME. MANY STATES ARE USING 5 OR 6 PER CENT BY WEIGHT OF CALCIUM CHLORIDE AS AN ADMIXTURE WITH PORTLAND CEMENT FOR THIS TYPE OF WORK AND WITH EXCELLENT RESULTS. EXPERIENCE HAS SHOWN THAT THIS WILL GIVE A VERY GOOD PATCH AND THAT THE ROAD MAY BE OPENED IN TWO OR THREE DAYS. WHERE A BITUMINOUS PATCH IS PLACED, COARSE STONE SHOULD BE USED IN THE BASE AND THEN TOPPED OFF WITH THE SMALLER SIZE. CARE MUST BE EXERCISED NOT TO USE TOO MUCH BITUMEN AS THE PATCH WILL SHOVE OR WRINKLE. IN THE CASE OF SUNKEN OR HEAVED SLABS, THE REMEDY SHOULD NOT BE APPLIED TOO SOON, AS IT MAY BE FOUND THAT FURTHER HEAVING OR SETTLEMENT MAY TAKE PLACE. IN THIS CASE A TEMPORARY BITUMINOUS PATCH SHOULD BE PLACED UNTIL MOVEMENT OF SLAB IS COMPLETED. THE DISTORTED SECTION SHOULD THEN BE REMOVED AND A NEW PIECE LAID ACCORDING TO THE METHOD DESCRIBED ABOVE. FOR SLIGHT OFFSETS A THIN BITUMINOUS PATCH WILL WORK VERY WELL. WHEN HOLES AND DEPRESSIONS ARE SHALLOW, A BITUMINOUS PATCH IS PREFERABLE TO A CEMENT PATCH.

SOME OF THE STATES HAVE USED CEMENT GUNS TO FILL CRACKS WITH GROUT. EXPERIMENTS ARE TOO RECENT TO MAKE ANY STATEMENT AS TO RESULTS.

IN MANY CASES WHERE THE SURFACE OF A CONCRETE ROAD IS BADLY WORN AND DISINTEGRATED A NEW WEARING TOP MUST BE PLACED. EXPERIENCE SHOWS THAT BOTH CEMENT CONCRETE AND BITUMINOUS MATERIALS HAVE BEEN USED WITH GOOD RESULTS. IF AN OLD ROAD IS RESURFACED WITH CONCRETE THE NEW LAYER SHOULD NOT BE LESS THAN 4 INCHES THICK. EXPANSION JOINTS SHOULD BE PROVIDED AT POINTS COINCIDING WITH THOSE EXISTING ON THE OLD ROAD. IF BITUMINOUS TOPS ARE TO BE USED ON OLD, ROUGH CONCRETE ROADS SOME KIND OF EQUALIZER THAT CAN BE USED IN SHALLOW DEPRESSIONS MUST BE DEVISED. THIS MATERIAL MUST BE OF SUCH A NATURE THAT IT CAN BE FEATHERED OUT AND IT MUST BE UNYIELDING WHEN IN PLACE.

SUBJECT No. 4. - CONTINUING THE STUDY OF SNOW-REMOVAL EQUIPMENT. THE GENERAL CONCENSUS OF OPINION IS THAT THE DEMAND FOR THROUGH HIGHWAY SERVICE FOR WINTER MONTHS IS GROWING RAPIDLY AND THAT BEFORE LONG A SYSTEMATIC SNOW-REMOVAL PROGRAM MUST BE INSTITUTED BY PRACTICALLY ALL STATES IN THE SNOW BELT IF THEY ARE TO RENDER 365-DAY SERVICE TO THE USER OF THE HIGHWAY. IT IS

FELT THAT A BIG PART OF THE SNOW PROBLEM IS NOW DRIFT PREVENTION. IT IS PRACTICALLY AGREED THAT A SNOW-REMOVAL ORGANIZATION MUST BE QUICK ACTING AND FREE FROM DEPARTMENTAL RED TAPE IF IT IS TO FUNCTION EFFICIENTLY. SNOW-REMOVAL EQUIPMENT MUST BE IN THE MAIN FAST MOVING AND INEXPENSIVE AND WITH IT THERE MUST BE UTILIZED OTHER HIGHWAY EQUIPMENT WHICH MAY BE USED FOR OTHER HIGHWAY PURPOSES.

THERE IS NOT MUCH TO REPORT ON NEW EQUIPMENT SINCE LAST YEAR'S REPORT. FOR ORDINARY SNOW REMOVAL MOST OF THE STATES ARE NOW USING TRUCKS EQUIPPED WITH SINGLE-BLADE OR LIGHT-WEIGHT V-PLOWS. IN SOME CASES THESE ARE SUPPLEMENTED WITH WINGS WHICH ARE USED TO SPREAD THE SNOW. FOR DRIFTS UP TO 3 OR 4 FEET, THE CATERPILLAR TRACTOR WITH HEAVY V-PLOW IS USED. FOR EXCEPTIONALLY HEAVY WORK THE CATERPILLAR V-PLOW WITH ROTARY ATTACHMENT IS USED.

A GREAT PART OF THE WORK IS IN SNOW OF ORDINARY DEPTH AND FOR THIS PURPOSE THE TRUCK EQUIPPED WITH PUSH-PLOWS SEEMS TO BE THE MOST EFFICIENT AND SPEEDY. POWER-GRADERS ARE BEING USED WITH SUCCESS FOR ORDINARY SNOW FALLS. SPECIAL EQUIPMENT MUST BE USED IN MOUNTAINOUS DISTRICTS.

BRIEFLY, THE FOLLOWING PRACTICES WILL HELP TO SOLVE THE SNOW PROBLEM:

1. REMOVE THE CAUSE OF DRIFTING BY PROPER LOCATION OF THE ROAD AND BY ELEVATING THE GRADE.
2. PREVENT DRIFTING BY ERECTING SNOW FENCES AND BY REMOVING OR RELOCATING EXISTING HEDGES, WALLS, BRUSH, ETC.
3. REMOVE THE SNOW BY LIGHT FAST-MOVING EQUIPMENT AS SOON AS IT FALLS.
4. OPEN DRIFTS WITH HEAVY EQUIPMENT.

SUBJECT No. 5. - CONTINUING THE STUDY TO DETERMINE IF POSSIBLE THE UNITS OF COMPARATIVE WEAR IN ORDER TO SHOW MAINTENANCE COSTS FOR SUCH UNITS ON VARIOUS REPRESENTATIVE ROADS OF DIFFERENT TYPES.

UNFORTUNATELY, THIS SUBJECT INVOLVES MANY DETAILS WHICH ARE OFTEN DIFFICULT TO WORK OUT TO A POINT WHERE THE FIGURES AS OBTAINED ARE REPRESENTATIVE. IT IS BELIEVED THAT, IN ORDER TO GET THE COMPARATIVE WEAR ON DIFFERENT TYPES OF ROADS, SEVERAL

ITEMS SHOULD BE CONSIDERED: (1) TYPE AND AMOUNT OF TRAFFIC; (2) QUANTITIES OF REPAIR MATERIAL USED IN PATCHING SURFACINGS, WHETHER THEY BE BITUMINOUS, CONCRETE, OR GRAVEL; (3) GALLONS OF BITUMEN USED IN FILLING CRACKS; (4) SQUARE YARDAGE OF PATCHES AS COMPARED TO THE AREA OF ORIGINAL SURFACE; AND (5) DEPTH OF MATERIALS ADDED ON GRAVEL AND STONE ROADS.

