

## Road Maker's Art Evolved by the Ancients Reaches its Highest Development in America

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From the beginning to the present time it has been the highway that has made nations great. The road is the pioneer. Civilization follows the flag but the road opens up the way through the wilderness, over the mountains and across the valleys for the bearers of the flag and the steady advance of civilized influences. With the building of roads, savagery has retreated and disappeared, forests have fallen before the axe, new fields have been cultivated, towns have sprung up and cities grown to be linked in commerce with distant markets by ribbons of steel upon which speed the railroad trains—those advanced carriers of trade for which the modern highway is the feeder. Savage man built no roads, nor had he any conscious need of them for his wants were few and individual in character.

From those prehistoric days when man and mammal trod the paths to the ancient watering places near the sites of which in some localities we find their petrified bones still imbedded, man has gradually risen in the civilized scale. His wants have increased proportionally and have passed from the individual to the collective. The path no longer served his requirements. Roads became a necessity. Wheeled traffic developed with the Roman Empire, but when and where the first real roads were built has never been definitely ascertained. That it was long before the beginning of authentic history is certain.

While we know little about the roads that existed prior to the Roman Empire we do know from records remaining that not only the Romans but the Egyptians, the Carthaginians, the Sumerians and other ancient peoples employed much the same materials that we are today using in highway construction. There is evidence that both the Romans and the Egyptians used a mineral cement. The Bible tells of the manufacture and use of bricks. As early as 44 A. D. the Romans used bricks in England. Actual scientific and quantity production did not begin, however, until 886, when Alfred The Great directed that bricks be produced under government supervision. The earliest recorded use of asphalt was by the Sumerians, a people inhabiting the Euphrates Valley prior to the ascendancy of the Babylonians. An asphalt cast excavated at Logash near the mouth of the Euphrates dates back to 2850 B. C. As a mortar for brick, similar to the filler now used in brick city streets, asphalt was used in the construction of the Tower of Babel. One historian claims this same substance was used about 1500 B. C. to daub the basket which served to conceal Moses in the bullrushes when the children of Israel were suffering under bondage in Egypt.

It was Nabopolassar, King of Babylon, who, about 500 B. C., first used asphalt as a filler for brick pavements. His son, Nebuchadnezzar continued the practice. In the Western Hemisphere asphalt was used in ancient times by the Incas who established an elaborate system of highways in Peru and Ecuador. Thus we see that cement, brick and asphalt instead of being products of exclusively modern use really are world-old materials, the use of which has been handed down to us through the centuries to be im-

### THE OLD ROAD

The old road draws with dip and pause,  
Through loneliest vale and down  
From that highway whose broad display  
Leads folk from town to town.

proved upon and adapted to civilization's growing needs. The same is true of stone, except that in modern usage stone is crushed for use in road building, whereas in the days of Rome's greatness, stone was used in the form of large slabs frequently two feet thick. Roads of this type carried Caesar's armies forward to conquest.

Herodotus tells us that in Egypt a great king built a magnificent road across the sands for the transportation of materials for the Pyramids, employing for this purpose 100,000 men for a period of ten years. This road was built of massive stone blocks and was lined on both sides with mausoleums, statues and temples. Traces of what may have been a part of this ancient highway are today found near the great Pyramids and comprise what is probably the oldest remains of a road surfaced with stone. Early historians write of wonderful roads radiating from the city of Babylon about 2000 B. C. and running to Susa, Ecbatana, Sardis and Nineveh, as having been paved with brick. The ancient Persians, Assyrians, Carthaginians, Chinese and Peruvians were all renowned road-builders. Their works, however, have passed away and the records of their great achievements are now lost to mankind.

Specimens of Roman roads are still to be seen in Rome and in Pompeii. The "Appian Way" or "Queen of Roads," begun by Claudius Appius about 312 B. C., led from Rome to Capua, a distance of 142 Italian miles. This road

### SHANGHAI HARBOR TO BE IMPROVED

Leading engineers of six countries are in Shanghai serving on an international consultative board which is reviewing the work of a decade, consisting of preliminary surveys undertaken in connection with a great project to improve Shanghai's harbor. As Shanghai is about thirty miles from the sea, on the Whangpoo river, the preliminary work, which was carried out by the Whangpoo Conservancy Board, consisted of extensive surveys of the entire estuary of the Yangtze river, into which the Whangpoo empties.

