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Four Thousand Years of Practical Engineering in China.

By DANIEL W. MEAD

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The Wisconsin Engineer

VOL. XIX JANUARY, 1915 NO. 4

FOUR THOUSAND YEARS OF PRACTICAL ENGINEERING IN CHINA

DANIEL W. MEAD.
Professor of Hydraulic Engineering.

The American engineer traveling in China cannot but be impressed on the one hand with the many and important public works which have been constructed in the past by the Chinese people, and on the other hand with the apparent ineffectiveness of many of these works, the absence of any proper scientific basis for their design, and their wholly inadequate maintenance. Here are found great works conceived and undertaken while Western nations were still in barbarism. Here are evidences of an advanced state of a civilization almost as ancient as that of Egypt, and developed by a people who have maintained their nationality, while other ancient nations have flourished, have scattered and gone, and have left only their works to tell of their former greatness.

For some 4,000 years the Chinese people have been constructing public works of importance. These works consisted of bridges and roads, dikes and other structures for the control of rivers, for the prevention of overflow of cities and farm lands, and for the reclamation of land for farming purposes. Nearly 2,000 years before the time of Christ, the Chinese began the construction of works to control the Yellow River. Over 200 years B. C. they constructed the great defensive wall along the northern border (see Fig. 3); they built great walls around their principal cities; they built roads and bridges for transportation purposes, and began to develop a great system of canals for navigation, irrigation and drainage. They have developed various handicrafts,

displaying great skill in many lines, such as boat building, carpenter work, iron work, metal casting, and the arts of carving, weaving, embroidery, pottery, and cloisonne. Each industry has been developed along lines more or less unique and all are characteristic of this people. There is perhaps no other country in the world where there have been developed and have been in continuous use, for so many years by the same people, public works and native industries of such importance and interest as those of China.

FIG. 1.—*Temple and Native Hut on the Embankment of the Grand Canal. The Temple has Tile Roof, the Hut a Roof Thatched with Grass.*

In spite of the great antiquity of China's civilization and the early beginning of its material development, and in spite of the creditable work accomplished, for much of which the Chinese people may be justly proud, the present status of China in material things, is only fairly comparable with Western civilization during the middle ages. The material development, and especially the development in engineering, is the result of centuries of experience without a knowledge or appreciation of the fundamental principles on which any successful effort for the betterment of conditions must depend.

Before the growth of scientific knowledge, every people has endeavored to explain the occurrence of natural phenomena, such as sunshine or storms, bountiful crops or famine, fair weather

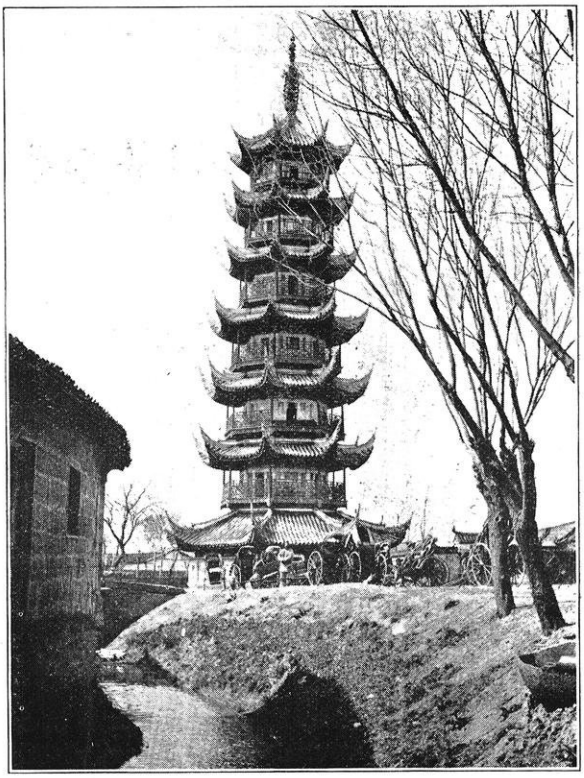

FIG. 2.—*The Loong Hua Pagoda Near the City of Shanghai; at the base are Native Ricksha Men Awaiting Passengers.*

or floods and droughts and most other conditions and phenomena, beneficial or detrimental to mankind, on the theory of the predominance of good or evil spirits which are able to and do modify or control such occurrences. It is well known that every step in the advance of science in Western civilization was opposed by the medieval theologian who believed that nature was governed by direct divine intervention and not by universal law, as science has fully demonstrated. Lack of scientific knowledge in China

left superstition to explain these phenomena, much as they were explained in the middle ages of Western civilization.

There has been developed in China from the earliest times a system of geomancy which has secured a strong hold on the imagination of the Chinese people and has seriously dwarfed and hampered their material development. According to this belief, nature is filled with influences for good or evil which must be

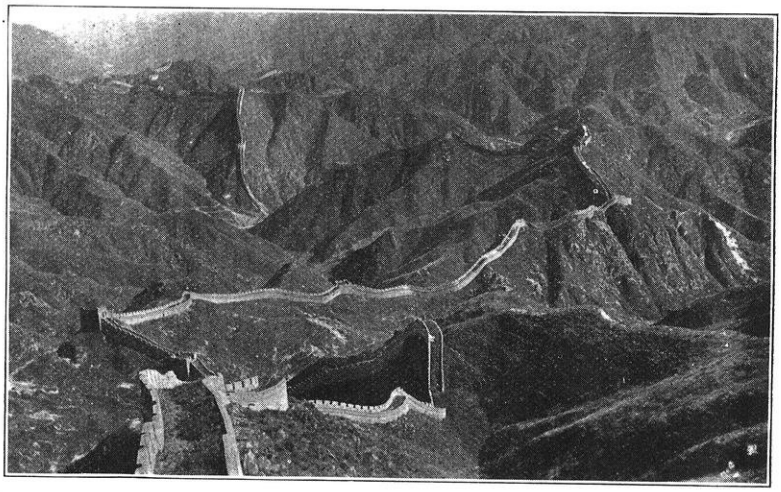

FIG. 3.—*The Great Wall of China, Built along the Ridge of the Mountains, over Peaks and across Valleys for 1,500 Miles.*

carefully studied by those versed in the mysteries in order that favorable results may be secured in the affairs of life. These influences are believed to affect almost every action and every event in life, and this belief has been a most powerful force in opposition to new ideas and especially to the introduction of new conditions, which it was feared might disturb the geomantic contions. If such beliefs prevail, nothing but sacrifices, prayers and fastings can be considered as effective in preventing flood or famine, and any attempt to correct such unfavorable conditions by other means must be regarded as more or less sacriligious and liable to bring about even more serious conditions. When such beliefs prevail a better gospel is possible only with the advent of scientific knowledge.

In Chinese education, the study of the Chinese classics has prevailed to the exclusion of all other lines of study for many centuries. During the Han dynasty (206 B. C.—221 A. D.) competitive examinations for literary degrees were established as the basis of official preferment, and were abolished by edict in September, 1905. This kind of education was similar to the old

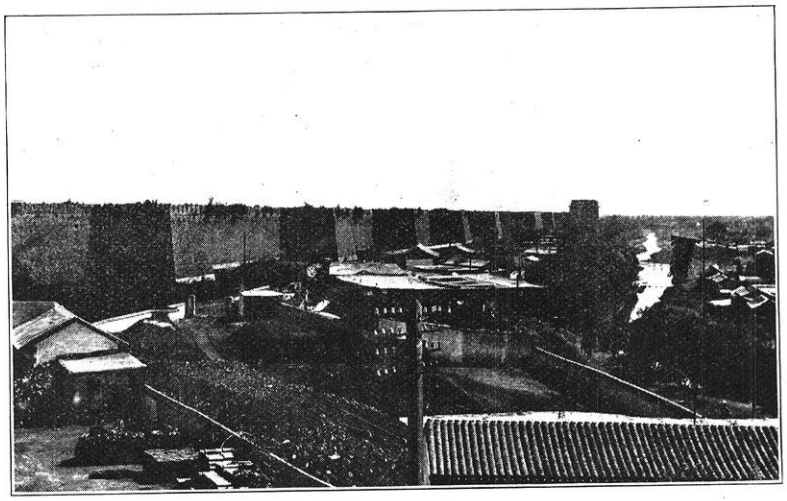

FIG. 4.—*East End of South Wall of Tartar City of Peking. A Moat 120 Feet Wide Formerly Flanked this Wall. The Moat is now Partially Filled and Occupied by a Railroad and by Coal Yards and other Commercial Structures.*

classical education of Western nations; but the great development of scientific education in Western civilization has as yet had little effect on the affairs of China. Proud in the consciousness of their early civilization, the Chinese people have not until recently recognized the advantages of scientific knowledge. Unwelcome contact with the Western nations has, however, aroused this people to a partial recognition of their needs, and a radical change in their educational system is gradually taking place. Many of their brightest young men are now being sent by the government to acquire scientific educations at the principal schools of Europe and America, and the dawn of a new and a better material development seems assured for the Chinese nation.

The new force which has partially lessened the intolerable conditions under which many of the people of China have been forced to live, has made many aware of the possibility of better things. The possibilities of flood prevention, the needlessness of the resulting famines, which have devasted again and again the provinces of the nation, the desirability of better transportation

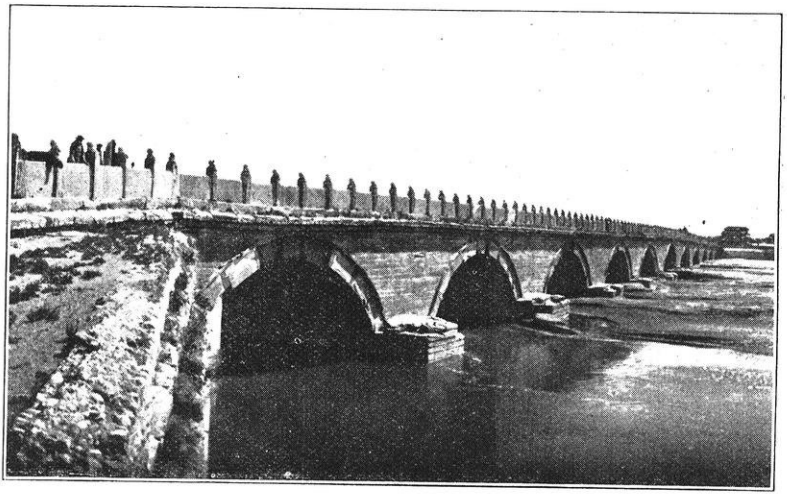

FIG. 5.—*Bridge Across the Hun River near Peking, Described by Marco Polo as in Use in the 13th Century.*

facilities, of better sanitary conditions and of general betterments in the condition of the entire people, are being slowly recognized and will ultimately create a vast field of labor not only for the young Chinese engineer but also for many foreign engineers who will be needed for many years to guide in this movement toward better material conditions.