THE ABOVE NAMED ITEMS WILL FURNISH A MEASURE OF WEAR ON THE ROAD PROVIDED AN ACCURATE ACCOUNT IS KEPT OVER A DEFINITE PERIOD OF THE AREAS OF THE SURFACES REPAIRED AND QUANTITIES OF MATERIALS USED IN PATCHING. SOME VERY INTERESTING STATISTICS HAVE BEEN KEPT ON THE AMOUNT OF GRAVEL USED ON VARIOUS UNTREATED GRAVEL-SURFACED ROADS IN THE STATE OF INDIANA OVER A PERIOD OF THREE YEARS. THESE STATISTICS HAVE BEEN WORKED UP FROM THREE INDIVIDUAL SOURCES AND THE AMOUNT OF GRAVEL USED WAS TABULATED FOR THE VARIOUS SECTIONS OF ROAD OVER THE THREE-YEAR PERIOD. THE TRAFFIC OVER THE HIGHWAYS WAS TAKEN INTO CONSIDERATION. THE FIGURES SHOW THAT AN AVERAGE OF 0.289 CUBIC YARDS OF GRAVEL PER MILE WERE WORN AWAY EACH YEAR BY AN AVERAGE DAILY TRAFFIC OF ONE VEHICLE OR THAT 0.00079 CUBIC YARDS OF GRAVEL WERE WORN AWAY BY EACH VEHICLE-MILE OF TRAFFIC OVER AN ORDINARY GRAVEL ROAD, OR 0.79 CUBIC YARDS PER MILE PER 100 VEHICLES PER DAY. THE FIGURES FURTHER SHOW THAT THE AMOUNT OF GRAVEL LOST IS DIRECTLY PROPORTIONAL TO THE AMOUNT OF TRAFFIC. A MORE COMPLETE REPORT OF THE INDIANA EXPERIMENT IS CONTAINED IN THE 1926 MAINTENANCE REPORT OF THE HIGHWAY RESEARCH BOARD.

THE VARIOUS STATE DEPARTMENTS HAVE BEEN SO OCCUPIED WITH THE ACTUAL MAINTENANCE AND CONSTRUCTION OF THEIR HIGHWAYS THAT VERY LITTLE THOUGHT HAS BEEN GIVEN TO THE SUBJECT. HOWEVER, IT IS BELIEVED THAT THE TIME WILL SOON COME WHEN THE MAINTENANCE COSTS AND THE UNITS OF WEAR ON DIFFERENT TYPES OF ROAD MUST BE GIVEN CONSIDERABLE ATTENTION. IT IS RECOMMENDED THAT FURTHER STUDY BE MADE OF THIS PHASE OF THE WORK AND THAT EACH STATE BE URGED TO KEEP ACCURATE DATA TO THE END THAT A COMPREHENSIVE REPORT MAY BE MADE AT THE 1927 MEETING.

IT IS RECOMMENDED THAT THIS COMMITTEE CONTINUE ITS STUDY OF ALL OF THE ABOVE SUBJECTS AND BE PREPARED TO REPORT FURTHER ON THEM AT THE 1927 MEETING OF THIS ASSOCIATION.

ROCK ASPHALT PAVEMENTS

CONTRIBUTED BY THE DIVISION OF DESIGN.

ROCK ASPHALT HAS BEEN USED FOR MANY YEARS IN BOTH EUROPE AND AMERICA FOR THE SURFACING OF CITY STREETS, AND IN RECENT DECADES THIS TYPE OF PAVEMENT HAS BEEN USED QUITE EXTENSIVELY FOR RURAL ROADS. BECAUSE THE SUPPLY IS LIMITED TO A RELATIVELY SMALL AREA OF THE COUNTRY, IT IS BELIEVED THAT A BRIEF DESCRIPTION OF THE CHARACTER AND USE OF THE MATERIAL, WILL BE OF INTEREST ESPECIALLY IN THOSE LOCALITIES WHERE IT IS UNKNOWN.

THE PRINCIPAL SOURCES OF SUPPLY WHICH HAVE BEEN DEVELOPED ON A COMMERCIAL SCALE IN THIS COUNTRY ARE LOCATED IN KENTUCKY, TEXAS, OKLAHOMA, CALIFORNIA, AND ALABAMA, AND THE USE HAS BEEN RESTRICTED LARGELY TO THESE AND NEIGHBORING STATES. THIS IS DUE TO THE FACT THAT THE ENTIRE BULK OF THE SURFACING COURSE MUST BE SHIPPED FROM THE MINE, WHICH PROVES TO BE A GREAT DISADVANTAGE IN COMPETITION WITH TYPES USING LOCAL SOURCES OF AGGREGATE.

THE ROCK ASPHALTS FROM VARIOUS QUARRIES DIFFER WIDELY IN MINERAL CONTENT AND IN THE AMOUNT AND CHARACTER OF THE ASPHALTIC BINDER. FOR THIS REASON THE METHODS OF USE ARE NOT UNIFORM.

IN VARIOUS OTHER STATES THERE ARE KNOWN TO BE GREAT DEPOSITS OF ASPHALTIC ROCK, BUT EACH QUARRY PRODUCT REQUIRES EXPERIMENTAL SECTIONS AND THE TEST OF TIME AND TRAFFIC BEFORE IT CAN BE ADOPTED WITH ASSURANCE OF ITS VALUE.

KENTUCKY ROCK ASPHALT

THE BEST KNOWN KENTUCKY ROCK ASPHALT IS MINED NEAR BOWLING GREEN. THE MINES ARE LOCATED ON THE GREEN RIVER, A NAVIGABLE STREAM AND A TRIBUTARY OF THE OHIO RIVER. BY REASON OF ITS FAVORABLE LOCATION WITH RESPECT TO WATER TRANSPORTATION AS WELL AS RAIL THE MATERIAL HAS QUITE AN EXTENDED USE IN NEIGHBORING STATES AND IS FREQUENTLY USED IN DISTANT STATES.

THE ROCK ASPHALT DEPOSITS CONSIST OF SANDSTONE IN NEARLY HORIZONTAL BEDS AND IMPREGNATED WITH ASPHALT. THE IMPREGNATION IS SOMEWHAT IRREGULAR, THE UPPER BEDS BEING LEAN AND THE LOWER BEDS RICH IN ASPHALT, BUT AS THE LEAN AND RICH

THE HISTORY OF THE UNITED STATES

The history of the United States is a story of growth and expansion. From a small collection of colonies on the eastern seaboard, it grew into a vast nation that stretched across the continent. The early years were marked by struggle and conflict, as the colonies fought for their independence from British rule. The American Revolution was a turning point in the nation's history, leading to the signing of the Declaration of Independence in 1776. The new nation then faced the challenge of creating a stable government, which was accomplished through the drafting of the Constitution in 1787. The years following the Revolution were a period of rapid growth and development. The nation expanded westward, and the economy flourished. The Industrial Revolution brought about significant changes in the way people lived and worked. The United States emerged as a major power in the world, and its influence was felt across the globe. The Civil War, which began in 1861, was a defining moment in the nation's history, as it fought to preserve the Union and end slavery. The war resulted in the abolition of slavery and the strengthening of the federal government. The Reconstruction period that followed was a time of great challenge and progress. The nation worked to rebuild itself and address the needs of the newly freed slaves. The late 19th and early 20th centuries were a period of continued growth and expansion. The United States became a world superpower, and its influence was felt in every corner of the globe. The 20th century was marked by significant events, including the Great Depression, World War II, and the Cold War. The United States played a leading role in the world during this time, and its actions shaped the course of human history. Today, the United States remains a major power in the world, and its history continues to be studied and debated by scholars and citizens alike.

