What Fossils Teach.

In a recent lecture Dr. P. H. Carpenter, of Eton College, mentioned the case of Greenland as an illustration of the manner in which the earth's history is read from fossils, those remains of by-gone life which in the middle ages were regarded as "sports of nature." Fossils of four climates, all warmer than the present icy one, are found in that country. Remains of the oak and the maple tell us that the climate was once very similar to that of England to-day, and the coal, found lower down, shows that something approaching tropical heat prevailed at an earlier period. The fossils of certain sea creatures appear on the land, and that Greenland once lay beneath the sea and that its water was temperate, while the coral, obtained still lower down, must have grown when the waters were still warmer.

IMPROVED DREDGER.

The engraving herewith represents a dredger, on Messrs. Bruce & Batho's system, lately constructed for use in British Burmah. It is designed to work to a depth of 15 feet, and is of the following general dimensions: Length, 120 feet; breadth, 32 feet; depth, 7 feet; and mean draught, 3 feet. The vessel is propelled by twin screws worked by independent pairs of high pressure engines, supplied by steam from an ordinary marine multitubular boiler, 9 feet in diameter by 9 feet 6 inches long.

The whole of the operations involved in working the excavator are, says *Engineering*, performed by hydraulic power, which is furnished by a pair of direct-acting differential pumping engines with steam cylinders 15 inches in diameter and pumps $4\frac{11}{16}$ inches in diameter, the stroke of both being 18 inches. All the rams are controlled by slide valves placid amidships, so that one man can regulate the whole of the motions without leaving his station. The excavator is mounted on the end of a beam pivoted on frames fixed to the deck. This beam is raised into the position in which it is shown in the engraving by a hydraulic ram about half way between the center and the excavator, and it is caused to descend partly by the weight of the excavator, and partly by a smaller hydraulic ram near the other end. The excavator itself is worked by two rams coupled together by side rods, so that they move in unison. The lower and larger ram is connected by rods to the three segmental scoops, and serves to draw them together when they are receiving a load of soil, shingle, or rock, a pressure of 30 tons being available and amply sufficient for that purpose. The smaller ram opens the excavator when it is raised.

The two hydraulic cylinders with the hemispherical shell, and the casting to which its component parts are attached, are hinged to the beam by a universal joint, through the trunnions of which the pressure water enters. The chute for discharging the spoil is connected to the beam, and follows the excavators ready to receive its load as it falls. The speed of working is about forty lifts an hour, and, as the excavator has a capacity of 160 cubic feet, the work done amounts to 300 tons per hour.

As may be seen from the official reports to the Government of India, the cost of dredging with one of these machines is now only 1d. per cubic yard, while after some years of work the dredger was described as "perfect in every way." The fact that all the working parts are either on board, out of water, or above the material acted upon by the excavator, accounts for the great differences in wear and tear as compared with the bucket and ladder type of dredger.

MAGICAL APPARITION OF A DRAWING ON WHITE PAPER.

It is well known that the vapors of mercury are very diffusive in their nature, and some quite singular experiments have been devised based upon this, and upon the fact that the salts of silver and the cholorides of gold, platinum, iridium, and palladium are affected by these mercurial vapors.

If any one, for instance, should write upon a sheet of white paper with chloride of platinum, no mark would be visible, as the liquid is quite colorless. If, however, the same sheet of paper should be held over a little mercury, the metal will be brought out on the paper in dark tints. This magical apparition of a figure or drawing on a sheet of paper which appears to be perfectly white is very astonishing to the spectator.

On the other hand, reversing the experiment, a no

MAGICAL APPARITION OF A DRAWING ON WHITE PAPER.

less marvelous result is obtained. At first expose the drawing in writing to the gases of mercury; the lines will become charged with mercury, and then by simply bringing the drawing in contact with a sheet of paper previously sensitized with a solution of platinum, the drawing will be reproduced, line for line, on the white paper.