A brief review of some of the conditions which now exist and of the works already constructed in China may illustrate the magnitude of the problems which yet await solution in China.

Architecture

With the exception of the buildings in the treaty ports and the native pagodas, most of the buildings of China are only one or two stories in height. They are constructed mostly of wood or brick, although stone is frequently used in the foundations.

The exteriors of most buildings present blank walls except for the central door, for the windows open only on a central court, except where the building is built within outer protecting walls. Palaces, yamens, and the residences of the wealthy include numerous small buildings constructed around one or more court yards. The roofs, which are commonly of tile, with their wide eaves and graceful, curved lines, often highly ornamented with

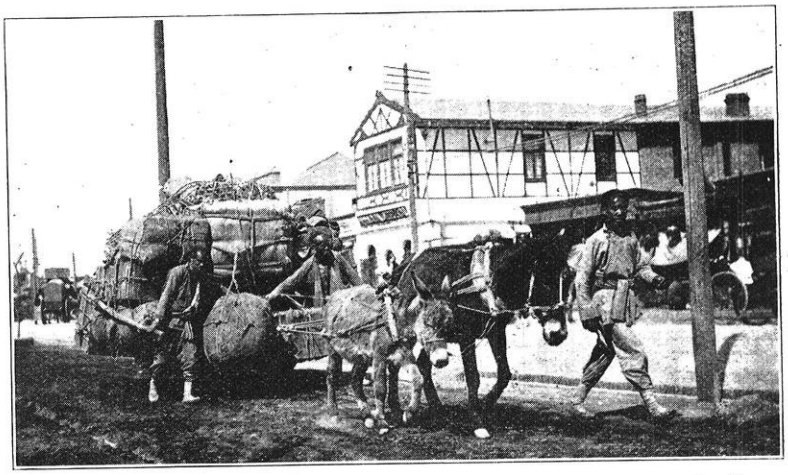

FIG. 6.—*Wheel Barrow Drawn by Typical Team and Operated by Four Men, One at the Barrow Handles (invisible), Two to Balance Barrow, and One with Team.*

carvings and projections, often form pleasing features. Fig. 1 is from a photograph of a temple built on the embankment of the Grand Canal. The lattice constructed in the wall is not common except in the walls of temples. The small building to the left is a native hut, built of woven reeds and thatched with grass.

The pagoda is the most sightly and ornamental construction in China (see Fig. 2). Buildings of this type often stand on prominent elevated points, and are visible for long distances. They are graceful in outline and are usually seven, nine or at least an odd number of stories in height. There are said to be several thousand of these structures in China. They are understood to be constructed to improve the geomantic condition of the neighborhood rather than for religious purposes.

In the native cities, the buildings are built close together, along narrow, crooked streets; the only open spaces are usually adjacent to the temples. Most of the native Chinese shops are wide open to the street and are closed at night by adjustable shutters. In the treaty ports and foreign concessions, the modern shop front is, however, rapidly taking the place of the native type of construction.

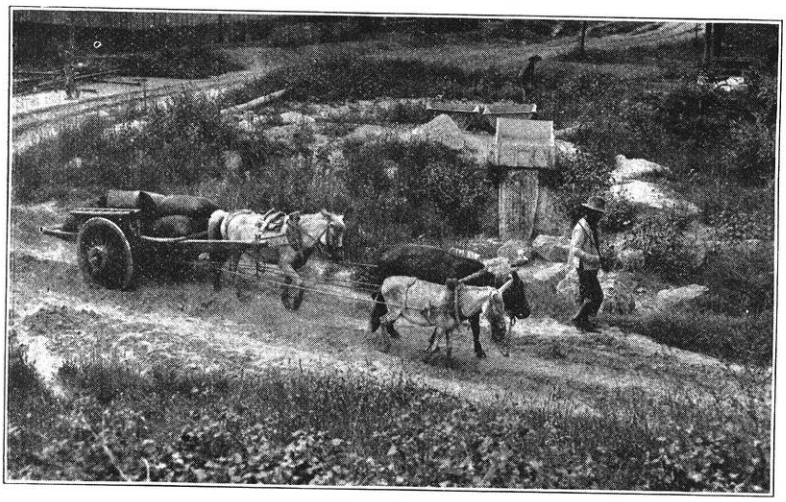

FIG. 7.—*Typical Team Hauling Salt from Salt Boats near the Yellow Bridge to the Hankow-Peking Railway Station.*

The houses of the poor are of the cheapest possible construction. They are often built of bamboo or reeds, plastered with mud. In some cases the walls are of earth, pounded into forms, in others of adobe, or sun dried brick. The roofs are commonly thatched with grass or straw. (See Fig. 1.)

In spite of its great age, China possesses few ancient ruins, for her building construction has not been of such a character as to withstand the ravages of time. Even the Great Wall has been reconstructed once or more, and much of it is said to be in complete ruin at the present time. The development of China in architecture cannot compare with that of Europe during the middle ages when highly developed religious ideas found partial expression in the creation of magnificent churches and cathedrals,

unequalled in the later and more material periods of Western civilization.

The Great Wall

The Great Wall (see Fig. 3) is perhaps China's best known structure. It was begun over 200 years B. C. It is about 1,500 miles in length and averages about 27 feet in height and about

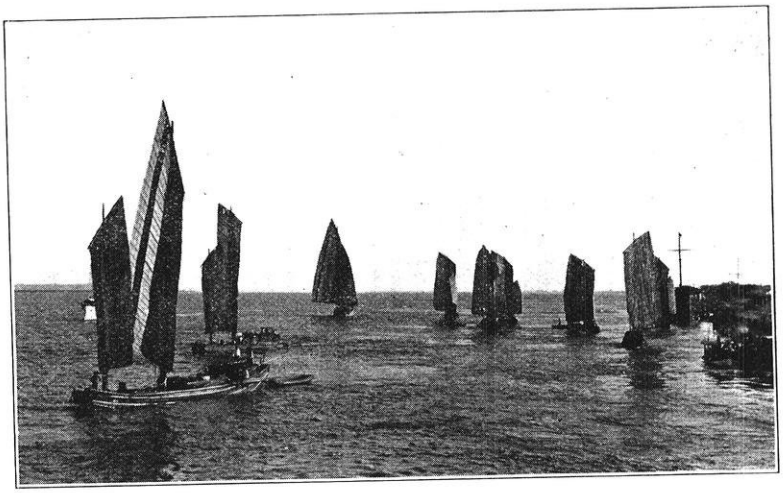

FIG. 8.—*Junks on the Yangtse River near the City of Nanking.*

30 feet in width, and in differents portion is built of stone, brick and earth. It was constructive for defensive purposes against the northern tribes, and was first built in parts by various states or provinces for their own protection. Its various sections were finally connected up, strengthened, and the wall made continuous by the Emperor Shih Huang Ti, to whom the entire structure is commonly credited. The wall was repaired and lengthened in the 15th and 16th centuries by the emperors of the Ming Dynasty.

Colonel Wingate, who examined the Great Wall at many points about 1907, states that in many places it has ceased to exist, "the only places where it forms a substantial boundary being in the valley bottoms, on the passes and where it crosses main routes." While the task of building this wall was very great, its construction was simple and not to be compared with some of the great works of ancient Egypt.

City Walls

The larger cities of China are protected by walls for defensive purposes. The greatest of these is the Great Tartar City Wall of Peking, which was begun in 1419 under the third emperor of the Ming Dynasty. This wall (see Fig. 4) has a height of 40 feet, a base of 62 feet, and is almost 13 miles in length, enclosing an area of about ten square miles, within which lie the Tartar, the Imperial and Forbidden Cities. With the exception of its

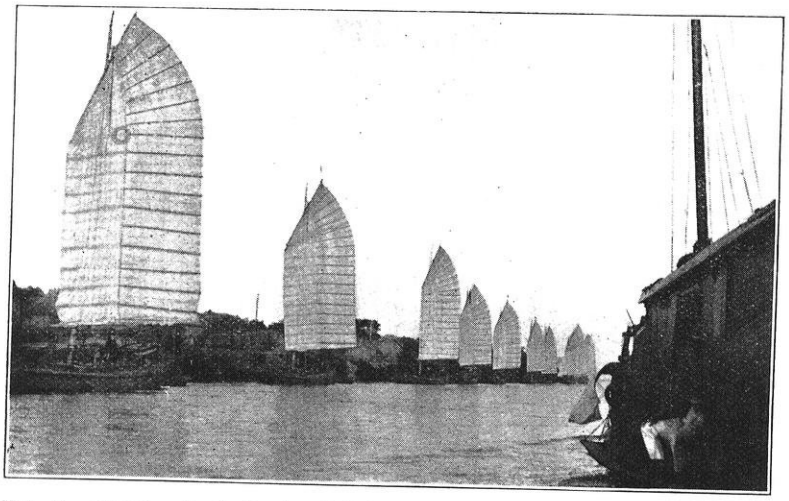

FIG. 9.—*Empty Coal Junks, Sailing up Grand Canal, about 50 Miles above Tsingkiangpu to the Coal Mines of Shantung.*

gates, which are points of weakness, it would offer no mean resistance even to modern artillery. The substantial brick walls which protect the City of Yang Chow on the Grand Canal, just north of the Yangtse River, are shown in Fig. 10.

Many of the smaller cities are protected by walls of mud, which, while frequently in need of repair, seem to stand unusually well for such structures the somewhat severe rainstorms which frequently occur in China during the summer months. Although such structures would be of little use against artillery, they probably offered a fair protection against medieval weapons; they would even prove of some value against ordinary rifle fire. The walls around the Chinese City of Shanghai are now being

removed; a broad street now occupies the site of the wall that formerly existed between this city and the foreign concessions.

Bridges and Roads

Numerous arched bridges, many of them of stone and of excellent workmanship, are found in many parts of China. Some of

Fig. 10.—*Loaded Junks, anchored in Grand Canal in Front of the City of Yang Chow, about 15 Miles North of the Yangtse River. Brick Walls of the City are Shown in the Background, and Native Huts Thatched with Grass are seen on the Banks.*

these are centuries old, and show both skillful workmanship and artistic design. (See Fig. 5.)

