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**THE SCIENTIFIC AMERICAN SUPPLEMENT**

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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.