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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 511,

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MISSISSIPPI RIVER IMPROVEMENTS.

Of the many waterways which Congress yearly provides the means of improving, none, perhaps, is more worthy than the Mississippi River. When we consider the vast extent of country drained by this great stream and its tributaries, and the amount and importance of the commerce of which it is the highway, the appropriations for improvements, were they many times as large as usual, could not, if judiciously expended, be looked upon as excessive.

That large sums have been wasted in abortive attempts at improvement there is no doubt; and yet those who have studied the subject, and are aware of the progress that has been made, will doubtless incline to the belief that the money has not been altogether thrown away. In this we do not mean to include the splendid achievement of Captain Eads at the mouths of the Mississippi, because the work at this point was an unqualified success, and appropriations were, perhaps, never used to greater advantage. But the success had by Eads in interpreting Nature's processes in physical hydrography has not always attended the efforts of those who have sought to improve navigation in the various reaches and bends of the Mississippi system of waters. We have seen large amounts of money expended in dredging and cutting, which, when the flood season came, was seen to have been ill-advised. In a few days, and even in a few hours, we have seen nature assert itself; the banks and shoals which had been dredged away were built up again in the same order and shape, and with similar dimensions; and where short cuts had been made, the waters, as if indignant at man's presumption, began once more to hollow out another curve to wind around as of yore.

Of late years, however, more careful students have devoted themselves to the problems to be met with in the scheme for Mississippi improvement.

It is known now that the systems which have been employed with success on European streams will not always prove effective here. For the fact is, the Mississippi presents features in physical hydrography not known to exist anywhere else. The bed of the Mississippi is made up of gravel, sand, or mud, instead of rock in place, and the stream is not in any way influenced by the tide. The quality of the bottom and the banks on either side has a direct bearing upon the characteristics of the various portions of the main body of waters and its tributaries. During the flood season, the waters load themselves with alluvial matter, which they bear down the stream, and deposit where the current slackens in the same manner as a glass of water taken from a muddy pond, if permitted to rest, lets fall its sediment. The constant erosion of the stream wears away its banks, and the great river, forsaking its original bed, makes frequent excursions to the one side or to the other; the lateral defections being limited only by the sides of the valley through which the stream is flowing.

The constant movement of large masses of sand and silt, and the changes in the direction and force of the current due to the varying contour of the shore line, results naturally enough in moving the channelways now to this side and now to that, so that the pilot on the Mississippi can neither run on ranges nor by any other established marks, beacons, monuments, or stakes. He must know how to follow the axis of the current, and to read the physical signs, which experience and good judgment alone will serve to interpret.

As said before, during the seasons of flood, large amounts of alluvial matter are carried down stream by the waters, and deposited at various points, which, when the waters fall, are found to have formed into bars and shoals that greatly impede navigation.

Now, instead of trying, as in the old way, to dredge these—an endless and bootless task—or to cut through the slim parts of the bends, which soon leads to physical changes presenting other and not less formidable obstacles to navigation, an ingenious scheme has been devised to feed and re-enforce the river during the dry season, and thus deepen the channel ways without interfering with the natural processes continually alive.

It is a plan almost original in its inception, and while it has not yet been sufficiently developed to decide upon its ultimate feasibility, offers, it is thought, no little promise of success.

This project, which is in charge of Major C. J. Allen, of the engineers, may be described as involving the construction of reservoirs upon the headwaters of the Mississippi River and its tributaries. Major Allen proposes, as he says:

"To collect surplus water, principally from the precipitation of winter, spring, and early summer, to be systematically released so as to benefit navigation upon the reaches of the several streams below the dams, and also that of the Mississippi below Saint Paul. Alleviation of floods, in localities near the proposed reservoirs, expected to obtain to some extent, but control of extended floods or freshets covering long reaches not expected.

"In order that navigation may be benefited upon the Mississippi above the mouth of the Saint Croix, upon the Saint Croix, the Chippewa, and the navigable reaches of the Wisconsin, the system of dams proposed for each must be carried out, and no benefit of consequence to the Mississippi below Lake Pepin can be predicted unless the entire system is built."