ROCKS ARE SORTED AND COMBINED WHEN THE ROCK IS CRUSHED AND GROUND, THE ASPHALTIC CONTENT OF THE COMMERCIAL PRODUCT IS FAIRLY UNIFORM. AFTER GRINDING, THE MATERIAL IS USED FOR SURFACING IN A MANNER SIMILAR TO OTHER MIXED ASPHALT PAVEMENTS EXCEPT THAT IT IS LAID COLD.

THE COMPOSITION OF THE GROUND SANDSTONE ROCK GENERALLY RESEMBLES THAT OF A SHEET ASPHALT PAVING MIXTURE. THE MINERAL GRADING CANNOT BE SO THOROUGHLY CONTROLLED, AS THE SAND GRADING OF THE NATURAL ROCK MUST BE USED, WHICH IN SOME INSTANCES RESEMBLES A STANDARD SHEET ASPHALT GRADING AND IN OTHER CASES DOES NOT.

THE EXTRACTED ASPHALT IS TOO SOFT FOR THE PENETRATION TEST AND THE FLOAT TEST GIVES A VALUE OF ABOUT 180 SECONDS. ON ACCOUNT OF ITS SOFTNESS THE PROPORTION OF ASPHALT IS KEPT DOWN TO BETWEEN 7 AND 9 PER CENT AS COMPARED WITH $9\frac{1}{2}$ TO $12\frac{1}{2}$ PER CENT IN STANDARD SHEET ASPHALT. PAST EXPERIENCE HAS SHOWN THAT A HIGHER PERCENTAGE IS A SERIOUS DETRIMENT IN THAT IT CAUSES SURFACE DISPLACEMENT AND SOFT SPOTS IN THE PAVEMENT. THE PROBABLE REASON FOR THIS IS THAT THE SOFT ASPHALT COATS EACH PARTICLE MORE THOROUGHLY AND WITH A THINNER FILM THAN WHEN A STIFF ASPHALT IS USED AND THEREFORE AN EXCESS IS MORE READILY APPARENT. IN SPITE OF THESE DIFFERENCES THE FINISHED PAVEMENT IN ITS BEST EXAMPLES RESEMBLES A SHEET ASPHALT AFTER THE FIRST YEAR, DURING WHICH THE PAVEMENT IS SOMEWHAT MARKED BY THE WHEELS OF VEHICLES, OWING TO THE SOFTNESS OF THE ASPHALT.

THE PREVAILING PRACTICE IN THE USE OF KENTUCKY ROCK ASPHALT HAS BEEN TO EMPLOY A BROKEN STONE BASE, WHICH MAY BE EITHER NEW CONSTRUCTION OR WORN MACADAM RESHAPED. IN BOTH CASES THE METHOD IS ESSENTIALLY THE SAME. THE BASE COURSE OF CRUSHED STONE IS ONLY PARTLY FILLED WITH SCREENINGS. WHEN THE SURFACE COURSE OF GROUND ASPHALT ROCK IS APPLIED AND ROLLED, THE PROJECTION OF THE COARSE STONE OF THE BASE INTO THE SURFACE LAYER PROVIDES A CERTAIN ANCHORAGE THAT PREVENTS MAJOR DISPLACEMENT OF THE PAVEMENT ON THE FOUNDATION. DISPLACEMENTS SUCH AS OCCUR FREQUENTLY IN POORLY DESIGNED SHEET ASPHALT PAVEMENTS ARE NOTICEABLY LACKING AND THIS IS PROBABLY DUE TO THE FACT THAT THE ROCK ASPHALT AFTER GRINDING CONTAINS A CERTAIN AMOUNT OF ANGULAR STONE FRAGMENTS WHICH INTERLOCK AND PREVENT SUCH MOVEMENT.

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THIS MATERIAL HAS IN SOME CASES BEEN LAID ON A CONCRETE BASE. THE SURFACE OF THE CONCRETE IS FINISHED FAIRLY ROUGH OR IS PAINTED WITH A CUT-BACK ASPHALT TO INSURE ADHESION OF THE SURFACING TO THE FOUNDATION. EXPERIENCE INDICATES THAT ON A CONCRETE BASE THE CUT-BACK ASPHALT, IF USED, SHOULD BE APPLIED SPARINGLY.

OLD BRICK PAVEMENTS, WATERBOUND MACADAM, MODIFIED TELFORD, OLD TAR-BOUND MACADAM, AND OCCASIONALLY GRAVEL ROADS HAVE BEEN UTILIZED TO SUPPORT ROCK ASPHALT PAVING. EITHER SCARIFICATION AND COMPACTION UNDER TRAFFIC OR, IN THE CASE OF SUCH AS OLD BRICK, THE ADDITION OF A LEVELING-UP COURSE IS ADVISABLE TO PREPARE THE OLD SUBGRADE FOR THE WEARING SURFACE.

UVALDE ROCK ASPHALT

UVALDE ROCK ASPHALT IS MINED NEAR KLINE, UVALDE COUNTY, IN SOUTHWESTERN TEXAS. THE DEPOSITS ARE LARGE AND HAVE BEEN USED FOR A GREAT MANY YEARS. FORMERLY BITUMEN EXTRACTED FROM THE ROCK WAS USED IN MIXED ASPHALT PAVEMENTS BUT THE INTRODUCTION OF NATIVE ASPHALTS WHICH CAN BE PRODUCED AT LOWER COST HAS DISPLACED THE UVALDE ASPHALT.

UVALDE ROCK ASPHALT CONSISTS OF A LIMESTONE IMPREGNATED WITH ASPHALT. THE LIMESTONE IS COMPOSED OF FOSSIL CORAL AND SHELL SAND OF GREAT PURITY, CEMENTED TOGETHER BY THE PARTIAL SOLUTION AND HARDENING OF PART OF THE LIMESTONE. THE REMAINING VOIDS ARE FILLED WITH AN ASPHALT OF CONSIDERABLE HARDNESS AS COMPARED WITH THE ASPHALT EXTRACTED FROM THE KENTUCKY, ALABAMA AND OKLAHOMA ROCKS. AS TESTED BY THE BUREAU IT HAS A PENETRATION OF BETWEEN 5 AND 15 WITH AN AVERAGE OF ABOUT 8. THIS CONDITION AND THE FACT THAT THE NATURAL ROCK ORDINARILY CONTAINS AN AMPLE AMOUNT OF ASPHALT TO FILL ALL VOIDS COMPLETELY, MAKES THE ROCK OF CONSIDERABLE VALUE FOR ROAD WORK.

THE ASPHALT CONTENT OF THE MATERIAL SHIPPED FROM THE MINES FOR TOP-COURSE CONSTRUCTION ORDINARILY RUNS FROM 12 TO 15 PER CENT BY WEIGHT; BUT LEANER ROCK EXISTS IN THE UPPER LAYERS OF THE DEPOSITS, RUNNING AS LOW AS 5 PER CENT IN ASPHALT. THIS LEAN MATERIAL HAS BEEN USED TO A LIMITED EXTENT IN BASE-COURSE CONSTRUCTION, BOTH WITH AND WITHOUT THE ADDITION OF FLUXING OILS.