The government of China at one time paid much attention to overland transportation, or at least to courier communications, and established many imperial roads. As early as the Han dynasty, important canals, bridges and roads were undertaken. Except the principal courier roads, these are now merely narrow tracks and have fallen into bad condition. Peking, the seat of government, has numerous broad streets, and some good roads are found in the larger inland cities, such as Kaifeng and Nanking, but the majority of the streets in these cities, and in most of the smaller cities, are narrow and crooked. They are

usually roughly paved with large blocks of stone. On account of the bad condition of the roads, overland transportation is difficult and expensive, and the lack of good roads has not been favorable to the development of high grade vehicles. Overland transportation and local traffic, both in the country and in the larger cities, are accomplished by men and animals, who carry

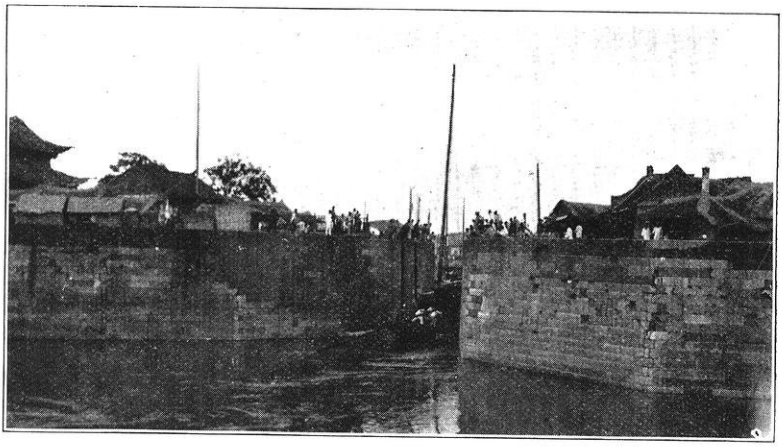

FIG. 11.—*Upper Sluice or Lock (?) in Grand Canal, above Tsingkiangpu, Built to narrow the Canal and Concentrate the Fall. Boats are pulled up through the Sluice by Capstan and Cables, of which 36 are Available. Passengers are Encouraged in this Passage by the Beating of Gongs.*

loads both on their backs and by crude vehicles, economical in cost and suited to the bad road conditions, perhaps, but poorly designed for rapid transportation. (See Figs. 6 and 7.)

Passenger transportation in the country is carried on by sedan chairs, borne by men or animals, and by wheel barrows; and in the north, the Peking cart is used. This is a substantial, springless, two-wheeled vehicle, not especially designed for comfort. Where good roads are available in the better cities, two-wheeled rickshas, often provided with springs and even with pneumatic tires, drawn by men, and carriages drawn by one or two horses, afford a rapid and pleasant means of transportation. Many automobiles are in use in Shanghai, Peking, and other treaty ports and foreign concessions.

Waterways

For many centuries the waterways of China have furnished the principal source of internal transportation. The Yangtse Kiang, one of the greatest rivers of the world, traverses the country from the west to the east, through the southern portion of the Great Plain and about the center of China proper. For 600

FIG. 12.—*Chain Pump Operated by Foot Power for the Irrigation of Rice in Country East of the Grand Canal. Similar Pumps Operated by Water Buffalo are in General Use South of the Yangtse.*

miles from its mouth to Hankow it is navigable by ocean going vessels, while from Hankow to Ichang, about 400 miles farther, it is navigable by smaller river steamers. It has, therefore, been one of the most important lines of communication through a most fertile and populous portion of the Chinese Empire. (See Fig. 8.) The Yellow River is of comparatively small value for transportation purposes, since on account of its high velocities and rapidly changing channel, it is difficult and dangerous to navigate. It is, however, utilized to a limited extent. The Huai River drains the Great Plain of China between the Yellow and the Yangtse Kiang. It and its tributaries are navigable for the smaller boats, and have long been one of the main arteries of commerce. The West River in Southern China is navigable for

steamers for over 200 miles, and for smaller crafts for about 100 miles in addition.

In 1912 the total number of vessels entered and cleared from Chinese sea ports was 107,698, and the tonnage was 75,819,888. Of this tonnage, about twenty per cent was carried by Chinese ships. On the inland waters, the larger number of steam ves-

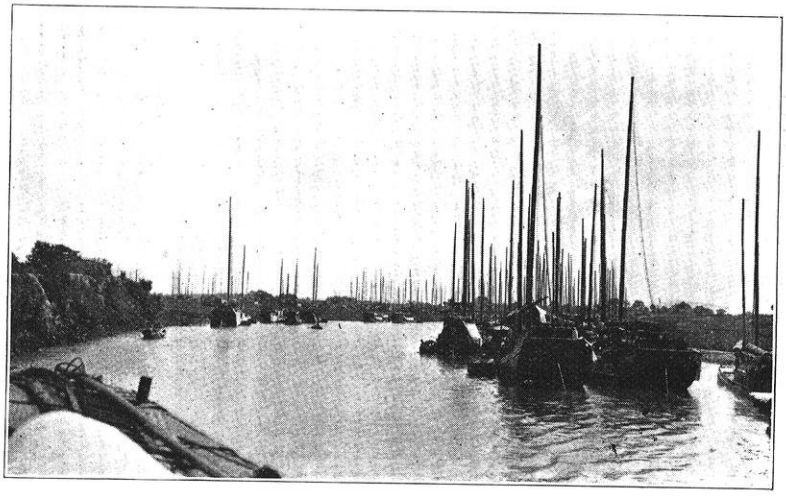

FIG. 13.—*Junks on Grand Canal, Waiting to Load with Salt, near Junction with Yen Canal above Tsingkiangpu.*

sels and practically all sailing vessels are Chinese. In 1912, 1,021 steam vessels were registered as plying on inland waters. Of these, 845 were Chinese. Excellent passenger boats ply between Shanghai and Hankow on the Yangtse River.

Canals

The Grand Canal extends from Tientsien south to Hangchow, approximately 1,000 miles in length, and is the principal artificial waterway in China. This waterway, formerly of great importance, extends southerly from Tientsin to the Yellow River, crosses that river northwesterly of the City of Yenchow, extends southeast to Tsingkiangpu, near which it crosses the ancient channels of the Yellow and the Huai Rivers, and hence south to the Yangtse Kiang, where it enters that river near Chinkiang.

From Chinkiang the canal extends in a general southeasterly direction around Lake Tai, thence south to the City of Hanchow. The portion of the Grand Canal between the ancient channel of the Yellow River and the Yangtse was begun about 600 years B. C. The section south of the Yangtse from Chinkiang to Hanchow was built in the 7th century, A. D., and the section north

FIG. 14.—*House Boats Anchored off the Chinese Bund in the Woosung River at Shanghai.*

of the old bed of the Yellow River was constructed in the latter part of the 13th century, A. D. This canal was built largely for the transportation of tribute rice from the southern provinces to the Capital at Peking, and carried a very large traffic.

The southern portion of the canal to a point perhaps 100 miles north of Tsingkiangpu is still an important waterway and swarms with hundreds of junks used in the internal commerce of the nation. (See Figs. 9 and 10.)

In general, the canal, like most other public works in China, has been seriously neglected. The upper section, except where the canal occupies the channel of the River Wei, has become so filled that navigation is frequently interrupted for months at a time. For about a hundred miles above Tsingkiangpu, the canal receives and carries the flood waters of the Yi and other streams, and in times of flood is a magnificant waterway, being in many

places 500 to 600 feet in width and 20 to 30 feet in depth. During low water, this portion of the canal is, however, navigable only for small boats of light draft, as the low water flow of these rivers is insufficient for proper navigation under the present conditions. Between Tsingkiangpu and the Yangtse, the canal is in somewhat better condition, although during low water, navigation at times becomes impossible, while south of the Yangste the canal still remains, for the most part, a navigable and ex-

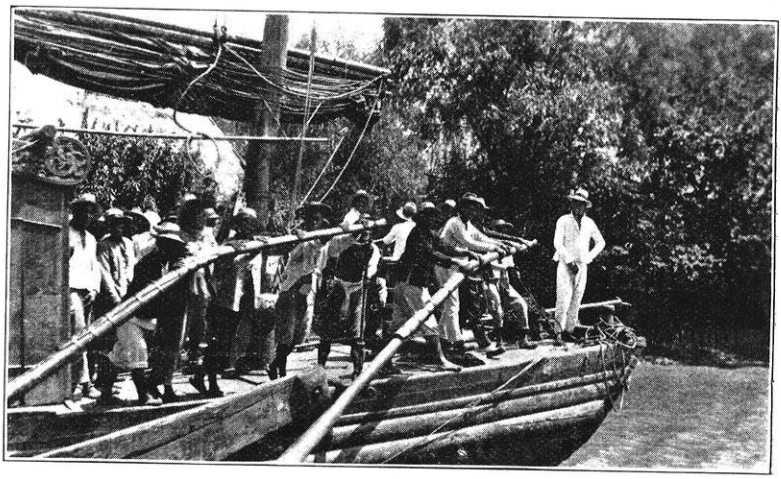

FIG. 15.—*Large Junk on Grand Canal, Operated by Large Sweeps or Oars in Absence of Wind.*

tensively used waterway. Near Tsingkiangpu a considerable fall exists, which has been partially overcome by lengthening the canal by means of great bends and by the construction of masonry sluices, by which means the canal is narrowed to about 25 feet in width, the waterway constructed as to concentrate the fall at these places. (See Fig. 11.) At times of flood, the fall is so considerable at the upper sluice that boats cannot pass, while at other times boats are hauled through these sluices by means of numerous cables with winding drums, which are operated by the men, women and children of the adjacent villages.