The members of the international board are: Major General W. M. Black, formerly chief of the United States army engineers, representing the United States; P. G. Hornell, consulting engineer of the hydraulic engineering bureau of Stockholm, who represents the Chinese chamber of commerce on the board; P. Ott de Vries, formerly head of the department of public works of the Netherlands, representing Holland; L. Perrier, for twenty years engineer of the Suez canal, representing France; Isamu Hiroi, representing Japan, and F. Palmer, consulting engineer of the Port of London Authority, representing Great Britain.

was later extended to Brundisium, sometimes called Brindisi, a total distance of 360 miles and was finally completed by Julius Caesar. It was in excellent condition until 509 A. D. The "Flaminian Way," the second of the great Roman roads, was begun about 220 B. C. This road crossed the River Nar about 60 miles from Rome by means of a great stone-arch bridge, with a central span of 150 feet and a rise of 100 feet. The "Flaminian Way" originated at the Milvian Bridge in Rome and terminated at the bridge in Rimini. Other famous Roman highways were the Aurelia, Aemilia, Cassia, Latina, Solaria and Valeria. When Rome was at the height of her glory no less than 29 great roads radiated from her gates and the empire was well served with highways that have endured to this day in Italy, Spain, England, Gaul, Illyricum, Macedonia, Thrace and Egypt.

From the days of the ancients, road-building has developed until it is today a principal industry in every civilized country of the world—the United States, England, France and Germany leading all other nations in its application. Its development has brought about many innovations and while the basic materials employed by the ancients are still in use, many new materials have been evolved and applied with success. The United States, which stands at the dawn of the greatest road-building era in all history because of the development of the motor vehicle, leads all nations in road-building. Those living today will see the time when the United States will have the finest and most extensive system of arterial and tributary highways the world has ever known, a system of beautifully paved roads, properly located, splendidly shaded with trees, adorned with hedges and shrubbery, edged with side walks and gutters, lighted by electricity, kept in repair by working patrols and protected against highwaymen by mounted police. Grade crossings will have disappeared and our rural highways will equal in beauty and practicability the most beautiful and practical of our city streets. Rural life, therefore, because of these and other modern improvements will approach more closely the ideal of human existence and young men from the city will seek life in the country.

Highway work is constantly developing new types of roadways. Its development in America has brought many peculiar types of pavement ranging from the old earth roads and military plank roads down to portland cement concrete and those refined petroleum asphalt pavements now largely manufactured since the discovery of asphaltic petroleum in California and Mexico. Native lake asphalt is still in use but the bulk of the asphalt used in paving is now manufactured from petroleum oil. Many odd types of roads have been tried only to fail because of cost, climatic or traffic conditions. There have been in the United States probably more experiments with odd and unusual materials in road-building than in any other country in the world.

It was at Newton, Massachusetts, in 1908 that the molasses refuse of a sugar refinery combined with lime was first used as a binder for road materials but it was found impracticable because of its increasingly high cost and the fact that the binder was somewhat soluble in water. The road, however, did sustain traffic for a number of

years. Plank roads were legion in the United States during the pioneer days and are much used today by Military engineers. Road binders have been made from sulphite liquors obtained from tanneries and attempts have been made to burn roads that were surfaced with clay so as to make a surfacing material approaching brick in hardness. A recent attempt to harden clay roads by burning was made near Clarksdale, Mississippi, in 1904, when experiment conducted by the United States Bureau of Public Roads proved to be successful but too costly and practicable only in regions where an ample supply of timber could be secured for fuel. Roads have been constructed of chats from zinc mines, slag from blast furnaces and shells from the sea. Oyster and clam shell roads are now to be found in many places in the coast states. Rubber has also been utilized as a road material in experimental highway construction. In fact successful rubber roads have been in very limited use in India for some time. The ordinary broken stone or macadam road invented by John Macadam, a Scotch road engineer of Ayrshire, has until recently been in general use. These are now giving way to the hard surfaced roads that are better adapted to automobile and truck traffic. Seaweed, cotton, hay and straw have often been used in the construction of roads and in contrast to such materials it is interesting to note that iron and steel have been used. A steel road has been in use in Calencia, Spain, for twenty years. Portland cement roads in America are now commonly being reinforced with steel.

While highway improvement has made tremendous strides in the United States in recent years it is still in its infancy. Eighty-five per cent of American roads are yet to be improved. It is not now so much a question of raising the money required to build good roads as it is the problem of spending wisely the large sums available in every state for this purpose.