THE ROCK ITSELF IS COMPARATIVELY SOFT, BUT ON ACCOUNT OF THE COMPLETE IMPREGNATION NOT ONLY OF THE ROCK PARTICLES THEMSELVES, BUT ALSO OF THE INTERSTITIAL VOIDS WITH A HARD BITUMEN, A TOUGHNESS IS IMPARTED TO THE ROCK THAT MAKES IT ENTIRELY SUITABLE FOR SUSTAINING HIGHWAY TRAFFIC.

THE FIRST PROCESS AFTER MINING IS THE CRUSHING IN SPECIALLY DESIGNED PULVERIZERS INTO PARTICLES WITH A MAXIMUM SIZE OF ABOUT ONE-HALF OR ONE-QUARTER INCH.

VARIOUS METHODS OF LAYING THE MATERIAL HAVE BEEN SUCCESSFULLY EMPLOYED. TYPICAL OF EARLY PRACTICE, THE AGGREGATE WAS HEATED, A VERY FLUID FLUX WAS ADDED AND THE MASS WAS MIXED IN A SPECIAL MIXER SUCH AS IS GENERALLY USED FOR BITUMINOUS CONCRETE. THE ADDED FLUX SERVED TO SOFTEN THE EXPOSED PARTICLES OF ASPHALT AND AIDED IN THE PROPER CONSOLIDATION OF THE MIXTURE UNDER ROLLING. THE COARSER FRAGMENTS OF ROCK ASPHALT WERE SOFTENED ONLY AT THEIR SURFACES, AND THUS THE RESULTING PAVEMENT STRUCTURE RESEMBLED WELL-PROPORTIONED ASPHALTIC CONCRETE AND WAS COMPARATIVELY IMMUNE FROM LATERAL DISPLACEMENT. THE SURFACE RESEMBLED A SHEET ASPHALT. PAVEMENTS LAID BY THIS PROCESS ARE KNOWN TO HAVE BEEN IN SUCCESSFUL USE FOR OVER 20 YEARS.

RECENT PRACTICE IN TEXAS, WHERE MOST OF THE UVALDE MATERIAL IS USED, HAS INCLINED TOWARD THE COLD PROCESS, ALTHOUGH THE HEATING OF THE AGGREGATE IS OPTIONAL WITH THE ENGINEER ACCORDING TO STANDARD SPECIFICATIONS.

THE SURFACE OF THE EXISTING BASE, WHETHER CONCRETE, MACADAM, OR GRAVEL, IS THOROUGHLY CLEANED AND THEN TREATED WITH ONE OR TWO APPLICATIONS OF HOT ASPHALTIC OIL OF ABOUT ONE-TENTH GALLON PER SQUARE YARD, FOLLOWED BY A LIGHT APPLICATION OF FINELY PULVERIZED ROCK ASPHALT. THIS RESULTING SURFACE LAYER OF ABOUT 1/4-INCH THICKNESS IS ORDINARILY ALLOWED TO CONSOLIDATE UNDER TRAFFIC. THE MATERIAL FOR THE ADDITIONAL THICKNESS OF PAVEMENT, USUALLY ABOUT ONE INCH, IS PASSED THROUGH A PUG MIXER WHERE 1 TO 2 PER CENT BY WEIGHT OF FLUXING OIL IS ADDED. AFTER SPREADING AND ROLLING, A TOP DRESSING OF LIMESTONE ASPHALT DUST, FREE FROM FLUX, IS ROLLED INTO THE SURFACE UNTIL ALL EXCESS BITUMEN IS ABSORBED AND THE DESIRED COMPACTION IS PRODUCED.

THE LOCATION OF THE MINES IS SUCH THAT THE AREA SERVED IS SOMEWHAT LIMITED. HOWEVER, BEING LOCATED IN THE ARID AND THE SEMI-ARID SECTION OF THE UNITED STATES WHERE OTHER SUITABLE MATERIALS AS WELL AS WATER ARE DIFFICULT TO OBTAIN, THE MATERIAL IS OF PARTICULAR VALUE. IN THESE SECTIONS FROSTS DO NOT PENETRATE DEEPLY AND A HEAVY CRUSHED STONE OR GRAVEL BASE COURSE ORDINARILY SUPPLIES AN AMPLE SUPPORT, IF THOROUGHLY CONSOLIDATED.

OKLAHOMA ROCK ASPHALT

OKLAHOMA ROCK ASPHALT IS MINED NEAR DAUGHERTY AND IN OTHER LOCALITIES OF SOUTHERN OKLAHOMA. THERE ARE TWO KINDS, BITUMINOUS SANDSTONE AND BITUMINOUS LIMESTONE. THE MATERIALS ARE FOUND IN SEPARATE BODIES LOCATED SOME DISTANCE APART AND HAVE BEEN USED BOTH IN COMBINATION AND SEPARATELY. THE TREND SEEMS TO BE TOWARD THE ADOPTION OF THE LIMESTONE BECAUSE OF THE UNSATISFACTORY GRADING OF THE IMPREGNATED SAND THUS FAR ENCOUNTERED. BOTH OF THESE TYPES ARE FINE GRAINED. FOSSIL SHELLS OF MARINE ORIGIN ARE OCCASIONALLY ENCOUNTERED IN THE CALCAREOUS FORMATION. THE ASPHALTIC CONTENT IS UNIFORMLY CLOSE TO 5 PER CENT BY WEIGHT IN BOTH THE SANDSTONE AND THE LIMESTONE DEPOSITS. IN BOTH CASES THE EXTRACTED ASPHALT IS TOO SOFT FOR THE PENETRATION TEST AND HAS A FLOAT TEST OF ABOUT 225 SECONDS.

WHERE USED IN COMBINATION THE TWO MATERIALS ARE CRUSHED TOGETHER IN PREDETERMINED PROPORTIONS. THE SIZE OF THE COARSEST PARTICLES IS ONE-HALF INCH. THE PULVERIZED MATERIAL IS SHIPPED, USUALLY BY RAIL, TO THE SITE OF THE IMPROVEMENT. THERE IT IS HEATED TO A TEMPERATURE OF FROM 225° F., TO 325° F., AND MIXED IN A PUG MIXER. SUFFICIENT ASPHALT OF PENETRATION FROM 40 TO 60 IS ADDED TO BRING THE BITUMINOUS CONTENT UP TO BETWEEN 8 AND 11 PER CENT.

WHERE USED SEPARATELY THE SAME HEATING, MIXING, AND PROPORTIONING OF ASPHALTIC BINDER ARE USUALLY EMPLOYED FOR EITHER THE BITUMINOUS SANDSTONE OR LIMESTONE. THE COLD LAYING PROCESS HAS BEEN EMPLOYED WITHOUT THE ADDITION OF ASPHALT, AND HAS GIVEN SATISFACTORY SERVICE FOR MORE THAN TEN YEARS.

THE COMPOSITION AND FINAL APPEARANCE OF THE PAVEMENTS CONSTRUCTED OF THIS MATERIAL RESEMBLE A MODIFIED TOPEKA PAVEMENT AS THEY INCLUDE, ACCORDING TO PREDETERMINED PROPORTIONS, STONE FRAGMENTS BETWEEN THE ONE-HALF INCH AND No. 10 SIZE UP

TO ABOUT 32 PER CENT. THE INTERLOCKING EFFECT OF THE CRUSHED STONE FRAGMENTS NO DOUBT EXPLAINS THE FREEDOM FROM SURFACE DISPLACEMENT. SOME SUCH PAVEMENTS IN CITIES OF THE MIDDLE WEST HAVE REMAINED IN EXCELLENT CONDITION FOR AS MUCH AS TWENTY YEARS AND ARE STILL FREE FROM DEFECTS TRACEABLE TO THE MATERIAL ITSELF.