In the eastern bank of the lower portion of the Grand Canal between Tsingkiangpu and the Yangtse are numerous sluices which are utilized for the irrigation of the country to the east,

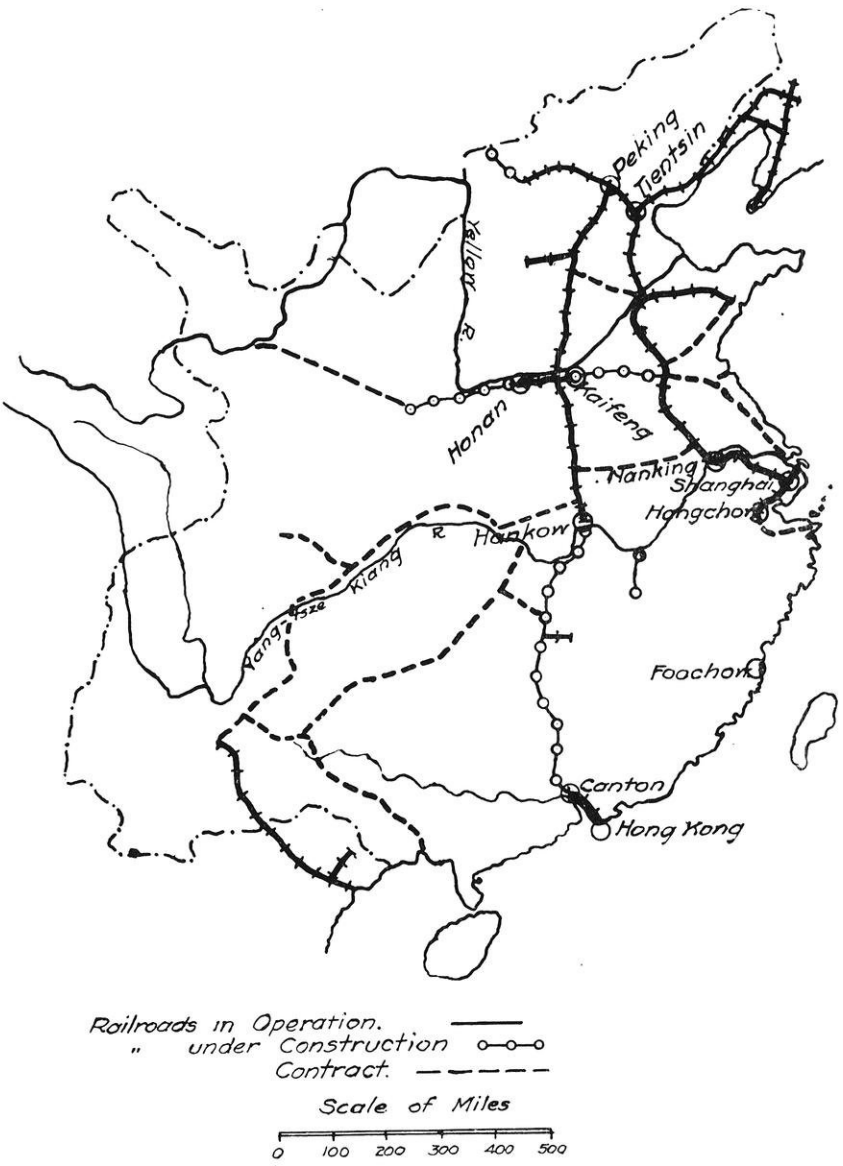

FIG. 16.—*Map Showing Routes of Railways in China Proper. Now in Operation or under Construction or Contract.*

often to the detriment of navigation. The water is not carried directly onto the land, but is admitted into canals at a lower level, from which it is pumped, by foot power pumps or similar pumps operated by water buffaloes, onto the rice fields. Proper arrangement and management of ditches would, in many cases,

FIG. 17.—*Track of Hankow-Peking Railway, Lined with Willow Trees for a Considerable Part of Its Length—Much to the Detriment of the View from the Train.*

permit the flow of this water directly onto the fields, thus obviating a large and unnecessary expenditure of labor. (See Fig. 12.) At times of flood, these irrigation sluices, together with temporary dams or "pas" built of reeds, in the east embankment of the canal, are opened and the flood waters released, to save the canal banks from destruction; but the country to the east is frequently flooded thereby and greatly damaged. By proper design, this frequent flooding of this important farming country could be entirely prevented. The canal level, especially during floods is frequently high above the surrounding country, and the embankments designed to create and confine the canal and to protect the adjacent lands from overflow are in many places in poor condition and a constant source of danger. Near Tsingkiangpu, the Grand Canal connects, by a short canal, with the Hungtse Lake and the Huai River and its tributaries, also

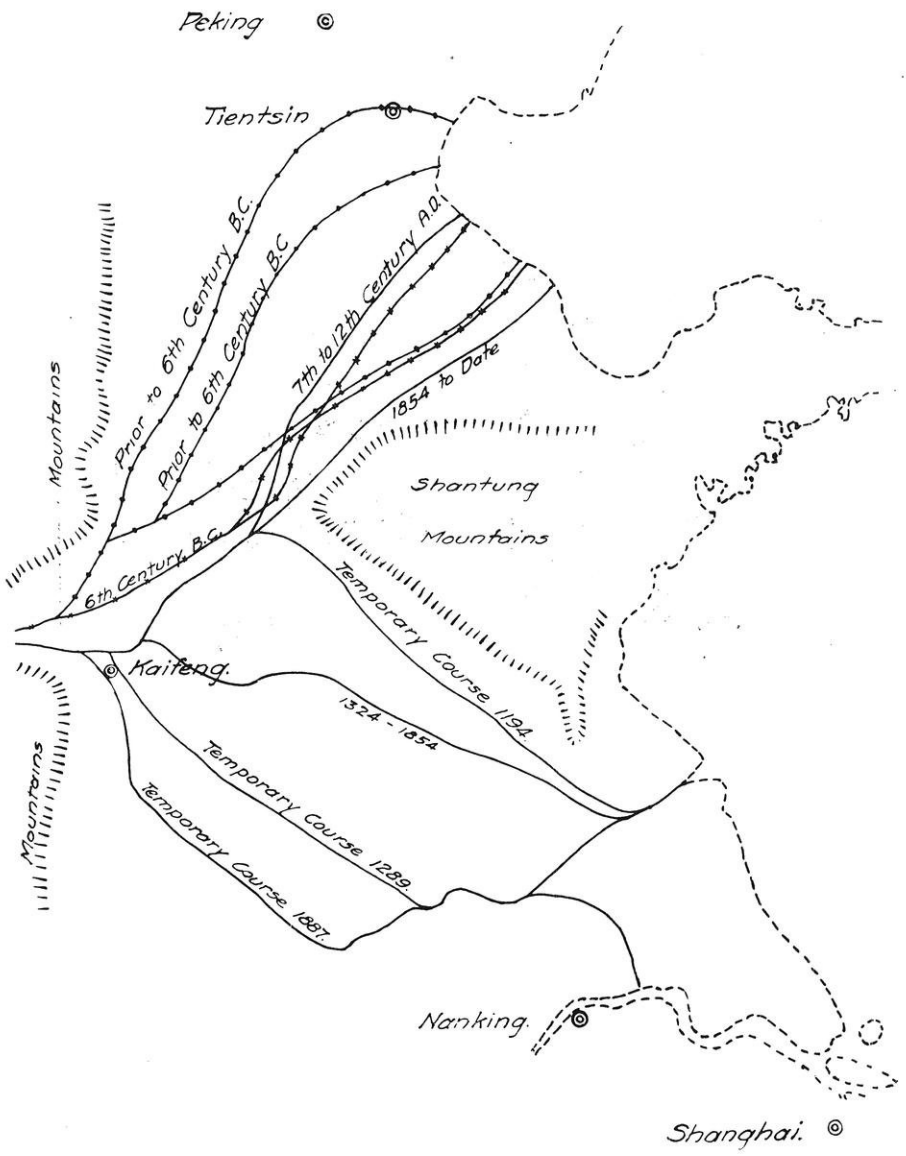

FIG. 18.—*Map Showing the Various Courses of the Yellow River Across the Great Plain of China, from the Earliest Records to the Present Day.*

with the Yen or Salt Canal, which extends to the seashore and reaches the important salt district along the coast. The Yen and Grand Canals are not connected, but the boats that bring salt from the coast transfer their cargoes to junks on the Grand Canal, by which the salt is distributed up the Huai River and other waterways. (See Fig. 13.)

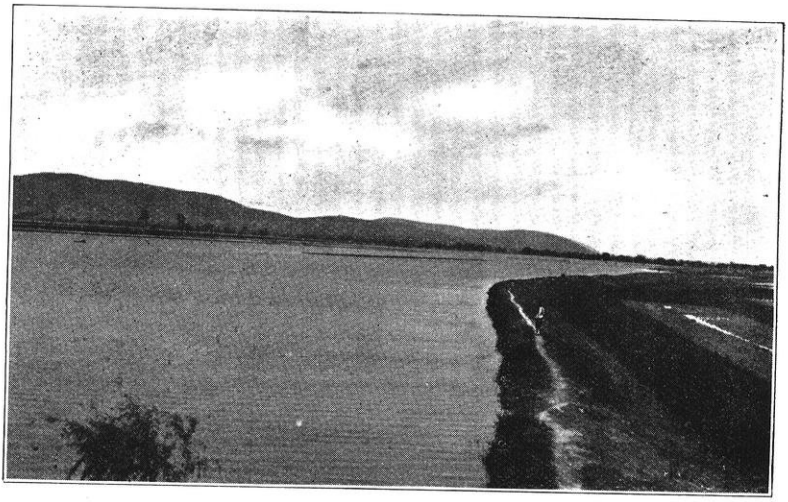

FIG. 19.—*A Flood in a Small Tributary of the Huai River, Showing Low Country, to the Right, and Inadequate Dike Protection.*

In addition to the Grand Canal, there are probably 100,000 miles of smaller canals which have been constructed, at great labor and expense, for irrigation, drainage and navigation purposes, on the lower portion of the Great Plain and the lowlands adjoining the rivers and the coast.

The rivers previously named, together with other smaller streams and the extensive canal system of China, afford important facilities for transportation, and China is probably better supplied with waterways than any other country in the world.

Boats and Boat Life in China

There are probably more boats in China than in all the rest of the world. Thousands of crafts of all sizes, from the seagoing junk that navigates the great rivers in China and the waters of

the adjacent seas, to the small sampan that ply in the harbors and the small waterways of the interior, are seen.

Thousands of people are born, live and die on the house boats. Their lives are spent largely in these floating homes on the waters of China. Thousands of these boats are seen anchored near the large cities (see Fig. 14) and along the canals, loading or un-

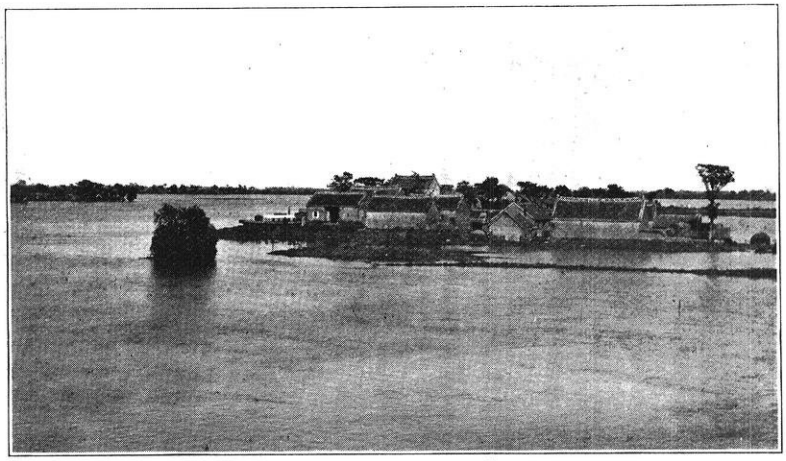

FIG. 20.—*Flooded Country Along Pukow-Tientsin Railway, Showing Farm Buildings Built on Slightly Elevated Lands.*

loading, waiting for employment or for conditions favorable for transportation. The boats are usually provided with sails, but are also equipped with oars or sweeps, which are used with adverse winds or during calms. (See Fig. 15.)