Many questions pertaining to highway finance and administration as well as road construction and highway transportation will be discussed in the light of more recent developments at a big nation-wide good roads congress and exposition of road-building machinery, materials, methods and appliances to be held in Chicago, January 16th to 20th, 1922, under the auspices of the American Road Builders' Association. About 20,000 delegates from all parts of the United States and Canada, Cuba, Porto Rico, Hawaii and other places are expected to attend this Road Convention. One result that is hoped for from this meeting and the consequent impetus to the good roads movement is that of enlisting more young men in the field of highway engineering. The number of road engineers is entirely too small for the existing demand.

Good transportation facilities constitute one of the greatest of the sources of national wealth. We really do not need to search the pages of history to realize the vital part that highways have played in world development. In our day, I believe, the highway will become the great rival of the railroad. The passenger automobile and motor truck industries, two of the greatest now in point of capital invested and output, are absolutely dependent for their stability and growth upon good roads. In establishing our highway systems and in building our roads the motor traffic of the future must be gauged and ample provision made for a rapid increase in the volume and weight of highway traffic. Our highways must be planned to meet future rather than present needs, and built—not for a day—but for all time. They have become a means to an end. And that end is the co-ordination of all the great sources of power in the nation for the use, comfort and convenience of all of the people.

## California Leads Other States in Probable Construction---is Forecast

The greatest building activity in this country next year will be in the industrial states, according to a forecast of the building outlook made by the Committee on Statistics and Standards of the Chamber of Commerce of the United States.

It is pointed out by the Committee that there will be a good many business buildings next year, and a large number of them will be in the shape of alterations and enlargements. On the other hand, it says, it is unfortunate that not a great many farm buildings, such as dwelling houses, barns, cribs and the like are contemplated.

According to the Committee, California leads the other states with respect to probable construction, while good likelihoods of construction lie in the Central West and in the East.

### HAMMOND LUMBER COMPANY DENIES \$15,000,000 DEAL

All property of the Hammond Lumber Company has been sold to the Long-Bell Lumber Company of Kansas City for \$15,000,000, according to a report from Portland, Ore. The sale is said to include the Hammond mills at Astoria and Detroit, Ore., the famous redwood mill at Eureka, Cal., extensive timber holdings in California and Oregon, and the Hammond fleet of lumber ships.

It is understood that the purpose of the Long Bell company in seeking to purchase the Hammond interests has been mainly to gain control of the big line of wholesale and retail yards controlled by Hammond in California. These would be of great importance to the Long Bell company, which will soon be one of the largest, if not the largest, operators on the Pacific Coast. It is taken as a confirmation of the prediction that Southern pine will be closed out in a decade and that operators in southern pine will, one by one, bring their organizations and investments to the West.

The San Francisco offices of A. B. Hammond denies Portland reports that Hammond had sold his Pacific Coast lumber interests to the Long Bell Lumber Company of Kansas City for \$15,000,000.

"I can say authoritatively that we have had no dealings with the Long Bell people," Vice-President Bennett of the Hammond company said.

"There, also, are a great many possibilities for building in the Southern States," it says. "These possibilities are greater than seemed likely under the stringent conditions which prevailed there prior to the rise in the price of cotton.

"The prospects for building in the strictly agricultural states are not so favorable. There are several reasons for this, principally the exceedingly low and unremunerative prices on farm products, which seriously reduce the purchasing power of the farmer. In addition, the banks generally throughout the agricultural sections are fully loaned up, so that the farmer finds it difficult to obtain either ready money or credit. In such circumstances there is not likely to be much building in these states, especially on farms, for the simple reason that the farmer is financially unable to build. "Three factors enter largely into the

problem of building during the coming months: The high price of material; high price of labor and the question of obtaining funds for construction. Prices of material, on the whole, are much the more favorable of the three factors. It is only here and there that there is any apparent difficulty in this respect. The matter of too high priced labor does not stack up so well as that of material, but there is a general belief that not only are matters improving in this direction but when springtime comes, the long period of probable idleness of labor will naturally tend to bring about a much more favorable solution of this problem than is now presented.

"There are the usual scattered exceptions to any general statement. Labor is plentiful in some sections, scarce in others. The matter of obtaining money for construction is the most difficult problem of all. It is not that money seems to be so high in price that it is hard to get, particularly in the agricultural sections and on the countryside rather than in the large cities.