ALABAMA ROCK ASPHALT

WHILE THE OCCURRENCE OF ROCK ASPHALT IN ALABAMA HAS BEEN A MATTER OF SCIENTIFIC RECORD FOR MORE THAN THIRTY YEARS, THE COMMERCIAL SIGNIFICANCE OF THESE DEPOSITS MUST DATE FROM THE YEAR 1922 WHEN A PRACTICAL TEST DISCLOSED THEIR VALUE. IN THE FALL OF 1923 ABOUT 12,000 SQUARE YARDS OF CITY PAVEMENTS WERE LAID COLD AT FLORENCE, ALABAMA, AND IN 1924, SOME 78 CITY BLOCKS WERE LAID BY THE HOT PROCESS FROM THE MARGERUM DEPOSITS OF ASPHALTIC LIMESTONE. MANY MILES HAVE BEEN PAVED WITH ALABAMA ROCK ASPHALT, EITHER THE SANDSTONE OR THE LIMESTONE FORMATION, DURING THE PAST TWO YEARS. THE MOST IMPORTANT OF THE KNOWN DEPOSITS ARE WITHIN A 15-MILE RADIUS FROM MUSCLE SHOALS NEAR FLORENCE, ALABAMA.

CORRECTION

IT IS DESIRED TO CALL ATTENTION TO THE CONCRETE PAVEMENT DESIGN ARTICLE IN THE DECEMBER 1926 NEWS LETTER. ON PAGE 5 IN THE COLUMN HEADED "SPECIAL FEATURES" FOR MINNESOTA THE TEXT SHOULD READ "SEE SKETCH OF CONTRACTION JOINTS." AT THE TOP OF PAGE 8 THE DISTANCE BETWEEN THE PARALLEL LEGS OF THE CORNER REINFORCING BARS SHOULD BE 6 INSTEAD OF 3 INCHES. AT THE BOTTOM OF PAGE 8 THE WIDTH OF THE WASHINGTON PARTIAL JOINT IN THE SECTION SHOULD BE ONE-QUARTER INCH AS SHOWN IN PLAN ABOVE.

PROGRESS OF FEDERAL HIGHWAY LEGISLATION
(NOT FOR RELEASE)

H.R. 14827 - THE INTERIOR DEPARTMENT APPROPRIATION BILL. INTRODUCED IN THE HOUSE ON DECEMBER 10, 1926. SIGNED BY THE PRESIDENT ON JANUARY 12, 1927.

PROVIDES AN APPROPRIATION OF \$2,000,000 FOR ROADS AND TRAILS IN THE NATIONAL PARKS AND MONUMENTS. ALSO PROVIDES THAT THE SECRETARY OF THE INTERIOR MAY INCUR ADDITIONAL OBLIGATIONS NOT EXCEEDING A TOTAL OF \$2,500,000.

H.R. 15008 - THE AGRICULTURAL DEPARTMENT APPROPRIATION BILL. INTRODUCED IN THE HOUSE ON DECEMBER 13, 1926, BY W. W. MAGEE OF NEW YORK AND SIGNED BY THE PRESIDENT AND BECAME AN ACT ON JANUARY 18, 1927.

PROVIDES AN APPROPRIATION FOR FOREST ROADS AND TRAILS OF \$6,500,000. OF THIS AMOUNT \$1,675,000 IS A PART OF THE AMOUNT AUTHORIZED FOR THE FISCAL YEAR 1928, AND THE BALANCE IS FROM THE AUTHORIZATION FOR THE FISCAL YEAR 1927.

PROVIDES ALSO THAT THE APPROPRIATION FOR FOREST ROADS SHALL BE AVAILABLE FOR THE CONSTRUCTION OF STOREHOUSES USED IN ROAD CONSTRUCTION, THE TOTAL AMOUNT OF ANY SUCH BUILDING NOT TO EXCEED \$1,500. APPROPRIATES \$71,000,000 FOR FEDERAL-AID ROAD CONSTRUCTION, OF WHICH \$23,800,000 IS THE REMAINDER OF THE \$75,000,000 AUTHORIZED FOR THE FISCAL YEAR 1926 AND THE BALANCE IS FROM THE AUTHORIZATION FOR THE FISCAL YEAR 1927.

H.R. 15422 - INTRODUCED IN THE HOUSE ON DECEMBER 18, 1926, BY B. C. REECE OF TENNESSEE AND REFERRED TO THE COMMITTEE ON ROADS.

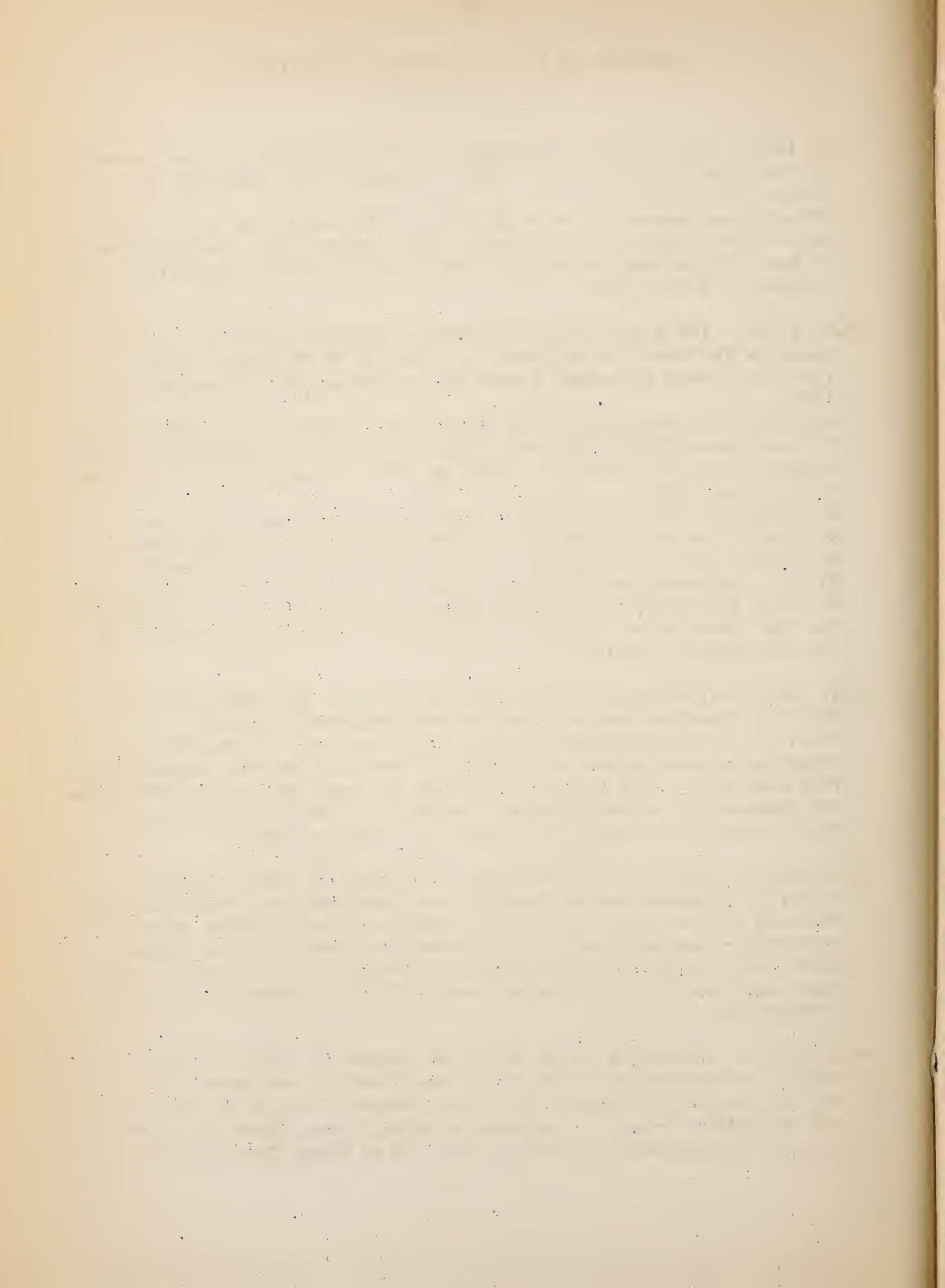
PROVIDES FOR AN AMENDMENT TO EXISTING FEDERAL-AID LEGISLATION TO DIRECT AN APPROPRIATION OF \$50,000,000 FOR EACH OF THE FISCAL YEARS 1928 AND 1929. THIS MONEY TO BE SPENT ON RURAL POST ROADS OTHER THAN THE FEDERAL-AID HIGHWAY SYSTEM. THE MONEY IS TO BE SPENT BY THE STATE HIGHWAY DEPARTMENT IN COOPERATION WITH THE BUREAU.