These reservoirs are nearly completed, and Major Allen speaks of them in a recent report as likely to perform a valuable service The gates of the Winnibigoshish dam were closed some time since for a period of a few weeks, as were also those of the Leech Lake dam. "During this short time," says Major Allen, "the surplus water collected in the two reservoirs amounted to about 12,000,000,000 cubic feet."

These dams constitute only a portion of the system of dams which it is proposed to use in aiding navigation on the Mississippi; and when their influence upon the main stream shall have been thoroughly tested, it will become apparent whether or not an extension of the system is advisable.

Like Eads' jetty work at the mouths of the Mississippi, the scheme of dams to feed the Mississippi during droughts is original only in its application; and while it has not excited the derision nor met with the opposition which Eads' encountered, it will, if it succeeds, be entitled to quite as much commendation.

A NECKLACE OF MUMMY EYES.

The material for a unique necklace is now in the hands of Messrs. Tiffany & Co., of New York, and is awaiting the attention of their workmen. It consists of a large collection of very beautiful mummy eyes, which were brought from Peru by Mr. W. E. Curtis, of the South American Commission. The majority of them came from Arica, where large cemeteries are filled with mummies of the ancient Incas.

Some little discussion has occurred in scientific circles as to whether they are mummified human eyes or those of some variety of fish, which had been substituted by the Inca embalmers on account of their less destructible nature. Mr. Curtis writes us that the local antiquaries from whom the eyes were purchased believed them to have belonged to a species of cuttle fish which was common on the Peruvian coast.

On the other hand, Prof. Ramondi, the most distinguished native ethnologist, maintains that they are really human eyes, and the Superintendent of the Ethnological Branch of the British Museum quotes Dr. Tschudi, of Vienna, a friend of Humboldt and a thorough student of Peruvian antiquities, as likewise supporting this theory. Since the eyes have been in this country, they have been examined by Mr. G. F. Kunz and by several of the gentlemen connected with the Smithsonian Institution, and they seem to agree in pronouncing them to be the crystalline lens of the eye of a cuttle fish or squid. They vary in size from 5 to 18 millimeters in diameter, and are therefore considerably larger than the lens of the human eye. Their excellent preservation would also seem to disprove a human origin, for the lens of the human eye is very perishable, and can with difficulty be preserved even a few days. The custom of embalming, which was so common among the Incas, was made very easy by the warm, dry climate of Peru, and it is stated that the embalmed were often simply placed in a sitting posture on the vast niter beds, and left exposed to the open air. For years after death they were visited by friends and relatives, and it was consequently important that the semblance of life should be maintained as perfectly as possible. Hence it was that the dried cuttle fish eye, which is almost indestructible, and possesses sufficient warmth and fire to partially simulate life, was substituted for the human organ.

So common are these mummies that they can be dug up almost anywhere, or can be purchased for four or five dollars apiece. In the rough state, the eyes are of a bronze yellow color, and quite opaque, but when the outer covering or skin is removed, and the inner lens carefully polished, it becomes translucent or even semi-transparent, and shows a handsome coloring varying from yellow to orange and reddish brown. In this form, it makes a very beautiful gem. The concentric arrangement of the different layers gives the eye the appearance of iridescent glass, and produces an effect similar to that formed by placing a series of minute crystal globes one within the other. Some of the less perfect specimens have also radial cracks, which add to the refractive power of the lens, but will probably detract from its durability. The crystalline lens of a squid possesses so much solid matter that, when removed from the eye, it becomes hard and dry in a very few days, and has a milky, opalescent appearance. Those taken from the mummies had been cut in two pieces, so as to expose the cross section. It is supposed that the darker and richer tints found in them are due either to an organic change within the eye, resulting from age, or to the absorption of juices or antiseptics from contact with the body.

The work of polishing the eyes has been interrupted by the illness of several of the lapidaries, which is attributed to poisons used in preserving the eyes. Opinions differ as to what the poison may be; some of the symptoms would indicate arsenic, but the opinion has also been advanced that it is due to some alkaloid generated by the decomposition of the organic constituents.