"Apparently when construction gets well under way, it will comprehend a great many dwelling houses in its purpose and intent; this because of the supreme necessity of more adequate housing almost everywhere.

"There also will be a very large number of educational buildings, such as schools, and additions to colleges and universities. The numerous 'drives' for funds set on foot by all sorts of educational institutions will bear fruit in many new buildings next spring. In particular, the great state universities of the West and the South have more liberal appropriations from their various legislatures for building purposes than for many years. There are likewise a number of public buildings under way.

"Few things tend to hasten the return of better times more than the building industry. Things used in the building of dwelling houses call upon virtually all the industries of the country for their products. A general and far-reaching construction program in this country in 1922 is the best possible harbinger of a return to more prosperous conditions."

### SAN FRANCISCO BUILDING FOR YEAR TOTALS \$22,244,672

Building construction undertaken in San Francisco for the year 1921 totaled \$22,244,672, according to the Bureau of Building Inspection of the Board of Public Works. During the past year 6313 permits were issued; 1830 for new buildings and 4483 for alterations, additions and repairs to standing structures.

The total for 1921 is \$4,485,320 less than that of 1920 and \$7,081,430 greater than that of 1919. Following is a segregated list of the activities of the past year, as reported by the Board of Public Works:

Class	Number	Cost
"A"	25	\$ 2,916,000
"B"	12	1,597,500
"C"	170	3,409,313
Frames	1610	8,984,934
Alterations	4183	3,638,783
Public	12	1,624,354
Harbor	1	73,788
Total	6313	\$22,244,672

A ton of coal produces 10,000 feet of gas.

**IMPORTANT CHANGES IN 1911 IMPROVEMENT ACT**

The large number of proceedings started under the Improvement Act of 1911 is one of the striking features of street improvement work in California municipalities. Many amendments to this act were passed at the last session of the California legislature and are now in effect. These have removed many objections to the law and particularly have made improvement work done under it more attractive to contractors. Some of the important new provisions are as follows:

Failure to post a few of the notices required to be put up in an assessment district cannot affect the validity of a street work proceeding. Failure to post notices on even part of a street in a district was fatal under the old law, and such failure occurred more than once, despite the exercise of great care.

A contract shall not be invalidated because an extension of time was not granted prior to the expiration of the time within which the work was to have been completed, provided the contractor made his application before the original time expired.

Liens shall take priority in the order in which they are imposed. The old law contained nothing relative to liens and the supreme court held that the last lien should have priority.

A reassessment may be made in case the original for any reason should be void or unenforceable. Trivial technical errors, such as transposition of type lines in printing a resolution of intention, may invalidate an assessment. Substantial compliance with the law assures the contractor he will be paid for his work.

When a contractor signs a contract for street improvements with the street superintendent he shall not be obliged to advance any more of the incidental expenses than have been incurred up to that time. This provision merely clears up ambiguity in the old law.

Assessment district may be described by council by showing a plat of same, by giving numbers of lots or blocks to be assessed or any other method which may be clear; this is supplemental to the provision of the old law requiring boundaries of district to be minutely described.

Altogether the changes made in the Improvement Act of 1911 make it a most satisfactory measure for street improvement work. Some of them have been sought by city officials with the object of reducing the hazards to the contractor and thereby lowering the cost of street work. Those changes placing street contracts on a safe basis where there has been substantial compliance with the law are particularly pleasing to contractors. Nothing is more aggravating or discouraging than to have a contract upset by some trivial technical error in the proceedings. It means irritating delay and trouble if not actual financial loss. However, the property owner is equal gainer with the contractor if his street work costs less. It is not altogether a one-sided proposition.—**Southwest Builder and Contractor.**

Young man seeks financial interest in reliable firm, manufacturing, staple line, building material or contracting, capable superintendent or assistant—best of references.  
Address Box EG—c/o Building and Engineering News.

## Wider Roads, Stronger Bridges to be Discussed at National Good Roads Show

The growing demand for wider and safer roads and stronger bridges has awakened the officers and directors of the American Road Builders' Association to the need for action and the program committee has provided for an exhaustive discussion of the subject at the Twelfth American Good Roads Congress and Thirteenth National Good Roads Show to be held in Chicago, January 16th the 20th, next.