H.R. 15669 - INTRODUCED IN THE HOUSE ON JANUARY 3, 1927, BY C. J. MCLEOD OF MICHIGAN AND REFERRED TO THE COMMITTEE ON FOREIGN AFFAIRS.

PROVIDES FOR THE CREATION OF A PAN-AMERICAN PEOPLES GREAT HIGHWAY COMMISSION WHOSE DUTY WILL BE TO LOCATE THE MOST FEASIBLE HIGHWAY ROUTE FROM CANADA, THROUGH THE UNITED STATES, MEXICO, CENTRAL AND SOUTH AMERICA. TO CARRY ON THE WORK \$200,000 IS AUTHORIZED TO BE APPROPRIATED.

H.R. 15970 - INTRODUCED IN THE HOUSE ON JANUARY 6, 1927, BY SCOTT LEAVITT OF MONTANA AND REFERRED TO THE COMMITTEE ON ROADS.

PROVIDES FOR THE AUTHORIZATION OF AN APPROPRIATION OF \$1,144,000 FOR THE CONSTRUCTION OF A HIGHWAY FROM RED LODGE, MONTANA, TO THE BOUNDARY OF YELLOWSTONE NATIONAL PARK, NEAR COOKE CITY, MONTANA.



H.R. 16462 - URGENT DEFICIENCY APPROPRIATION BILL. INTRODUCED IN THE HOUSE ON JANUARY 19, 1927, AMENDED AND SENT TO CONFERENCE ON JANUARY 29, 1927.

PROVIDES AN APPROPRIATION OF \$1,400,000 FOR FOREST ROADS AND TRAILS, BEING THE REMAINDER OF THE \$7,500,000 AUTHORIZED FOR THE FISCAL YEAR 1927.

H.R. 16464 - INTRODUCED IN THE HOUSE ON JANUARY 19, 1927, BY E. E. DENISON OF ILLINOIS, AND REFERRED TO THE COMMITTEE ON ROADS. PROVIDES THAT FEDERAL AID MAY BE GRANTED ON A ROAD OR HIGHWAY LEADING DIRECTLY TO OR FROM A TOLL BRIDGE OR FERRY.

H.R. 16551 - INTRODUCED IN THE HOUSE ON JANUARY 21, 1927, BY W. A. OLDFIELD OF ARKANSAS AND REFERRED TO THE COMMITTEE ON ROADS. PROVIDES THAT FEDERAL-AID FUNDS MAY BE GRANTED IN THE CONSTRUCTION OF ANY TOLL BRIDGE AND APPROACHES THERETO, IF ALL TOLLS RECEIVED LESS THE ACTUAL COST OF OPERATION AND MAINTENANCE, ARE APPLIED IN COMPLETE REPAYMENT TO THE STATE OR SUBDIVISION CONSTRUCTING THE BRIDGE, OF ITS PART OF THE COST THEREOF; THE BRIDGE WHEN PAID FOR TO BECOME A FREE BRIDGE.

H.R. 16777 - INTRODUCED IN THE HOUSE ON JANUARY 28, 1927, BY O. B. BURTNESSE OF NORTH DAKOTA AND REFERRED TO THE COMMITTEE ON INTER-STATE AND FOREIGN COMMERCE. PROVIDES REGULATIONS CONCERNING THE CONSTRUCTION OF FREE BRIDGES AND TOLL BRIDGES OVER THE NAVIGABLE WATERS OF THE UNITED STATES AND ON OR LEADING TO ROUTES ON THE FEDERAL-AID HIGHWAY SYSTEM.

S. 4933 - REPORTED TO THE SENATE WITH AMENDMENTS FROM THE COMMITTEE ON TERRITORIES AND INSULAR POSSESSIONS ON JANUARY 24, 1927, BY H. BINGHAM OF CONNECTICUT. PROVIDES AN AUTHORIZATION OF \$100,000 FROM THE TREASURY TO ENABLE THE SECRETARY OF AGRICULTURE TO CONSTRUCT, RECONSTRUCT AND MAINTAIN PUBLIC HIGHWAYS IN THE VIRGIN ISLANDS OF THE UNITED STATES.

S. 5031 - INTRODUCED IN THE SENATE ON JANUARY 3, 1927, BY R. H. CAMERON OF ARIZONA AND REFERRED TO THE COMMITTEE ON POST OFFICES AND POST ROADS. CONTAINS PROVISIONS IDENTICAL WITH THOSE OF H. R. 15669.

H.J. RES. 329 - INTRODUCED IN THE HOUSE ON JANUARY 10, 1927, BY J. C. LINTHICUM OF MARYLAND AND REFERRED TO THE COMMITTEE ON FOREIGN AFFAIRS. PASSED BY THE HOUSE WITHOUT AMENDMENT ON JANUARY 17, 1927. REPORTED OUT WITHOUT AMENDMENT BY THE SENATE COMMITTEE ON FOREIGN RELATIONS ON JANUARY 18, 1927. PROVIDES AN AUTHORIZATION OF \$15,000 FOR THE EXPENSES OF PARTICIPATION BY THE UNITED STATES IN THE SECOND PAN-AMERICAN CONFERENCE ON HIGHWAYS AT RIO DE JANEIRO.

FEDERAL AID ROAD FUND APPORTIONMENTS FOR
THE FISCAL YEAR 1928.

ON DECEMBER 31, 1926, THE SECRETARY OF AGRICULTURE APPORTIONED THE FOLLOWING SUMS TO THE SEVERAL STATES AND THE TERRITORY OF HAWAII FOR FEDERAL HIGHWAY CONSTRUCTION FOR THE FISCAL YEAR ENDING JUNE 30, 1928. THESE SUMS ARE IMMEDIATELY AVAILABLE FOR CONTRACT.

