

has been boiled or "bowked" in the ordinary way, and washed, it is piled in the bleaching keir precisely as it is piled in the chemicking vat in the ordinary process. The cover is then secured and the keir made air-tight, the valve on the pipe, F, being closed. An air tap in the cover is opened, and the bleaching solution is forced into the keir until it is quite full, thus expelling the air. The air tap is then closed, and the valve on the pipe, F, opened.

After the bleaching solution has remained long enough in the keir to enable the material to be thoroughly soaked, and which is about five minutes, the liquor is drawn off through the pipe, K, into the vessel, C, and the valve at J being open, the gas under pressure of the water in the upper part of the gas holder follows the retreating liquor. The gas remains in contact with the moistened material for forty-five minutes, by the end of which time it will have decomposed the whole of the chloride of lime in the bleaching solution on the fiber of the cloth. The bleaching liquor is again run in upon the material in the keir, thus forcing the carbonic acid gas back into the gas holder; but which again returns when the liquor is run out. This alternating of bleaching liquor and gas is repeated till the material is of sufficient whiteness. For a medium grade of cloth, provided it has been boiled three hours, it will take about eight hours to bleach, but if the cloth has not been boiled the bleaching will require a longer time. When the bleaching in the keir is finished, the material is thoroughly washed, after which it is slowly passed through the solution of triethylrosaniline and again washed, when the process is complete. The total time occupied ranges from eight to twelve hours, according to the nature of the fabric under treatment.

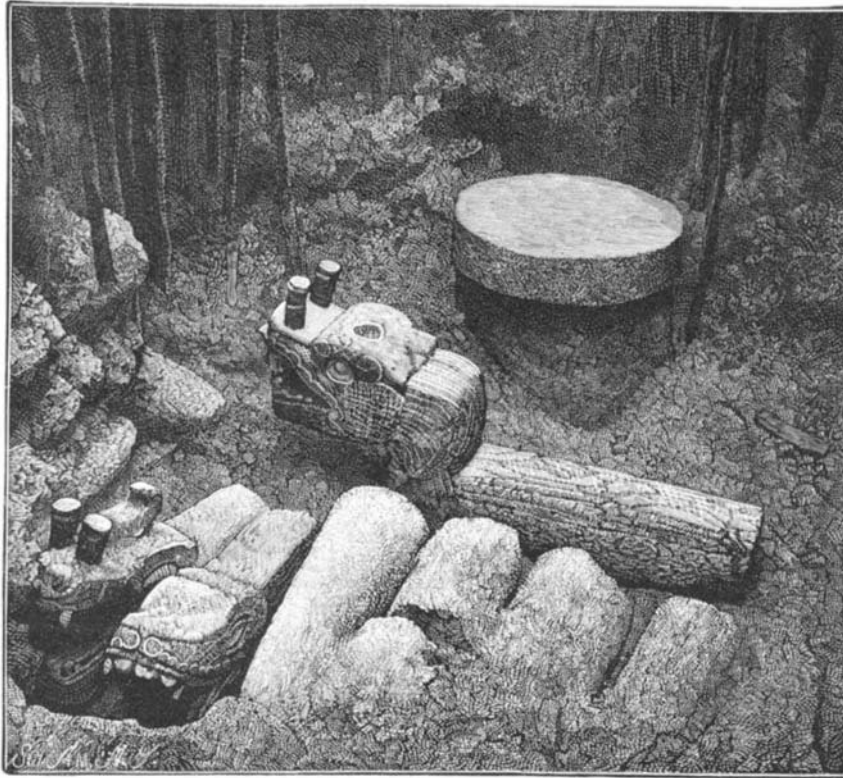
From what we have stated it will be clear to the practical mind that the great value of the process arises from the circumstance that the two operations of chemicking and souring, which have hitherto been carried on separately, are here performed simultaneously. The value and importance of the invention are, moreover, further enhanced by the fact that a great reduction in the wear and tear of the fabric under treatment is secured. Of the results of Mr. Thompson's invention we may write with confidence, for it has passed the experimental stage, and has entered the region of practice. It has been proved on a practical scale at the Halliwell Bleach Works of Messrs. R. Ainsworth, Son & Co., near Bolton, England. Respecting the theory upon which the process is based there never has been any question, namely, that by the reaction of carbonic acid on chloride of lime vegetable fiber is readily bleached. The point to be settled, however, was whether the carbonic acid gas could be made to penetrate to the center of a large body of cloth, that is, whether it would penetrate to the center of an ordinary keirful of cloth, say about 30 cwt., piled or laid in the usual manner. This Messrs. Ainsworth find is really done, even under disadvantageous circumstances in connection with the first apparatus erected at their works, and which proved slightly defective, but which defects are being remedied in the permanent plant now being laid down. Messrs. Ainsworth state that the carbonic acid gas does penetrate to the center of the goods in the keir, so that the entire contents are perfectly bleached. This point regarding penetration having been satisfactorily settled, we have now only to consider those respecting the saving of time and expense. The question of time we have already dealt with, while with that of cost we leave Messrs. Ainsworth to deal. They state from experience that the cost of bleaching one ton of cloth by the Thompson process is under 30s. for chemicals, labor, and coal. Although there is some little difficulty in arriving at a precise estimate of the cost of bleaching by the ordinary process, our practical readers will agree with us in placing it at from £4 to £6 per ton. The saving will, therefore, be seen to be at the worst very considerable, and at the best 75 per cent. If we place it at 50 per cent, we believe we shall be well within the mark. Without doubt Mr. Thompson deserves credit for so ingenious an invention, and Messrs. Ainsworth for the spirited manner in which they have given it its initial start in practice. They have shown it to be a thorough success, and there is every reason to believe that it will prove of incalculable benefit to the bleaching trade.