As no chemical analysis has been made, it is not yet possible to assign any definite cause for the illness of the workmen. It was sufficiently severe, however, to produce an unwillingness to resume the task, and for the present nothing is being done.

Bolts and Screw Threads.

In a recent communication to the American Institute of Mining Engineers, Major King, of the Government Corps, again calls attention to the evident weakening of bolts by cutting coarse "standard" threads upon them, and gives some experimental proof of the great advantage to be derived from the use of a finer standard. As a rule, bolts are the weakest part of a structure, and they are at present further weakened by cutting away too much metal for the screw threads. When the thread is cut deeper than is required to prevent stripping, the bolt is weakened by precisely the same method that the blacksmith employs when he wishes to break a bar of iron or steel, only it is to be noted that the standard thread is cut even deeper than the blacksmith nicks his bars. The standard sizes for V-shaped threads are much too coarse for nearly all purposes, and the nuts themselves are out of all proportion to the strains put upon them, as the bolt invariably breaks long before the thread or nut would yield.

In order to thoroughly verify these statements, Major King had three pairs of bolts made, having 6, 12, and 18 threads to the inch respectively. In all other respects they were entirely alike, being turned from bar iron 1⅝ x 2 inches square, so that no forging was required. When broken in a hydrostatic press, not a single nut showed signs of weakness, and the bolts with 18 threads to the inch showed unmistakably that they were the strongest, although they finally yielded by pulling out of the nut—not by stripping the threads, as is generally understood, but by drawing down the size of the bolt until the greater part of the threads were disengaged. The standard bolts broke at an average strain of 76,655 pounds, those with 12 threads at 92,991, and those with 18 threads at 94,248 pounds; or, taking the tensile strength in connection with the stretch, they showed a relative work of 1, 2, 9, and 4.

Major King thus sums up the advantages of increasing the number of threads per inch:

1. At least twenty per cent additional statical strength.
2. Three or four times the strength to resist impact.
3. The finer lines are easier to cut.
4. They are less liable to work loose.
5. In many cases this practice will take the place of upset or enlarged bolt ends.
6. In such cases it would have the advantage of filling the hole, or, rather, it would avoid the necessity of making the holes larger than the body of the bolts.
7. There will be a saving of fifty to sixty per cent in weight of heads and nuts, also in cost; and—
8. Bolts may be placed closer to angles in structures without chipping out for head or nut.

He mentions among the disadvantages the cost of changing taps and dies; the additional time required to put on or remove nuts, which, of course, is hardly worthy of notice; and the greater loss in strength from wear and rust of surfaces of thread. In some cases, such as the bolts which secure the cylinder heads of a steam engine, the coarse thread will probably be preferable; but for all other ordinary uses the finer thread seems undoubtedly the more desirable.

In establishing a new standard, it is suggested that instead of introducing such complications as fractional threads to the inch, whole numbers be agreed upon for each quarter inch of bolt diameter, and that each of the intermediate sizes of bolts have the same number of threads as the bolt next below it in size.

The Brotherhood of Locomotive Engineers.

The Brotherhood of Locomotive Engineers has a membership of over 17,000 engineers, and 294 subdivisions in the United States, Canada, and Mexico. Its head officer is Grand Chief Engineer Arthur, who for twenty years has ruled it.

One of the engineers at the reunion of the Brotherhood, speaking privately of engineers' work, said: "The boys are all lovely so far as the Brotherhood is concerned, but when they get back to work they are the most jealous set of men in the world. No one could help it. Engineers are governed by innumerable rules, the breaking of the least of which means suspension or discharge. No excuse will be taken. Only a perfect and a lucky man can hold his place. Scores of good men are waiting to take it. The jealousy between engineers is often so bitter that their wives, although old acquaintances, will not speak. One engineer may be in luck; the other, without blame, may have had the series of three accidents that sometimes come to an engine. If she has one, she is sure not to stop till she has had three, and the engineer may be in danger of discharge.