Drawings made in this way give a charming effect, the tones being very soft and the lines being distinct and clear.—*Le Science and La Nature.*

The Boiler Batteries at New Orleans.

Just outside the Main Building, beyond Machinery Hall, are the monster batteries of boilers that supply the steam power to the stupendous engines of the Exposition.

The first battery is composed of four boilers, 28 feet long, 48 inches in diameter, occupying a frontage of 22 feet, having each two 16 inch flues and of 200 horse power. They were built by William Mitchell, of Louisville.

The next five batteries come from McIlvaine, of Cincinnati. They have each four boilers, 28 feet long, 48 inches in diameter, and occupy a space 22 feet front. Each boiler has two 16 inch flues and a capacity of 200 horse power.

Then follow three batteries of six water-tube boilers, manufactured by Babcock & Wilcox, of New York, and having each 500 horse power.

John Ward, of New Orleans, furnishes the next battery of three boilers. These are 24 feet long, 48 inches in diameter, have each seventeen 6 inch flues and a capacity of 200 horse power.

The American Steam Boiler Company, of Chicago, furnishes a battery of two boilers, 60 inches in diameter, 16 feet long, containing fifty 4 inch tubes; two boilers 54 inches in diameter, 16 feet long, containing fifty-seven $3\frac{1}{2}$ inch tubes; horse power, 500.

The next battery is from William Mitchell, of Louisville, and is an exact duplicate of battery No. 1.

Armstrong Bros., of Springfield, O., have two batteries of four boilers, 28 feet long, 42 inches in diameter, and two 16 inch flues each, and are 200 horse power.

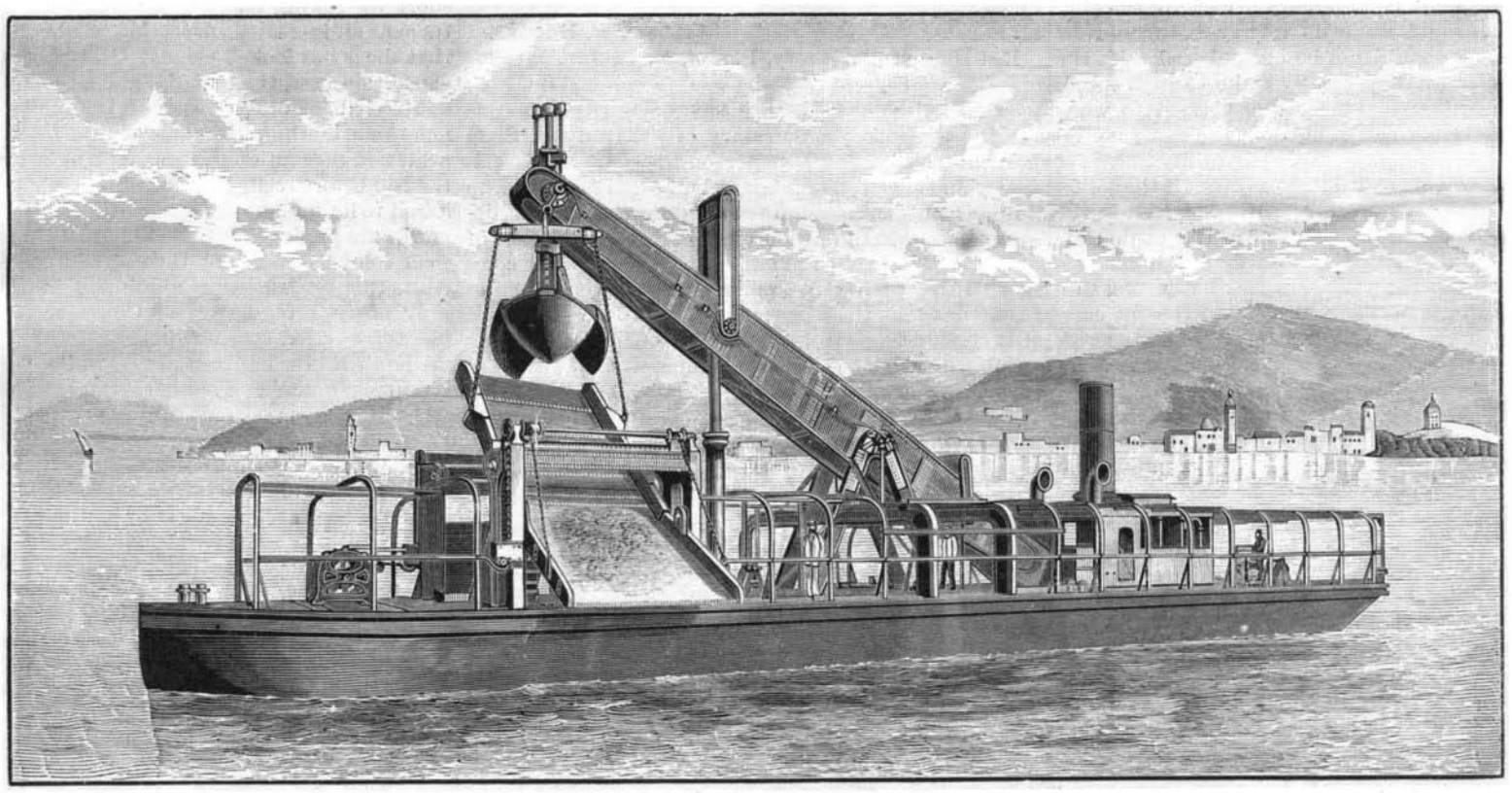
These batteries are so arranged as to be used all together or independently. They all lead into one main steam pipe, 500 feet long and 30 inches in diameter, and built of 5-16 homogeneous steel. The water supply is furnished by a system of duplex pumps that discharge into one main, with branches leading to each battery of boilers. The pressure in the water main is always maintained from 20 to 30 pounds greater than the pressure in the boilers, so as to equalize all frictional resistance in the pipes and bends, and thus insure at all times a constant supply of water to any or all the boilers. Each battery is regulated independently of the others by separate valves in charge of the engineer on watch.