Railways

The Chinese people long objected to the construction of railways, the telegraph lines and various other foreign inventions which were believed to bring with them effects unfavorable to the best geomantic conditions and were therefore strenuously opposed. The first railway constructed was a narrow gage line, built by an English company, between Shanghai and Woosung, in 1876. This line was built without a government concession, and was finally purchased and dismantled by the Chinese gov-

ernment, the rolling stock and rails being transferred and to some extent utilized in Formosa.

The progressive element in time began to recognize the great advantage of railway transportation, esepcially for the movement of troops, and for the rapid transportation of coal and other supplies. In the latter part of the eighties, a short rail-

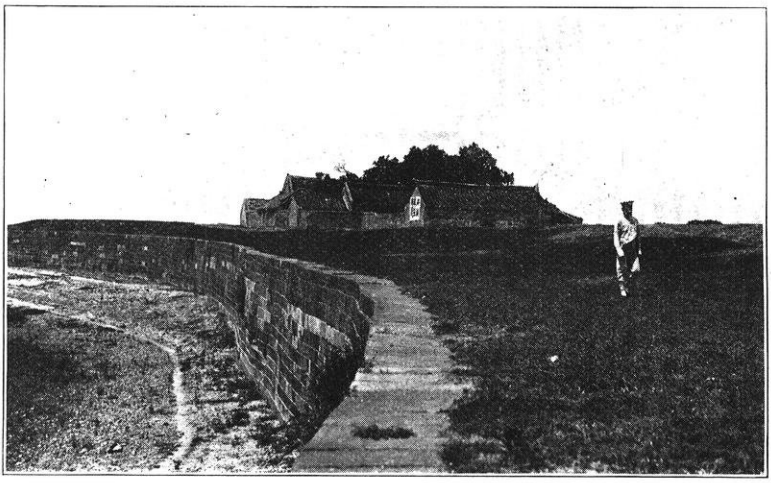

FIG. 21.—*Great Ming Dike near Tsingkiapa. This Dike is about 35 Miles in Length and is Faced with Cut Stone for its Entire Length.*

way line was built from the Kai-ping coal mines to the sea shore, and was afterward extended into the Peking-Mukden line, opened about 1887. The line from Shanghai to Woosung was also rebuilt by the Chinese government, and opened in 1898. With these exceptions all of the railways of China have been opened since 1900. The Peking-Hankow line was opened in 1905; the Shanghai-Nanking line in 1908, and the Pukow-Tientsin line in 1912.

The principal railways of China are government railways, built under various foreign concessions and paid for by bond issues, floated in foreign countries and guaranteed by the government of China. Fig. 16 shows the routes of the railway in operation or under contract and construction. China has about 6,000 miles of railway in operation, and about 2,100 miles under construction. The railroads are in general well built and well

maintained. For much of its length, the Hankow-Peking railroad is lined by willow trees, which greatly hinder a satisfactory view of the country from the passing trains. (See Fig. 17.)

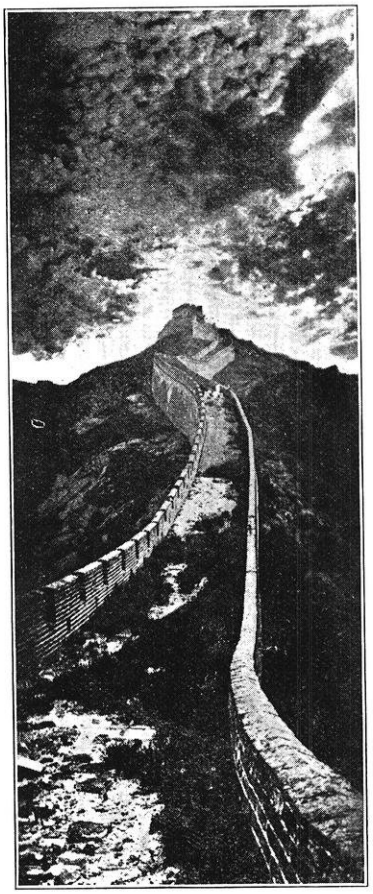

FIG. 22.—*The Sun behind the Great Wall of China. Typical of China's Present Condition, Emblematic of Both the Sunset of a Great but Mistaken Past and the Sunrise of a Bright and More Hopeful Future.*

The Hwang Ho or Yellow River

The conditions which surround this river are peculiar to itself and are found on no other great river in the world, so far as known. The present course of the river through the Great Plain

of China is geologically new. When this river first debouched on this plain, it apparently found the plain developed largely through other agencies than the gradual extension of the normal delta of the river itself. The river therefore found a plain with a gradient insufficient for the transportation of the great amount of silt borne by its waters to the sea, and it at once began to build up a delta gradient sufficient for silt transportation purposes. This condition has caused the Yellow river to wander over the Great Plain of China, and has resulted in forty centuries of warfare between the river—which is attempting to carry on its normal delta building under unusual conditions—and the Chinese people, who have endeavored to snatch from the encroachments of the river the land necessary for their sustenance. Hundreds of miles of dikes have been repeatedly constructed along the various channels to keep the river within definite bounds and to prevent incursions on the farms and villages of the Great Plain.

Within the dikes, various training works have been constructed to protect them from the attacks of the river, and between the dikes the river has repeatedly built up its bed above the surrounding country, creating thereby a condition of extreme hazard. On account of unusual flood conditions and the lapse of vigilance on the part of those in charge of these important works, the river has occasionally broken through the line of dikes. Many of these breaks have been temporary and have been repaired at great expense, but the river has, a number of times, formed an entirely new channel, and in some cases has moved its point of discharge many miles along the coast. Constant watchfulness and great expense are necessary to maintain these works and to guard the country from these temporary and permanent inundations. From 1324 to 1854, the river occupied a single channel with only temporary changes, but about 1851, a breach occurred near Kaifeng, which finally became permanent, and the course of the river was changed, the mouth moving from a point south of Shantung Peninsula to a point north of that peninsula, and about 250 miles distant. Fig. 18, from a monograph issued by the Chinese Imperial Maritime Customs, shows

approximately the various courses of the Yellow River during more than twenty-five centuries.

The Hwang Ho has long been known as "China's sorrow," for since the dawn of history, it has by its overflows frequently devastated vast areas of the Great Plain of China, destroying farms and villages, drowning thousands of the inhabitants and causing the death of additional thousands by the famines resulting from the crop failure that followed. Literally millions of the Chinese people have thus perished.

In the early diking of its present course, wise counsel prevailed and the dikes were placed wide apart. The demand for more land was so strong, however, that the authorities allowed inner dike lines to be constructed, greatly restricting the flood plain and incurring a more rapid raising of the confined plain. The river has therefore so raised its bed in many places that it endangers the inner line of dikes; through their failure, the outer line will also be greatly endangered and the river may be expected again to change its lower course in the not distant future, with probable great losses of life and property, unless some immediate solution is found for the problem now confronting the officials in charge of this work.

The problem of the Yellow River is a most serious one. Even with the best knowledge of scientific hydraulics and practical methods developed on similar work, the control of the Yellow River can be accomplished only at great expense, and its control is worthy of the most profound and most thoughtful study and investigation. It is not surprising, therefore, that in the past its control has been only partial, and that since history began it has been a cause of sorrow and suffering to the Chinese people.

Other Flood Conditions

The typhoons from the East Indies that sweep the coast of China, many of which pass inland over the Empire, and bring with them the moist air from the southern seas and are the cause of heavy rains, usually occur in June, July and August. These rains are frequently of torrential character and give rise to frequent flood conditions in the Great Plain of China, and in the lowlands adjoining the rivers and along the coast. The frequent oc-

currence of these floods, and the consequent famine in the Huai River Valley, gave rise to the recent investigation by the Red Cross Commission of Engineers. The floods which this year occurred, on account of late rains, in September, were not as severe as usual; nevertheless much damage was done, both through loss of life and property. Fig. 19 shows one of the small tributaries of the Huai in flood. It is kept within its course and high above the surrounding country by dikes, by far too light for safety. The entire country is very flat and is frequently flooded by the overflow or breaking of the dikes; in consequence, the Chinese farmer has learned by dear experience to construct his buildings on the occasional slight elevations on the plains, in order that these buildings may be kept out of the floods as long as possible. (See Fig. 20.)

The Ming Dike.

Among the important works carried out by the Chinese people may be mentioned the great Ming Dike, built from a point on the embankment of the Grand Canal near Tsingkiangpu southeasterly about thirty-five miles to the high land, to protect the lower Grand Canal and the country to the southeast from the incursions of the floods of the Yellow and Huai Rivers. (See Fig. 21.) This dike was originally built of earth, but was faced by a cut stone wall for its entire length during the early Manchu dynasty. This cut stone work is of high grade, and the wall is substantially built. In trying to force the Yellow and Huai Rivers through their eastern outlet across the Grand Canal near Tsingkiangpu by means of this dike, the Huai River valley was subjected to such enormous floods that temporary openings had to be built in this structure in order to permit the water to escape during such periods. This gave rise to extensive flooding of the very country which the dike was intended to protect, and made the dike practically useless for the purpose for which it was constructed.

Most of the hydraulic works of China have been carried out in an equally immature and illogical way. The Grand and Yen Canals have been constructed across the drainage lines of the country, and their construction is responsible for much of the

congested flood condition of the adjacent country. The Grand Canal, partially built in river beds or closely adjoining such beds, is utilized to take care of the flood flow of the Yi and Szi Rivers, greatly to the detriment of the canal and its shipping and of the country lying along its lower course.

The Cause of Failure in Hydraulic Works in China.

Such great works, to be successful, demand a scientific understanding of cause and effect, and require the development of comprehensive plans which will take into account all of the results which must necessarily follow each move in the solution of the problem.

To the solution of these problems China has brought centuries of experience but no scientific knowledge, and years of practice without a correct theory.

The school of practical experience is exceedingly valuable, and correct theoretical analysis must usually be demonstrated by the results of such practice before the theory is of much value or can be safely adopted. Practical experience as a basis of future practice, is, however, of comparatively little value unless the conditions are considered and studied, and all the facts correlated and combined into a correct theory, from which experience can be extended to greater things. Without correct theory, the value of practical experience is limited to a reproduction of the experience under identically similar condition, and as no two sets of conditions are ever exactly similar, the experience so applied is liable to failure on account of the introduction of factors which the previous experience does not include.