"This intense rivalry sometimes leads to acts of meanness. A young man just promoted fears even the old engineer that he fired for, and that loved him like a brother—when he was a fireman—and will not run out his engine until he has inspected every inch of her, to see that no one has put up a job on him. A young engineer on the Nickel Plate cut out all the bearings of his engine on the first trip, and was laid off. He was a close observer, and found that some wretch had put emery in his oil can. He was able to prove this fact, and regained his situation. Another new engineer was suspended for burning out the flues of his boiler. He had worked and waited for years for promotion, and to have the coveted prize snatched from him just as he had grasped it drove him into the grave. He had insisted that the engine's gauges had registered plenty of water, but the master mechanic disbelieved him. When he was dead, it was found that he had told the truth. A conscience-stricken rival confessed that he had put oil in the tank, so that it foamed and showed water at the top gauge when there was scarcely a quart in the boiler. Another method of meanness is to choke up the water hose leading from the tank to the boiler with cotton waste.

"It is a great event in the life of an engineer when he gets a chance to make some special run that will give him a record, and he becomes a special object of envy. When the Nickel Plate was the rival of the Lake Shore, a Nickel Plate engineer made the run with thirty cars of stock, leaving Chicago at the same hour that the Lake Shore train did, and beating it into Buffalo more than ten hours. That engineer got promoted.

"An accident often makes an engineer famous and prosperous, and then he becomes an object of envy. Dan McGuire, one of the luckiest of men, was running the front engine of the double header that pulled the Lake Shore train the night of the Ashtabula accident. His engine managed to get across the bridge just as the train went down. The engine was saved, but stopped so near the awful brink that the tender hung poised over the edge. This crowning piece of good fortune called McGuire into prominence, and now, whenever Vanderbilt's train takes a trip over the road, McGuire is generally chosen to run it over his division. McGuire, by the way, is quite a prominent name among engineers. Shandy McGuire, an engineer running out of Elmira, N. Y., has become famous, not only as a good runner, but as the writer of poetry."

American Forests.

The agricultural, climatic, and commercial importance of preserving the country's forests was clearly brought out and emphasized at the meeting of the American Forestry Congress, held in Boston on September 22. The climatic changes induced by the destruction of our trees are already noticeable in the greater variability of the annual rainfall, the lengthened periods of drought, and the increased power of floods and cloud bursts. These are sufficient to offer a warning voice against any further depredations, and to demand an immediate and systematic restoration of the normal amount of forest vegetation. Several communications of interest were read by the president, the one from Dr. Oliver Wendell Holmes stating that he hoped the people would allow the country to retain "leaves enough to hide its nakedness, of which it is already becoming to be ashamed." Rev. N. H. Eggleston, of the Department of Agriculture, presented some suggestive facts in regard to the forests of the country and their consumption. The national domain, omitting Alaska, contain 1,856,070,400 acres. Of this large territory, 440,990,000 acres are covered with forests, and 295,650,000 acres are devoted to agriculture, or about five acres to each inhabitant. The unimproved and waste lands, including fallow fields, amount to 1,115,430,400 acres. To traverse this domain 150,000 miles of railway are employed, which have required 396,000,000 ties for their construction. Supposing that these ties require renewal once in every six years, and that 10,000 miles of new road are built annually, if twenty-five years be taken as the average age of trees fit for ties, it would require 15,000,000 acres of standing timber to supply the annual demand for ties, or an area equal to that of Vermont, New Hampshire, Connecticut, and Rhode Island. But with the increase of railroads, unless glass and steel and other materials for ties come into use, it must be remembered that the timber area required for their supply is likewise continually increasing. In other departments an even greater consumption of wood is taking place. The annual supply of timber consumed as fuel alone amounts to 145,778,137 cords of wood and 74,000,000 bushels of charcoal, which would clear the forests from 30,000,000 acres, or an area equal to that of New York and North Carolina together. To this estimate must be added the purely wasteful consumption of timber in the great forest fires which are a recognized feature in the year's catastrophies. This would add 10,000,000 to the grand total, and possibly more. The timber cut for lumber, though an immense drain, is comparatively small when the other statistics are considered. It would lay bare 5,600,000 acres. Altogether, then, it appears that the forest area in America is subject to an annual decrease of over 50,000,000 acres. These figures, taken in conjunction with our total forestry, furnish the material for very serious reflection.

Operations of the Patent Office.