STATES	AMOUNT	STATES	AMOUNT
ALABAMA	\$1,547,220	NEBRASKA	\$1,585,138
ARIZONA	1,056,994	NEVADA	948,510
ARKANSAS	1,277,896	NEW HAMPSHIRE	365,625
CALIFORNIA	2,483,437	NEW JERSEY	934,611
COLORADO	1,376,520	NEW MEXICO	1,186,763
CONNECTICUT	472,685	NEW YORK	3,635,217
DELAWARE	365,625	NORTH CAROLINA	1,713,356
FLORIDA	899,451	NORTH DAKOTA	1,194,951
GEORGIA	1,979,209	OHIO	2,762,209
IDAHO	935,193	OKLAHOMA	1,751,891
ILLINOIS	3,154,429	OREGON	1,182,202
INDIANA	1,926,772	PENNSYLVANIA	3,335,735
IOWA	2,044,999	RHODE ISLAND	365,625
KANSAS	2,068,532	SOUTH CAROLINA	1,054,988
KENTUCKY	1,417,947	SOUTH DAKOTA	1,220,064
LOUISIANA	1,013,308	TENNESSEE	1,614,766
MAINE	680,794	TEXAS	4,497,272
MARYLAND	635,119	UTAH	846,906
MASSACHUSETTS	1,089,100	VERMONT	365,625
MICHIGAN	2,214,691	VIRGINIA	1,442,714
MINNESOTA	2,120,741	WASHINGTON	1,131,532
MISSISSIPPI	1,307,879	WEST VIRGINIA	793,636
MISSOURI	2,405,175	WISCONSIN	1,870,455
MONTANA	1,551,499	WYOMING	934,369
		HAWAII	365,625
		TOTAL	\$73,125,000

THE ACTION OF CALCIUM CHLORIDE ON CEMENTS

ABSTRACT OF AN ARTICLE PUBLISHED IN
LE GENIE CIVIL, PAGE 283, OCTOBER 2, 1926.

ABSTRACTED AND TRANSLATED BY
C. S. JARVIS OF THE DIVISION OF DESIGN.

IN CONNECTION WITH AN INVESTIGATION OF THE CORROSIVE ACTION OF CALCIUM CHLORIDE ON STEEL REINFORCEMENT, AUTHORIZED BY THE UNION OF BUILDING TRADES, SOME INTERESTING OBSERVATIONS WERE REPORTED BY MR. ANSTETT REGARDING THE EFFECT OF THIS CHEMICAL ON CEMENT.

HE FOUND THAT VERY DILUTE MIXTURES OF CALCIUM CHLORIDE, SUCH AS A FEW GRAMS PER LITRE OF MIXING WATER, RETARD THE SETTING OF THE CEMENT QUITE NOTICEABLY. HOWEVER, WITH CONCENTRATED SOLUTIONS, SUCH AS 100 TO 400 GRAMS PER LITRE, THE SETTING AND HARDENING WERE ACCELERATED.

THE CALCIUM CHLORIDE ADMIXTURE IS A STABILIZER OF MORTAR, DUE NO DOUBT TO ITS AFFINITY FOR FREE LIME SUCH AS IS PRESENT IN VARYING AMOUNTS IN ALL CEMENTS. THE ELIMINATION BY COMBINATION OF THIS FREE LIME WITHOUT DELAY REMOVES A FREQUENT CAUSE OF SWELLING AND DISINTEGRATION OF CONCRETE.

MIXED WITH A STRONG SOLUTION OF CALCIUM CHLORIDE, THE CEMENT ACQUIRED CONSIDERABLE COMPRESSIVE STRENGTH IN A VERY SHORT TIME, BUT SAMPLES OF A SIMILAR MIXTURE DISINTEGRATED WHEN IMMERSSED IN WATER A FEW MOMENTS AFTER SETTING. OTHER SPECIMENS THAT HAD CURED IN AIR FOR 15 TO 20 HOURS REMAINED INTACT DURING SUBMERSION IN WATER. OTHER FACTORS ARE KNOWN TO INFLUENCE THE EFFECT OF CALCIUM CHLORIDE (SUCH, FOR INSTANCE, AS THE VARIATIONS IN CHEMICAL CONTENT OF THE GIVEN CEMENT - NOTE BY TRANSLATOR).

TO ILLUSTRATE THE INFLUENCE OF THIS ADMIXTURE ON THE SOUNDNESS, 18 CEMENT PATS WERE PREPARED, 9 OF WHICH WERE MIXED WITH PURE WATER, AND THE OTHER 9 WITH 5 PER CENT BY WEIGHT OF CALCIUM CHLORIDE. AFTER CURING FOR A FEW DAYS IN WATER AT 15 DEGREES C., 3 OF THE 9 PATS MIXED WITH PURE WATER HAD DEVELOPED CRACKS, BUT ALL OF THOSE WITH THE ADMIXTURE WERE INTACT.

EFFLORESCENCE INCREASES WHEN CALCIUM CHLORIDE IS ADDED IN STRONG PROPORTIONS, DUE, NO DOUBT, TO THE DELIQUESCENCE OF THE CHEMICAL AND THE CONSTANT HUMIDITY OF THE CEMENT AS THUS MAINTAINED.

TABLE 1 ILLUSTRATES THE INFLUENCE OF CALCIUM CHLORIDE ADMIXTURE ON THE TIME OF SETTING.

TABLE 1. - THE INFLUENCE OF CALCIUM CHLORIDE ADMIXTURES ON THE TIME OF SETTING OF THE CEMENT.

	: CEMENT MIXED WITH :		: CEMENT WITH ABOUT :		: CEMENT WITH ABOUT :	
	: PURE WATER :		: 3 PER CENT OF :		: 6 PER CENT OF :	
	:		: CaCl_2 :		: CaCl_2 :	
	: INITIAL :	: FINAL :	: INITIAL :	: FINAL :	: INITIAL :	: FINAL :
	: HRS. MIN. :	: HRS. MIN. :	: HRS. MIN. :	: HRS. MIN. :	: HRS. MIN. :	: HRS. MIN. :
ALUMINATE CEMENT:	4 10	: 8 40	: 0 20	: 1 05	: 0 12	: 0 35
HOLDERBANK.....:	3 -	: 6 45	: 0 16	: 1 20	: 0 04	: 0 11
ORDINARY PORTLAND						
CEMENT.....:	3 15	: 6 45	: 0 15	: 2 30	: 0 04	: 0 17
SLAG CEMENT.....:	3 15	: 19 -	: 3 45	: 11 30	: 1 45	: 6 15

IT MUST BE OBSERVED IN PASSING THAT THE 6 PER CENT ADMIXTURE IS NOT TO BE RECOMMENDED FOR USE WITH THE HOLDERBANK AND ORDINARY PORTLAND CEMENT, AS THE 4-MINUTE TIME OF INITIAL SETTING IS TOO SHORT A PERIOD TO EMPLOY IN PRACTICE.

TABLE 2 INDICATES THE RESISTANCE TO COMPRESSION IN POUNDS PER SQUARE INCH, AND THE INFLUENCE OF CALCIUM CHLORIDE AS AN ADMIXTURE.

TABLE 2. - THE INFLUENCE OF THE CALCIUM CHLORIDE ADMIXTURES ON THE COMPRESSIVE STRENGTH OF THE CEMENT.