DR. LE PLONGEON'S LATEST AND MOST IMPORTANT DISCOVERIES AMONG THE RUINED CITIES OF YUCATAN.
(Continued from page 311.)

The stones and mortar having been cleared away, it was found that the statue had rested on conoidal stone pillars,

from eighty centimeters to 1 meter 25 centimeters. On a level with the pillars were twelve serpent heads, with feathers and many designs exquisitely sculptured all over them. Two large ones, and two small, looked toward the east, northeast, and southeast. Three on the west side of the excavation looked west, and three on the south looked south, and two others southeast. From the top of each head rises a kind of plume or perhaps flame; and on each side of the front of the head perpendicular ornaments, like horns, that we have discovered represent the opening pod of the *Ceiba* tree, sacred to the Mayas. Their ideal heaven was to rest beneath the shade of the *Yaxche* (*Ceiba*), eating sweet things, and enjoying the happy do-nothing. The opening pod of that tree, with the silky filament coming forth, served as models for the scepters and badges of authority seen in the hands of the chiefs whose stone likenesses adorn the buildings.

The feathers carved all over the upper part of the body of the stone serpents are painted green; the scales of the belly, well defined, are yellow, as also the edge of the jaws. The inside of the mouth and forked, projecting tongue are red, like the gums, though the teeth and fangs are white. Blue paint is round the eyes and over the brow. The whites of the eyes were made of shell, that had a round hole where the pupil should be. Perhaps the pupils were made of some brilliant stones that were removed when the stones were interred, for nothing that might have served such purpose has come to light. The horn-like ornaments on the front of the head are painted green and tipped with red, which is the color of the feather on the top. The largest head measures fifty centimeters in



DISCOVERY OF TWELVE SERPENTS' HEADS.

length, thirty-five from top to lower jaw, and twenty-five across the top. Unhappily, we found nearly all of them more or less broken; they are of soft limestone, but we also found the pieces, so they could be mended; they were undoubtedly broken at the time of making the mausoleum.

On the south side of the excavation, at the feet of the statue, but lower down, was a round, white stone urn that measures outside 80 centimeters in diameter and 70 in depth, with the lid that is 17 centimeters thick. The diameter of the interior is 55 centimeters, and the depth 28. With difficulty four men were able to slide off the lid. Then, at first sight, the urn seemed empty, except a little red earth in the bottom, but feeling among it, we found a trapezoidal piece of green jade, 6 centimeters long, 4 wide, and 1 centimeter thick. The jade stone was held in great esteem by the Mayas, as it is to-day by the Japanese. On one side of the piece found in the urn there is a human face—full face—and letters round it; it is well carved and highly polished. Besides this, we found in the urn a tube-shaped jade ornament, nearly 3 inches long, one end of which broke to pieces when we touched it. Also two pieces of the same stone, that look like halves of pierced ornaments, and a ball of white glass nearly an inch in diameter. We took all the dust that was in the urn, and with some trouble separated from it many small pieces of shell or bone, and some seem to be enamel, painted red and green, and cut in various shapes, having served to form mosaic work. The ball of white glass is very interesting, proving that those people were acquainted with glass, and probably knew how to make it. At the time of the Spanish conquest looking glasses were in use among the Mayas, for the historians inform us that *only the men used them*. When the glass ball was taken from the urn, the Indian workmen said: "Holo! zazteen!" ("Here, the transparent stone.")