### Eliminate Grade Crossings

The elimination of grade crossings will be one of the phases considered. Out of 12,000 persons killed on the highways of the country last year, 7,000 were struck down at grade crossings. Investigation has shown also that one motorist in every three is careless at grade crossings, approaching the railroad tracks at reckless speed and without taking due notice of approaching trains.

### PITTSBURG ROAD TESTS

(Engineering News-Record)  
New York

Interest in the tests to destruction of the reinforced-concrete road, in the form of an elliptical track, construction of which was completed recently at Pittsburg, Cal., has centered, up to the present, upon the methods employed in building the roadway and the unusually elaborate equipment installed to determine the effects of motor truck traffic, temperature and moisture. A new phase of this research work has been reached \*\*\* of certain preliminary observations made since traffic started its procession around the track on Nov. 9. In other words the work has passed through the planning and construction stages into that of operation. It is still too early, of course, for the real story of what the results show. Nevertheless the indications thus far made are well worth studying, for a number of significant facts were disclosed by the measuring and recording apparatus before traffic began. The California engineers have already learned some interesting things regarding the influence of temperature changes and Pittsburg has become the objective of scores of highway engineers interested in research work. In no sense are the results which will be based on the data now being collected to be considered as merely of local significance. Lessons from the Pittsburg tests will surely have a decided bearing on the future design of concrete roads, particularly with regard to reinforcement and sub-grade problems.

The Pennsylvania and Southern Pacific railroads, especially, have been heavy sufferers from grade crossing accidents. On the Southern Pacific lines alone during the past three years 1909 motor cars and trucks were wrecked at grade crossings. In 490 cases, or more than 20 per cent, the motorist deliberately ran into the trains. In 122 instances autos plunged through the crossing gates. Nine crossing flagmen were struck down. In 970 cases in which motorists ran in front of the trains 136 persons were killed and 405 injured. In 490 cases motor cars stalled on the crossing and were demolished. Forty-three cars actually collided with the danger signals.

### Accidents Occur on Long Stretches of Road

An investigation conducted recently by the Maryland State Roads Commission demonstrated that most highway accidents occur on long stretches of road instead of at the curves and are due to speeding or reckless driving, rather than skidding.

A total of \$4,500,000 was paid out in death claims by American insurance companies for the 12,000 persons killed on the highways last year. In addition to the fatalities there were 1,500,000 non-fatal injuries.

Automobile fatalities in 1918 were 9,542. In 1919 the number increased to 9,826. Considering the 12,000 accidents last year and basing their calculations on the experiences of St. Louis, Cleveland, New York, Chicago, and other cities for the first six months of 1921, experts estimate that this year's fatalities on the highways will reach 15,000. A total of 690 persons were killed on New York State roads and city streets during the first six months of this year. Of this number, 403 met their death in New York City.

### Exhibit Record Broken

At a recent drawing of space for the good roads show in Chicago, ninety-five per cent of the 40,000 square feet of space was taken, breaking all records and necessitating the use of additional buildings to house the exhibits. Approximately \$1,500,000 worth of labor-saving road machinery and appliances will be exhibited.

At the good roads congress to be held during the exposition, many subjects of importance to highway users will be discussed, including the strengthening of bridges to carry the ever increasing truck loads and a more equitable distribution of taxation for the construction and maintenance of highways. Last year, Federal, State and Municipal taxes on motor vehicles reached the staggering sum of \$316,720,000—equivalent to \$34 per car. Governors of states, county commissioner and mayors of cities throughout the country are being asked to appoint delegates to the congress.

### JAMES C. HAYBURN GETS NEW BONDING COMPANY

Contractors and others will be interested to learn that the well known insurance man, James C. Hayburn, has added the Union Indemnity Company of New Orleans to his agency.

This company furnishes all classes of proposal, contract, court and fidelity bonds as well as automobile, workmen's compensation, payroll hold-up and other casualty lines.

The Union is a stock Company with assets of \$4,000,000 and a surplus to policy holders of \$1,500,000. Its bonds are accepted by the Federal Government and all Courts. The Company's address is Insurance Exchange Building and its Phone, Kearny 799.

### NEWMAN PAVING PROJECT UP FOR BIDS

Bids the second unit of the Newman paving program have been called by the city trustees. The bids will be opened January 24. Approximately ten blocks of streets are included in the project which will cost in the neighborhood of \$150,000. Work will be under the supervision of W. R. Sherman, town engineer.