	: TEST SPECIMENS CURED					
	: IN WATER AT 15 DEGREES C. :			: IN AIR AT MINUS		
	:			: 20 DEGREES C. :		
	: MORTAR MIXED WITH :		: MORTAR MIXED WITH :		: MORTAR MIXED WITH :	
	: PURE WATER :		: 6 PER CENT CaCl_2 :		: 6 PER CENT CaCl_2 :	
	: 2 DAYS :	: 7 DAYS :	: 2 DAYS :	: 7 DAYS :	: 2 DAYS :	: 7 DAYS :
	: LBS. PER :	: LBS. PER :	: LBS. PER :	: LBS. PER :	: LBS. PER :	: LBS. PER :
	: SQ. IN. :	: SQ. IN. :	: SQ. IN. :	: SQ. IN. :	: SQ. IN. :	: SQ. IN. :
ALUMINATE CEMENT:	3300	: 4600	: 2350	: 2370	: 1720	: 2480
HOLDERBANK.....:	950	: 2740	: 2340	: 2510	: 1340	: 3020
ORDINARY PORTLAND						
CEMENT.....:	336	: 1510	: 1070	: 1770	: 700	: 1316
SLAG CEMENT.....:	266	: 826	: 28	: 168	: 28	: 826

THE ADMIXTURE OF 6 PER CENT CALCIUM CHLORIDE WAS APPARENTLY HARMFUL WHERE THE TEMPERATURE OF THE BATH WAS 15 DEGREES C., EXCEPT FOR ORDINARY PORTLAND CEMENT. IT IS OF SOME ADVANTAGE WHERE EXPOSED TO TEMPERATURES AS LOW AS MINUS 20 DEGREES C., FOR THE SPECIMENS MIXED WITH PURE WATER DEVELOPED PRACTICALLY NO STRENGTH AT THIS TEMPERATURE.

TIMBER HIGHWAY BRIDGE SPECIFICATIONS APPROVED BY THE A.A.S.H.O.

CONTRIBUTED BY E. F. KELLEY, CHIEF OF THE DIVISION OF TESTS.

DURING THE YEAR 1926, THE AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, BY LETTER BALLOT, APPROVED THE SPECIFICATIONS FOR TIMBER HIGHWAY BRIDGES WHICH HAD BEEN PREPARED AND PRESENTED BY THE SUBCOMMITTEE ON BRIDGES AND STRUCTURES. DIVISION I, THE GENERAL PROVISIONS OF THE SPECIFICATIONS, WHICH HAD BEEN PREPARED BY THE SAME SUBCOMMITTEE, WERE ALSO APPROVED. THESE SPECIFICATIONS ARE NOW INCORPORATED IN THE STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES AND INCIDENTAL STRUCTURES OF THE ASSOCIATION. THE LATTER INCLUDE SPECIFICATIONS FOR STEEL AND CONCRETE BRIDGES, AS WELL AS MANY ITEMS OF INCIDENTAL AND MISCELLANEOUS CONSTRUCTION. THE COMPLETE HIGHWAY BRIDGE SPECIFICATIONS AS APPROVED BY THE ASSOCIATION TO DATE ARE NOW AVAILABLE IN MIMEOGRAPHED FORM. THE BUREAU HAS A LIMITED SUPPLY OF THESE WHICH WILL BE FURNISHED UPON REQUEST.

TREND OF CONCRETE PAVEMENT DESIGN - JANUARY 1, 1927.

CONTRIBUTED BY THE DIVISION OF DESIGN
(NOT FOR RELEASE)

IN THE NEWS LETTER OF MAY, 1926, THERE APPEARED A TABLE SHOWING THE TREND OF CEMENT CONCRETE PAVEMENT DESIGN PRACTICE AS BETWEEN THICKENED-EDGE, THIN-EDGE, AND UNIFORM-THICKNESS DESIGNS. THIS TABLE HAS BEEN EXPANDED AND REVISED TO INCLUDE THE 1926 FEDERAL-AID PROJECTS AND IS PRESENTED HEREWITH AS TABLE I.

THERE WERE SUBMITTED IN 1926, 12 THIN-EDGE DESIGNS OF WHICH 11 WERE FROM MARYLAND AND ONE FROM DELAWARE. ALL OF THESE DESIGNS ARE FOR A 15-FOOT ROAD WITHOUT LONGITUDINAL CENTER JOINTS. THE UNIFORM-THICKNESS PAVEMENTS ARE MOSTLY FROM THE NEW ENGLAND STATES. THE 9-6-9 DESIGN PREDOMINATES AND THE 9-7-9 IS SECOND IN POPULARITY.

THE THICKENED-EDGE DESIGNS WERE 80 PER CENT OF THE TOTAL FOR 1925 WORK AND 81 PER CENT OF THE 1926 WORK. IN MILEAGE OF ROAD, THE PERCENTAGE OF THE THICKENED-EDGE TYPE WOULD BE MUCH GREATER BECAUSE THE UNIFORM-THICKNESS AND THIN-EDGE DESIGNS ARE MOSTLY ON SHORT PROJECTS.

TABLE 1. - THE TREND OF DESIGN OF FEDERAL-AID CONCRETE PAVEMENT PROJECTS AS OF JANUARY 1, 1927.

(UNIFORM THICKNESS)

DESIGN THICKNESS		NUMBER OF FEDERAL-AID PROJECTS SUBMITTED BY YEARS										
EDGE	CENTER	EDGE	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
IN.	IN.	IN.	:	:	:	:	:	:	:	:	:	:
5	5	5	-	1	-	1	2	1	-	-	-	-
6	6	6	2	3	3	24	24	49	10	4	3	3
7	7	7	1	11	17	31	22	80	70	33	47	27
7½	7½	7½	2	4	17	31	21	30	9	1	-	2
8	8	8	4	17	68	90	78	85	61	51	44	57
9	9	9	-	1	13	9	9	8	8	-	-	7
10	10	10	-	-	5	5	5	2	2	-	1	2
12	12	12	-	-	-	-	-	-	2	-	1	-
TOTAL UNIFORM-THICKNESS PROJECTS			9	37	123	191	161	255	162	89	96	98

(THIN EDGE)

5	6	5	-	-	1	11	3	1	-	-	-	-
5	7	5	4	10	7	4	-	3	-	-	-	1
6	7	6	-	1	9	17	8	39	25	-	-	-
6	8	6	4	13	92	60	56	71	16	25	9	11
7	8	7	1	11	65	55	23	24	18	-	-	-
7	9	7	-	-	1	2	-	2	4	-	-	-
8	10	8	-	-	-	-	-	1	1	-	-	-
TOTAL THIN-EDGE PROJECTS			9	35	175	149	90	141	64	25	9	12

(THICK EDGE)

7	5	7	-	-	-	-	-	1	-	-	-	-
7	6	7	-	-	-	-	-	1	23	38	43	24
7½	5½	7½	-	-	-	-	-	-	-	-	15	2
7½	6	7½	-	-	-	-	-	-	-	12	-	6
8	5	8	-	-	-	-	-	-	-	4	-	-
8	6	8	-	-	-	-	1	8	17	21	72	52
8	6½	8	-	-	-	-	-	-	-	-	4	4
8	7	8	-	-	-	-	-	-	3	25	33	33
9	5	9	-	-	-	-	-	-	-	2	1	1
9	6	9	-	-	-	-	3	-	55	180	160	192
9	6½	9	-	-	-	-	-	-	-	22	34	34
9	7	9	-	-	-	-	-	9	6	38	49	80
10	7	10	-	-	-	-	-	2	1	5	3	26
10	8	10	-	-	-	-	-	1	3	9	3	4
12	6	12	-	-	-	-	-	-	-	-	1	-
TOTAL THICKENED-EDGE PROJECTS			0	0	0	0	4	22	108	356	418	458
GRAND TOTALS			18	72	298	340	255	418	334	470	523	568