Real advancement is attained only through a combination of theory and practice. Each is incomplete and often dangerous without the other, but by parallel development, safe and substantial progress is possible. Without practice theory produces the doctrinaire, and without theory practice produces the solecist. Each is unsafe and a dangerous adviser.

The scientific plans based on scientific knowledge necessary for the success of many of the great works that China has undertaken in the past have been entirely beyond the Chinese mind,

trained only by a study of history, literature and the moral code of the Chinese classics. These problems can be met and the conditions rectified only by the application of the most advanced engineering knowledge and practice. Such solution will be possible when the young Chinese engineer gains much knowledge and experience from other lands, but such education will require many years. Some of China's problems are pressing and will need the services and experiences of those who have spent years on similar and successful work.

It is to be hoped that the government of China will secure as its advisers in these new developments the best engineering advice from Western nations, that there will be little opportunity for the "engineer of fortune" who too often, for his own profit and on the basis of knowledge and ability which he does not possess, insiduates his services on a trusting but misinformed people who need sound professional advice.

Other Reasons for Present Conditions.

The past government of China was an absolute despotism, and China, for the most part, has existed for its rulers only. The common people have secured for their share only that portion that existence made imperative. Taxes were fixed at limits established by long customs, and radical departure has been followed by riot and rebellion by which official extortions were kept within certain bounds. Those rulers who have considered the welfare of the country and their people have encouraged certain lines of development, and occasional periods of advancement in the arts, industries and in the building of public works have taken place, but many of the rulers took all they could for themselves and their followers, political and social, and periods of progress were followed by periods of decline. Public works have been constructed largely by enforced labor which has been paid but inadequately, if at all. The artisan and the laborer receive only a few cents per day for their hire and, while the absolute necessities of life are cheap in China, a bare existence is practically all that the laboring class can secure.

In 1912, the Republic of China was declared, and although at the present time it is a republic in name only, the old regime

has been swept away, and better government conditions will certainly result. The time will be long, however, until the common people will understand, demand and attain the personal rights which a true republic involves, and only with such attainment will radical betterments in the lives of the common people of China take place. With the introduction of popular education, with the decrease in superstition, with the growth of scientific knowledge, and with the development of industries, additional demands and opportunities for labor will develop; and with such increase in opportunities will surely come increased compensation and greatly improved conditions of life for the Chinese people.

The inertia of poverty, ignorance and superstition in the common people of China will make general material advancement slow. But the intelligence, undoubted ability, mental capacity, and the modern progressive spirit of many of the educated scholars and students of China will certainly off-set, to some extent, this inertia and bring about the rapid advancement of China in certian specific directions.

The situation in China at the present time is typified by Fig. 22, which shows the sun behind the Great Wall, and may represent both the sunset of a great but mistaken past and the dawn of a brighter and more hopeful future.

THE OUTLET.

J. N. CADBY, e '03, E. E. '07.
Division Engineer of Public Utility Service, Railroad Commission of Wisconsin.

Jones entered the engineering course with good preparation and the ambition and ability to stand in the front rank of scholarship. He studied the university catalogue and decided that the last two years of the course were very attractive but that half of the first two years' work prepared one for the last two and that the remainder was of no value to an engineer, having been merely inserted to make the course a year longer than necessary. A couple of men from his home town who had entered a year or two earlier confirmed his impression regarding the course. English and a foreign language fell in his classification of "padding," but he decided to work at them hard enough to secure high grades. He took little interest in them, thinking that studies required of lawyers, teachers, librarians and economists should have little place in the curriculum of an engineer. He became a grind of the usual type, was too busy with his regular studies to join a debating society, or attend lectures in other departments or mingle much with his fellow students. He roomed with a man in the same course who had similar characteristics and habits. He proved to be a good draftsman and mechanic; he mastered German; he waded successfully through his mathematics, science and engineering subjects.

He was continually looking forward to the junior and senior years as the real "meat" of the course and was certain that they would give him the detail of successful engineering and make him a thoroughly up-to-date man who could upon graduating tell all the old "fogies" just how their work should be done. During his junior year he was a little uncertain as to whether he was getting this pre-digested, ready-to-wear engineering knowledge. In his senior year he began to feel that he had not received all he had anticipated and decided to take an extra year. Consequently he read more books and worked out more experiments and finally finished his course well versed in technical sub-

jects, a diligent student and a very good candidate for an apprenticeship course with a large company. During his entire five years at college he had seldom attended a lecture outside of his course, except on general engineering matters, he knew very few men outside his own course, his reading had been confined to engineering text books, he had never made a speech in his life, and he had spent all his summer vacation at home. When he had worked during vacation it had not been in engineering work.

Brown took an engineering course, too. When he began thinking seriously about it he asked the advice of several fairly successful engineers who were acquainted with his family. He learned that they valued the first part of their courses fully as much as the latter part. He was given advice on sifting out the important points of a lecture or chapter and encouraged to attend lectures and classes outside of engineering. He was advised to get into a debating society. One man told him that all he needed in addition to his high school training was a good working knowledge of fundamental science, a little experience, common sense, and the ability to handle men and express himself.

He entered college with a fairly definite idea of what he wished to get out of his course. He attended lectures in law, history and commerce, took more English than was required, was active in his debating society, and occasionally wrote for college publications. He frequently visited shops, public utility plants and cultivated the acquaintance of mechanics and their superintendents. These various activities required only a few hours each week and gave him greater interest and enthusiasm for his regular work. He broadened his acquaintance, made himself agreeable to all he met and during summer vacations worked in various places where he knew he would get valuable engineering experience. When he was able to elect subjects outside of his own department he took courses in commerce and economics. Before he completed his course he had joined a national engineering society and had cultivated the habit of reading the technical journals. When he learned a new principle he tried to fit it to some practical application. He cultivated the ability to express himself well when on his feet before a class or an audience. Brown was frequently called upon to substitute when a debater was absent from the regular meetings of the society and

he always did this in a very creditable manner. He had an idea of what things cost, knew something about the value of other people's time, and of what constituted a day's work. He was self reliant, popular, tactful, knew how to take orders or give them, how to listen as well as to talk and had good common sense. He did not aspire to be a research man or a designer but had ambitions for operating and sales engineering, and hoped some day to be a manager. He had made it a rule not to room with men who were taking engineering.

Is it surprising that after a few years Brown draws twice the salary paid Jones, is more widely known, has shorter hours, and is able to do work without being supervised? Is it strange that Jones is frequently laid off and looking for a position, while Brown's services are always in demand? Do you know how Jones explains it? He says it is because Brown has a pull, or isn't perfectly honest, or that it is because Brown has lots of "brass" and knows how to "work the boss." It has never once occurred to him that it could make any difference that he, Jones, never prepared a report that could be transmitted to the board of directors or to the public because only those who knew what he meant to say would understand it. He doesn't know that there is something wrong with him that made men quit before they had worked under him very long. He can't realize that the local branch of his engineering society hates to put him on a program because the attendance always falls off when this happens. Poor Jones was an expert witness only once and was a hopeless failure. Brown may not be any better scientist or engineer as far as the technical details are concerned, but he is worth three of Jones to his employers.

These are not purely fanciful characters but are very common types. The engineering world contains numerous Joneses who are bright, ambitious and anxious to succeed but who have put their attention to developing their ability to work out details without developing an outlet. The engineering course selected by the average student fits a man to take an apprenticeship course in some large corporation and perhaps ultimately to become superintendent of a department. Our colleges contain few of the Brown type; but the most successful engineers are those who begin developing an outlet for their activities very early.

It is a very common occurrence for a very able, experienced engineer to be obliged to take orders from a man who knows less about the business, simply because the latter can present a proposition to a board of directors in a manner that will compel their serious consideration, can organize and hold a large force of men in enthusiastic co-operation, and deal with the public in a manner that changes complainants and dissatisfied patrons to enthusiastic "boosters." Many an engineer has reached a point where no better position is open to him because he cannot dictate a letter or make a brief, convincing presentation of facts and arguments. An engineer in a position of much responsibility usually has to be a good teacher, not only in order to train his subordinates, but to explain to the uninformed the reasons for a great many steps in the performance of his work. If your college course teaches you to apply the fundamental principles of science and mathematics along with good common sense and gives you the ability to analyze a situation, work out the correct deduction and explain the result conclusively, it has succeeded. If it hasn't and you are not succeeding, just take stock and see if you have developed a five thousand dollar brain with only a one thousand dollar outlet.

THE WESTERN TRIPS.

SENIOR MECHANICAL AND ELECTRICAL ENGINEERS.

About fourteen men, properly chaperoned by Mr. B. E. Miller and Mr. A. L. Goddard of the faculty, took this trip, the itinerary of which included Milwaukee, Kenosha, Waukegan, Gary, Buffington, and Chicago.

At Milwaukee, perhaps the most interesting as well as the largest of the plants visited was that of the Allis-Chalmers Co. The plan of their buildings has been very carefully arranged for convenience in the passage of material through the stages of manufacture, and also providing for future growth. Their shop equipment is complete in every detail.

At Kenosha the chief attraction was the American Brass Co., where an excellent opportunity was given to see all the processes of manufacture, from the melting of the metal to the rolling of the ingots and the making of tubes. This was also true of the American Steel and Wire Co. at Waukegan. Where the whole process of manufacture may be followed a unified impression may be formed which is otherwise impossible.

Not every minute was occupied in inspection, however, for at Gary, notwithstanding the great extent of the steel plants, the museums of the city came in for a good share of the inspection of the members of the party.

Chicago affords manifold opportunities for inspection parties, some plants however being of especial value to student parties. Among those that leave the most vivid impressions with us are the Western Electric Co., the word's largest telephone manufacturers, the Fisk and Quarry St. Stations of the Commonwealth Edison Co., and the Chicago Telephone Exchange.

F. O. JORSTAD.

THE SENIOR CIVIL ENGINEERS.

There were thirty-six of us who took the annual inspection trip of the Senior Civil Engineers to the city of Milwaukee from Nov. 9 to Nov. 12, where he had the opportunity to see the practical aspects of nearly all phases of our future work.

Some of the most interesting work inspected was in connection with the track elevation through the heart of the city. "Herb" Schmitt was there and showed us through the open air laboratory in which the C. M. & St. P. is experimenting with different types of concrete blocks for retaining walls, where the bearing strength of the soil is too low for monolithic walls. A very interesting system for determining damage done by the cracking of walls along a right of way where piles are being driven has been worked out by the company. The method is to mount a camera on an accurately referenced hub, and to take an accurately focused photograph of nearby walls both before and after driving, thus giving a true determination of the damage done. At the Gimbel Annex we found another Wisconsin graduate, Erich Schroeder, '14, in charge. He is pouring this reinforced concrete skeleton at the record rate of a floor a day.