The water supplied is taken up cold by the pumps and discharged into a manifold having a four inch steam pipe connection, and is forced through about 1,200 feet of four inch pipe that is incased in the main exhaust pipe, which is 40 inches in diameter, built of quarter inch iron. The water is thus heated 210° and 212°, at which temperature it is delivered into the boilers. The frontage occupied by the several batteries is 400 feet, and they will have a combined force of 6,000 horse power.

Each battery has its own smoke stack, the draught of each being wholly independent of that of the others. The furnaces employed, and on which most of the boilers sit, are of a style that has been successfully in use for years throughout the Western and Southern States, and which has a record of evaporation of 10 pounds of water per pound of combustible. They are constructed on the regenerative principle, the object sought being complete combustion and the prevention of the smoke nuisance so much complained of in all large cities. The smoke stacks of the different batteries run from 45 to 110 feet in height and from 40 to 60 inches in diameter. The building of most of the furnaces and the supervision of the entire line of boilers is under the general superintendence of Mr. Louis Metesser, of Indianapolis, a gentleman highly qualified by education and experience for the position.—*Times-Democrat.*

Scotch Dredges for the Panama Canal.

A Panama dispatch says: The first of the Scotch dredges for canal work arrived in this bay on November 24, having made the voyage from Scotland in eighty-eight days. The dredge is 170 feet long, her greatest breadth is 26 feet, and her depth 12 feet. She has two compound engines—one for driving the vessel and one for working the dredging machinery. Each engine is 80 horse power, but can be worked up to 400. When clean, she steams eight knots an hour. She is the most powerful vessel of the class yet bought by the canal company, and she will be followed by several others. Their special work will be cutting the main channel in shore, from in front of the anchorage of the steamers at Flamenco to the entrance of the canal at the back of Ancon Mountain. By January it is expected that at least two of them will be at work.



IMPROVED HYDRAULIC DREDGER.