PIECE OF JADE.

Effectively, even to-day, there are people among the Indians of Yucatan who call themselves *H-men* (*m*) and *X-men* (*f*). The letter *H* before the word *men* is a contraction of the masculine article *Ah*, and the *X* a contraction of the feminine article *Ix*, which is pronounced ish; and as the *i* in Maya is like the English *e*, it is the feminine article *she* reversed. The *H-men* and *X-men* (wise men and women) use stones like the glass ball found, and in them pretend to see hidden things and coming events; so we may presume that clairvoyance was known among the Mayas; and Bishop Landa, in his work on Yucatan, tells us that soothsayers, who pretended to read futurity, formed part of the priesthood. After the serpent heads and urn were removed from the

placed horizontally side by side. Some were painted blue, others red, one meter high, and thirty centimeters in their thickest diameter; blue, by the bye, was the color of mourning among the Mayas, and was also a color much used at Egyptian funerals in ancient times, according to Sir Gardner Wilkinson.



THE SERPENTS' HEADS AND ROUND URN.

The pillars on which the statue rested were not the only ones; they extended over a space of about eight square meters, and in some places were three and four deep, the total number being 182, half the number of the days in our year, less half a day. Two-thirds of the pillars are painted blue, and one-third red; they vary in height

After the serpent heads and urn were removed from the

mound, with all the loose mortar and stones, we stand on a level floor, sixty centimeters below which was a small pile of bones, with one smoke-colored obsidian arrow head, twelve centimeters long, on each side of it. Also fragments of fine pottery, some painted blue inside, the others with vestiges of a design in white.

Though the bones had been completely protected from the air, they were so rotten that we had to handle them with care for them not to fall to dust. They seem to have belonged to a small animal with long and pointed jaws and very pointed teeth. We wrapped each bone in a separate paper, so that later some qualified person might examine them. Forty centimeters below these bones and arrowheads was a concrete floor beautifully leveled and painted bright red, which extended throughout the mound. Below this floor were loose stones without mortar to a depth of forty centimeters, then another floor painted yellow, making the seventh floor from the summit, though the upper floors were not polished like those beneath. Under the seventh floor there were more loose stones, sixty centimeters deep; then solid rock and Mother Earth. We next had the men to open further into the west or rather southwest part of the mound, in which direction the arrowheads had pointed, and after three days, reached a very solid block of masonry. Within it, about a meter and a half west of the center of the mound, was a stone seventy-five centimeters long and sixty-five wide, standing upright, its surface facing east.

The stone is deeply carved with signs that had their meaning among the Maya priesthood, and painted blue, yellow, red, and green. Further south, two other similar stones were found face downward, on the red concrete floor; they were stood up, together, and a photograph made of them. There, also, was another stone with a fish sculptured on it, the fish being surrounded by a fold of a serpent's body. No other object was found in this mausoleum, that seems to have been erected to the memory of a certain priest or wise man, called Cay Canchi, and also to conceal the remnants of some sacred temple that may have been destroyed by a great cataclysm; in which case we may presume that the apish figure was a principal and much respected object in that temple, and the property of the pontiff, since he inscribed his name (Cay Canchi) on the heel of the sandal; for we are not very ready to admit that the figure found is a likeness of a sage and philosopher—a learned man of the highest class, a nobleman among the Mayas.