From a statement prepared by Commissioner Montgomery, showing the operations of the Patent Office during the fiscal year ended June 30, it appears that the number of applications for patents received was 32,662, for designs 1,071, for reissues of patents 156, for trademarks 1,126, and for labels 673, making a total of 35,688, against 28,822 during the preceding year.

The number of caveats filed was 2,515. The number of patents granted, including reissues, was 22,928, of trademarks registered 1,092, and of labels, 337, making a total issue of 24,357. Patents numbering 2,828 were withheld for payment of final fees, and 13,332 patents expired during the year. The receipts of the Office from all sources were $1,074,974, as against $1,145,433 during the preceding year, while the expenditures were $934,123, leaving a surplus of $140,851. The number of applications for patents awaiting action on July 1, 1885, was 5,766, a decrease of 41 per cent as compared with the number awaiting action at the beginning of the last fiscal year.

The Reis Telephone.

The Orange, N. J., *Chronicle* says: Professor J. R. Paddock, of Stevens Institute, who resides on East Park Street, East Orange, has been engaged the past summer in important investigations as expert for the Overland Telephone Companies of New Jersey and Pennsylvania, in the suits pending in the United States Courts for infringement of Bell's patents. The defense rests in part upon the inventions of one, Philipp Reis, of Germany, who it is claimed invented a talking telephone fifteen years before Bell's telephones were patented. Professor Paddock received some time since the *original instruments of Philipp Reis* from Frankfort, Germany, and has been engaged with E. W. Smith, of New York, in testing their efficiency as regards this much disputed point. In their testimony before C. N. Williams, special examiner, who has been taking testimony in the case, Professor Paddock and Mr. Smith proved that for four months they had been experimenting with the Reis instruments in various forms. They gave the results in detail, and showed more clearly than has ever been done before that these instruments without any change are perfectly capable of transmitting speech. One sentence of fifty-six words was spoken by Professor Paddock and received by Mr. Smith by a Reis transmitter of the cubical box form without carbon points, and a knitting needle receiver. They also proved that *the identical telephone used by Reis at his lecture in* 1861 will transmit speech without any alteration. They stated that they had used it in Professor Paddock's laboratory on a line from the house to the stable, 350 feet, and had succeeded in sending many words and short sentences and the words and music of various songs. They were surprised at the result, because they did not think it probable that the actual membrane and electrodes used by Reis twenty-five years ago would retain their properties sufficiently for actual use at this time.

White of Egg in Obstinate Diarrhœa.

From the *Allg. Meg. Cent. Zeit.*, we learn that Celli has recently called attention to the curative properties of the albumen of hens' eggs in severe diarrhœal affections. In a discussion before a medical society at Rome he advocated its use, and related two cases of chronic enteritis and diarrhœa which, having resisted all treatment, speedily made complete recoveries under the use of egg albumen. The same diet is strongly recommended in the diarrhœa accompanying febrile cachexia, and in that of phthisis. In two cases of diarrhœa dependent upon tertiary syphilis, it was found of no avail. On post-mortem examination diffuse amyloid degeneration of the arterioles of the villi was found in these cases. The whites of eight or ten eggs are beaten up and made into an emulsion with a pint of water. This is to be taken in divided quantities during the day. More may be given if desired. The insipid taste can be improved with lemon, anise, or sugar. In case of colic, a few drops of tincture of opium may be added.—*Medical Compendium.*

Coating the Cages of Hydro-extractors.

Messrs. Marting et Cie. have taken out a French patent for the coating of the metallic cages of the hydro-extractors in such a way that they resist the action of the chemicals. The inventors employ a coating of caoutchouc; they first apply a solution of India rubber, and before it has time to dry they apply on the same a caoutchouc sheet, which is thus strongly bound to the metal. The perforations of the interior of the cage are also coated with India rubber, and so is the exterior of the cage itself. The whole is exposed to vulcanization, and the holes bored or cut in such a way that the holes in the caoutchouc are smaller than those on the metal.

Russian Saltpeter.

Rich deposits of saltpeter of very high quality were recently discovered in the transcaspian region near the Atreck River and in the neighborhood of Sukum.