A new feature on this trip was the inspection of the Wisconsin Bridge and Iron Works. This company is giving great prominence to their safety work. They have a safety organization among the men of the plant and they insure regular attendance at monthly committee meetings by serving the men a free supper and in addition paying the men for their time.

The trip had one real luxury,—a thirty mile automobile ride in search of the flaws and good features in the pavements of Milwaukee city and county. C. P. CONRAD.

SENIOR CHEMICAL ENGINEERS.

The trip was officially begun at 8 a. m. on Monday, November 9th, when the party of twenty-five chemical engineering seniors, under the direction of Professor Kowalke, met at the Public Service Building at Milwaukee.

The first day was spent in the inspection of the plants of the Milwaukee Coke Co., the Northern Glass Co., and the Illinois Steel Co. At all these plants the processes could be inspected from beginning to end, and thus in addition to the inspection of the particularly interesting features of the manufacture, a general impression of the plant as a whole was gained.

The second day started with a visit to the Pfister and Vogel Leather Co., followed by a trip to the National Distillery. After

a visit to the Milwaukee Linseed Oil Co. the party proceeded to Chicago.

Of special interest on the third day was the trip to the Carter White Lead Co., and of particular interest here was the manner in which they safeguard their workmen. All men are provided with goggles and respirators and every man is forced to change his clothes and bathe at the end of every day. At regular intervals each man is subjected to a medical examination. The Barrett Manufacturing Co., makers of Barrett "Specification" Roofs was also visited.

At Joliet we made a short voluntary visit to the prison. On this stop were included the American Refractory Co. and the United States Steel and Wire Co.

At La Salle we visited the German-American Portland Cement Co., but found the plant idle. In the afternoon the M. & H. Zinc Company's plant was visited. Especial interest was taken in the manufacture of sulphuric acid, which is one of their by-products. This concluded the trip, which was enjoyable in every respect.

L. S. LOEB.

THE RELATIONSHIP OF FACULTY AND STUDENT.

ARTHUR R. SEYMOUR, U. W. '94.

With the rapid increase in size of our universities it is becoming more and more difficult for the students and faculty to come into sympathetic relationship with each other. The large classes, the lecture method of instruction, and the personal research work of the professor have isolated him from those who should have intimate contact with him. The students, if at all encouraged, would look to faculty men for leadership and advice in matters outside of scholarship requirements. It is a splendid opportunity which should not be neglected. Parents suppose that they are sending their sons into an atmosphere of "uplift" when they send them to college. Is it right, then, to leave them to their own devices wholly or to chance acquaintances for the development of their tastes and the molding of their characters? Many a young man has had his life seriously handicapped before he realized it by the evil influences of careless companions in college.

Universities should not be mere machines with a diploma tag at the exit for the graduating student to grasp. They should become *educational homes* with high ideals. A graduate who has been surrounded with helpful influences will be able to improve the moral and educational atmosphere of the community which becomes his home. The standard of a college man should be higher than mere selfish efficiency in his vocation. Let him form the habit of "helping the other fellow." How can a state university meet its responsibility of shaping the character as well as training the efficiency of the citizens of the state? How may our students be trained so as to be of the greatest service in the world's progress? We have tried to solve the problem in various ways in different universities by having upper classmen or members of the faculty act as advisers, but we have as yet not advanced very far. Some universities have a Dean of Men and a Dean of Women who look after the conduct of the students. But how can one dean properly advise hundreds of students when only a limited time daily is allowed him? Then, too,

his efforts become too official and smack of disciplinary service. He has his place, but we need far more. The student who is not in trouble is even more worthy of guidance and sympathy than the one who is visibly deficient. Every student should have the opportunity of coming into sympathetic relationship with at least one professor who will inspire high ideals.

The University Extension service might well have a vocational adviser who could present the advantages and disadvantages, the special requirements, and the opportunities of the many vocations to which college students aspire. This man's services should be available to prospective students and their parents, either through local addresses at High Schools or through correspondence. Such assistance would enable a young man more wisely to direct his efforts toward definite ends upon entering college and to avoid a misfit in life. If a system of preregistration of prospective students should be in operation by means of which they can arrange their first year's work before reaching the university to begin their course, a vocational adviser could be of very great assistance.

Various systems of freshman advisers are in use throughout the country. In many of them there is too much system and too little of the "help the other fellow" spirit. The co-operation and mutual understanding of students and faculty can be greatly furthered by giving the new students something of the "home spirit" as soon as possible after they reach college. If freshmen are given advisers who will invite them to their homes and make them feel welcome in a social way, a spirit of fraternal helpfulness is at once aroused, a spirit which is quite as enlivening to the professor as it is inspiring to the new student. At the University of California much has been accomplished in this matter. Not over twenty freshmen are under the guidance of any one professor. The ties formed during the first year of college residence are frequently continued throughout the college course and by correspondence afterward. The immediate forming of faculty friendships helps not only to maintain a higher standard of scholarship but also to temper the whole character of the student body toward loftier ideals of world service. Dean Hutchinson of California, who has done much to develop this plan, says, "We need to change the attitude of the students themselves,

making them realize the truth that what is worth doing at all is worth doing well; that no matter what other excellent things they may get out of four years spent in university associations, they are acquiring a habit fatal to real success if they are content to perform any of their academic duties in a third class fashion. The world has but little use for third rate men: it demands the best.'' If we have the opportunity of developing first class men, we should not neglect it. The University of Illinois has had in operation for one year in the College of Liberal Arts and Sciences a plan for the association of faculty and students in small groups, and while it is as yet only a beginning, it has already proved of definite value. After the freshman and sophomore years the student will naturally go oftenest to consult with the professors who are directing their major line of work but they still will like to call at the homes of their early advisers for friendly chats upon many matters outside of classroom problems. This contact is quite as valuable to keep the professor alive to present-day problems of students as it is to assist the student to get the most from his college life.

To be of highest service to the state, universities must have men of noble character and splendid leadership in their faculties, men who are willing to devote part of their time to inspiring the young men who have sought a higher education. Greater co-operation and a more personal sympathetic relationship will accomplish splendid results. It is worth while.

The Wisconsin Engineer.

EDITORIALS.

The appointment of Professor D. W. Mead as a member of the Board of Engineers sent by the American Red Cross Society, during the past summer, to investigate flood conditions in China, was an honor, not only to Professor Mead, but to the College of Engineering and the University. During an investigation in the field covering a period of four months Professor

Mead secured a large amount of valuable and interesting information on many phases of Chinese life and conditions. The WISCONSIN ENGINEER considers itself very fortunate in being able to secure from him an extensive article covering certain features of his observations and takes great pleasure in presenting this article to its readers in the current number.

F. E. TURNEAURE.

* * *

It was in the January issue of last year that the editor took it upon himself to insinuate certain things about the blowing of horns in general, and of ego in particular, but nevertheless we feel that could he have been editing this issue of the WISCONSIN ENGINEER he could not have refrained from just a little sly tooting when no one was paying special attention. When one can give his readers a real scoop he is justified in just a wee bit of noise.

* * *

We are very pleased to publish in this number the article by Mr. A. R. Seymour concerning the relations between faculty and students. We had for some time been contemplating an editorial in just this same vein, and when we saw this article and realized how much better Mr. Seymour, with his ripe experience as a student adviser, had said the very things that we were about to express, we could but seize the opportunity to give you his statements also. Mr. Seymour is not preaching to individuals in particular; he is criticising a condition for which the students are certainly to some extent responsible.

It sounds rather inconsistent to hear groups of students making all manner of assertions regarding the impersonal attitude of the faculty toward the individual student, and then to find these same groups of students not only failing to make any effort individually toward making the associations closer than those which link with the blackboard and the lecture tables, but also failing to respond to any effort that the faculty puts forth to do their share.

And by personal touch is not meant the mere ritual of going every week to make a respectful call on your adviser and to pass the time o' day for an allotted period dutifully set apart. Here in the building where we work the whole day through, and

where the tools we work with, the products of our hands, and all the other manifold evidences of the hours spent in the pursuance of our everyday tasks are everywhere about us, we can never let down and be ourselves, as we truly are, no matter how hard we try. The Engineering Building is not the place.

We plead for a closer man to man relationship between our professors and ourselves. We do not advance any plans for the immediate realization of this condition. We would ask, rather, a more honest attitude on the part of the students, by which we mean that we show more on the exterior what we really feel. We know that when we get down to hard facts that we really do care, that we really do want to get into closer, more personal touch with these men, and yet for fear it will smack of "toadying" we put on the other exterior for the benefit of those who may read.

* * *

Mr. Cadby's article hardly seems complete without a supplement from the letter accompanying his "copy."

"I don't know any Brown, but I know several who have many of his qualifications. I can point out a great many engineers who have several of Jones' weaknesses. Too many Wisconsin men are taking second grade positions. We need to put out more who will become managers and men to handle public relations."

With the rapid approach of the second semester the upperclassmen are already planning what their electives shall be. We wonder whether those of you who read this will think that Mr. Cadby's statements apply to every other member of the class save yourself, and will consequently stow this away on the shelf without a second thought as to its application to our own selections.

* * *

The recent organization of the Press Club pointed unmistakably to the surprisingly small number of engineers that are interested in journalistic work of any sort. One does not expect in a general journalistic club that the number of students from the agricultural and engineering colleges would compare with those from the course in journalism. Nevertheless, this does not

alter the truth of the original assertion that the number is too small if the response to this club is a criterion. The response, too, to the call for men to fill the places on the staff of THE WISCONSIN ENGINEER is far from eager.

It does seem strange that Engineering Journalism, one of the biggest branches of engineering work, should be so slightingly passed over by the majority of students in our engineering colleges. We often hear the statement that the engineers are taking the lead in the life of their communities, and more often that engineering as a profession is fast usurping the most prominent place in the minds of the people. And how was this brought about? Almost entirely at first through the newspapers and magazines of a general nature, and then through the medium of the popular technical mazagines. It was the work of men with engineering training and the vision of the results of such advertising.

Consider then the place that the popular technical magazines are holding today. Consider the numbers of the engineering journals and purely technical magazines that are in circulation today. Does not the broadness of the field appeal? Consider, too, what you must be able to show if you expect to rise as an engineer. Think of the reports to write, the committees to appear before, the correspondence to maintain, the men to meet as superiors or as subordinates, and to obey on the one hand and manage on the other. These are things that ever successful engineer must be able to meet with grace, with tact, with promptness, and with ease.

To students in engineering, THE WISCONSIN ENGINEER is the logical place to get some very valuable experience in these lines. Places on the business and editorial staffs afford excellent opportunity for just this sort of training, which you will some day call invaluable. THE WISCONSIN ENGINEER does not claim to turn you out ready to replace immediately the present regime of editors in the country. Nor does it claim to give business experience enough to make you ready to take entire charge of the Commonwealth Edison Company. But certainly there is a fine opportunity for the foundations in these lines upon which the structures may be built. Next year we will have to fill some

places on the staff with men of no previous experience, simply because this year's staff will be halved by the graduation of the seniors. There is then ample opportunity at this time for men who are interested and who show ability in this work to fall in line for a regular staff position next year by application at the present time. You may have to do something for which you get little glory now, but which will be laying up for the future, both for next year's appointments and for your work after graduation.

CAMPUS NOTES

The following men, all seniors, were recently elected to Tau Beta Pi, honorary engineering fraternity:

Otterbein A. Bailey
Cuthbert P. Conrad
James M. Gillett
Floyd O. Jorstad
Louis C. Rockett
Sam I. Roth
Lester C. Rogers
Russell G. Smith
Thomas D. Tifft.

* * *

Mr. Bradley Stoughton lectured before the engineering students on Saturday, December 12. Mr. Stoughton is one of the country's authorities on the metallurgy of iron and steel. The lecturer discussed particularly the buying of steel and the development of the Bessemer and Open Hearth processes.

* * *

On Monday, December 14, at the eleven o'clock hour, Mr. E. T. Adams lectured on the subject, "The Development of the Large Gas Engine." Mr. Adams has been identified with the design of large gas engines from the beginning of their use in this country, first with the Westinghouse Company, and then with Allis-Chalmers. He was the designer of the engines now installed in the steel plant at Gary.

* * *

Twenty-five men were initiated into the U. W. Engineers' Club on the evening of December 4th. The affair was of rather a sprightly nature and ended with a trip *en masse* to the Orpheum, the initiates being the guests of the club.

* * *

A new club has been formed within our halls, and we now have afforded every opportunity possible for a man to become a

member of a student technical club. The new organization is for the Chemical Engineers. William R. Lacey is president.

* * *

The Wisconsin branch of the A. S. M. E. received between twenty-five and thirty members into membership on Tuesday, December 15.

* * *

With the beginning of the year 1915 the basket ball season takes full swing, and another aggregation of tossers is on the way to defend our enviable record of three successive Conference championships. We add our good wishes to all the rest for the successful defense of our title. Engineers should be especially interested with Ernie Lange, Senior Electrical, as captain of the team.

* * *

Committees have been appointed by J. B. Edwards, general engineering chairman for the University Exposition, for the various branches of the work in the college. Space forbids printing this long list. The chairmen are all seniors. Let us make the exhibits from E. B. and its satellites the feature of the exhibition.

DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

LIST 33.

Bulletins.

BULLETIN 76. United States coals available for export trade, by Van. H. Manning. 1914. 13 pp.

BULLETIN 77. The electric furnace in metallurgical work, by D. A. Lyon, R. M. Keeney, and J. F. Cullen. 1914. 216 pp., 56 figs.

Technical Papers.

TECHNICAL PAPER 76. Notes on the sampling and analysis of coal, by A. C. Fieldner. 1914. 59 pp., 6 figs.

TECHNICAL PAPER 94. Metal-mine accidents in the United States during the calendar year 1913, compiled by A. H. Fay. 1914.

ALUMNI

Some very interesting sidelights have come from some of the alumni letters we have received with subscriptions. We print herewith several extracts from letters and leave the comments unsaid.

This from a man who has recently taken a position in the department of Agricultural Engineering in a state college:

"We are very busy answering queries on every engineering subject from building to power for farmers in this and surrounding states. Just recently I had the pleasure of designing a 'sunlight' type of swine house for a man in Minnesota. A man in Montana told me his spring ran 30 miner's inches of water and had a fall of 30 feet in 100 feet, and wanted to know if he could light his house with it!"

The following in another tone balances the above:

"Business is so weak here these days that I don't dare attempt anything autobiographical, as it would be so pathetic!"

Experiences like the following brighten the day's work:

"The Emergency Revenue Law which was recently passed provided a tax of one cent for all telephone calls on which a charge of 15 cents or more is imposed. In arranging for the collection of this tax by the local companies throughout the country it became necessary for us to devise special means for collecting the tax at public pay stations. Pay stations in use throughout the country include some known as 'Baird's,' the name being that of the manufacturer. One of our engineers who wished to obtain information as to the number of these pay stations in use in the Pacific Coast, accordingly dictated the following telegram to the telephone company in San Francisco:

" 'Please advise number of Baird coin collectors in service.'

"The message came back from the stenographer as follows:

" 'Please advise number of bad coin collectors in service.' "

We wish that there were more in this vein:

"I will be glad to contribute material for the Engineer after the beginning of the new year."

CHANGES OF ADDRESS

J. S. Corley, m '14, is Operating Engineer with the Des Moines Electric Co., and may be addressed at 2845, Ridge Road, Des Moines.

R. H. Cahill, c '13, is now Junior Engineer, Bureau of Research, for the city of Milwaukee.

A. W. Ely, c '12, formerly Concrete Inspector at Ortonville, Minn., has been transferred to Aberdeen, S. D., where he is Draftsman for the C., M. & St. P. R. R.

D. C. Gayton, c '95, holds the position of Engineer with the Sidewalk Dept., City of St. Paul, Minn.

Marshall W. George, m '13, has been promoted to the position of Manager of the Renting Dept., of H. F. Norcott & Co., Chicago.

C. A. Hendee, e '13, is located in Milwaukee, in the Engineering Dept. of the Herman Andrae Electrical Co.

B. H. Hawkins, m '13, has a position with the C., R. I. & P. R. R. He is located at the La Salle St. Station, Chicago.

A. U. Hoefer, m '06, has taken a position with the American Telephone and Telegraph Co. He may be addressed at 222 S. Burnett St., East Orange, N. J.

F. P. Hutchinson, e '11, has changed his position. He is now Salesman for the Harrington & King Perforating Co. Mr. Hutchingson was formerly with the Cutler-Hammer Co., Milwaukee.

Glenway Maxon, Jr., m '14, enters engineering work as Power Plant Designer for the G. Maxon Co., Milwaukee.

Berry T. Stevens, m '14, is located with the London Guarantee & Accounting Co., Chicago.

Ed. F. Thomas, e '14, is in Schenectady, N. Y., in the service of the General Electric Co.

Fred G. Thwaits, e '14, is with the Road Commission of Delta County, Michigan. Mr. Thwaits is located at Escanaba, Mich.

C. F. Urbutt, e '09, has been promoted to the position of Assistant Engineer for the C., M. & St. P. R. R. He is located in Chicago.

H. L. Welsh, min '10, leaves the position of Assayer for the Southern Cross Mine and assumes the position of Superintendent of the Oro Fino Mining Co., Southern Cross, Mont.

C. A. Wendt, e '13, is Chief Operator, Racine Station, T. M. E. R. & L. Co., Racine, Wis.

James Whelan, c '77, has retired from engineering work. Mr. Whelan was Junior Engineer, Harbor and River Improvements, U. S. Engineer's Office, Milwaukee.

M. A. Whiting, e '04, is in the Power and Mining Engineering Dept. of the General Electric Co., Schenectady, N. Y.

H. J. Wiedenbeck, c '12, has been promoted to the position of Coal Gas Superintendent, Station B, La Clede Gas Light Co., St. Louis, Mo.

H. E. Willmore, e '12, has left the Public Service Company of Illinois. He is now located in the position of Designer for the Western Electric Co. in Chicago.

F. G. Willson, e '03, is now head of the Department of Applied Electricity, Wentworth Institute, Newtonville, Mass. Mr. Willson was formerly Principal of Wentworth Institute.

W. K. Winkler, m '07, adds the duties of Superintendent to those of Secretary, for the W. N. Durant Co., Milwaukee.

A. M. Wolf, c '09, C. E. '13, has been promoted to the position of Principal Assistant Engineer, Condron Co., Structural Engineers, Chicago.

J. F. Wolff, g '08, M. E. '11, is now Mining Engineer with offices at 608 Wolvin Bldg., Duluth.

W. P. Wolff, min '12, is Assistant Chief Engineer with the M. A. Hanna & Co., Virginia, Minn.

B. L. Worden, c '93, holds the position of President of the Lackawanna Bridge Co., Milwaukee, Wis.

H. E. Wulfing, e '05, is now with the Commonwealth Edison Co. of Chicago. The Cosmopolitan Electric Co., with whom Mr. Wulfing held the position of Superintendent of Outside Plant, has been absorbed by the Commonwealth Edison Co.

Jos. Zwolanek, m '07, has left the International Steam Pump Co. of Milwaukee, and is now Manager of the Creamery Supply Mfg. Co., Clinton, Wis.

Subscribers will please note that after February 1, the subscription price is $1.25. Prompt action is worth a quarter.

CHEMICAL NOTES

Mr. O. W. Storey, instructor in metallography in this department, resigned in August to accept a position with the Bureau of Mines at Pittsburgh. Mr. Storey's future work will be a study of the corrosion of metals in mines by waters, gases, and vapors. His resignation is regretted by his associates and former students, but the excellent position which he has obtained at the Bureau of Mines is a matter of great satisfaction to his colleagues. Mr. Storey's work was characterized by thoroughness, enthusiasm, and signal success in inspiring students for the work in his charge. His ability in research was recognized in a wide field and this will certainly bring him rapid success in his new position.

* * *

On Friday afternoon, October 30, Prof. J. G. D. Mack of the department of Machine Design delivered a lecture before the engineers upon the life and achievements of John Erricson. Not only did the lecture form a complete and detailed history of Ericsson as a man and as an engineer, but also served as an excellent character study, emphasizing the effect of personality upon a man's accomplishing ability.

The following thought, expressed by Prof. Mack in his lecture, sums up very adequately the main ideas brought forth. "Ericsson's personality was so engaging and his reputation so great, that his many failures in inventive attempts did not cause him any difficulty in obtaining from his friends the necessary money to continue his pursuits."

* * *

To say that the Chicago Game and the Annual Homecoming were not huge successes would be to admit that one is utterly unable to appreciate what such a victory means to WISCONSIN, and what it means to the old grads to be with us again, and what it means to us to have them.

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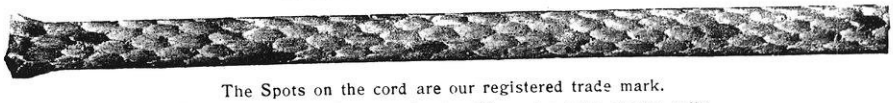

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