The great statue that was thrown from the top of the mound and broken may have been a picture of Cay Canchi; we cannot now tell; but no image of him was within the mound. We have found an exquisite stone bust of that individual in Uxmal, but have left it concealed where found, because in Mexico no one would know how to appreciate it, and we are not allowed to carry any stone from the country out of Mexico. Even though we give them being by bringing them to light from the bowels of Mother Earth, we cannot call them ours, neither will the government pay us one cent for our discoveries, that is well able to make its museums the richest, in *American antiquities*, that exist in any country; but it seized the statue of Chaacmol, and refused to defray the expenses incurred in the discovery. Even the Congress at Washington refused to aid Dr. Le Plongeon in the recovery of his expenses, when Hon. George Hoar appealed for protection to the Senate in a paper marked, "Confidential. 45th Congress, 2d session. Executive B. May 7, 1878." It seems that in America people who dedicate themselves to science, unless happy enough to be rich, run a good chance of starving, so far as the governments are concerned.

Your most obedient,

ALICE D. LE PLONGEON.

Ruins of Chichen Itza, Yucatan, January 12, 1884.

The Corinth Canal.

The work of making a ship canal across the Isthmus of Corinth, to connect the Gulf of Corinth with the Bay of Ægina, is now well under way, although, short as will be the route, it is expected that four or five years will be required for the completion of the undertaking. The total length will be 6,400 meters, or about four miles, and the route is on a line where a canal was once projected, and the excavation even begun, by the Roman Emperor Nero. The canal will be the same in section as the Suez Canal, 22 meters in width at the bottom, and 8 meters in depth at low tide, but the total amount of material to be removed is placed at 10,000,000 cubic meters.

A correspondent sends us an opinion as to the benefits this canal will confer upon navigators of that portion of the Mediterranean, and estimates that the tonnage of vessels likely to use the canal will be at least six and a half million tons yearly, yielding a revenue, on moderate charges, of about \$900,000 a year above charges for running expenses and maintenance. Full details of the work, showing plan and birdseye view of the route, with sectional elevations, may be found in *SCIENTIFIC AMERICAN SUPPLEMENT*, No. 425.

JOHN E. WOOTTEN, General Manager of the Philadelphia and Reading Railroad Company, who is the patentee of the Wootten dirt burning locomotive, has sold his rights in the patent for a sum estimated between \$250,000 and \$300,000. The purchase was made by an association of railroad capitalists, who formed a company, of which Mr. Jos. Wharton, president of the Wharton Switch Company, is the leading man.

BOILER FLUE CLEANER.

Keeping the flues clean is one of the most important duties connected with a boiler; when properly performed, it results in a decrease in the expenditure for both fuel and repairs and an increase in efficiency. One of the best tools for doing this work is the cleaner shown in the accompanying engraving, and which is manufactured by the Crescent Manufacturing Company, of Cleveland, Ohio. The form of the cleaner is shown in the cut. A hose connects the cleaner with a pipe that leads to the dome of the boiler, in order to obtain dry steam. The conical shaped head of the cleaner adjusts itself to the ends of the tubes, excluding the air, thereby preventing condensation and insuring a dry current of steam. The steam passes through the auger-shaped passage, which is without obstruction from the induction end to the outlet, and is delivered directly against the face of the tubes in an unbroken sheet, continuing through the entire



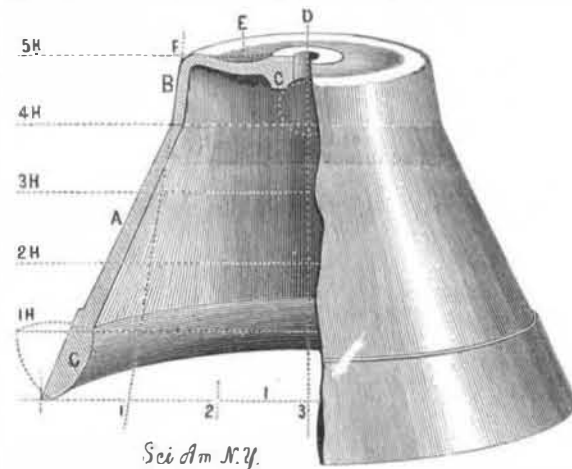
BOILER FLUE CLEANER.

length in a whirling motion, and thoroughly removing all ashes and other foreign matter. The cleaner need be held against the end of each tube only for a few seconds, so that every tube in the boiler can be cleaned in a short time. There are no parts needing attention, and the apparatus is ready for use at all times. For these reasons the tubes can be more frequently cleaned, thereby preventing the formation of scales, improving the draught, and permitting the use of a poorer grade of fuel.

The above mentioned firm also manufactures the "Crescent" steel tube scraper and boiler compound for dissolving scale and preventing its formation.

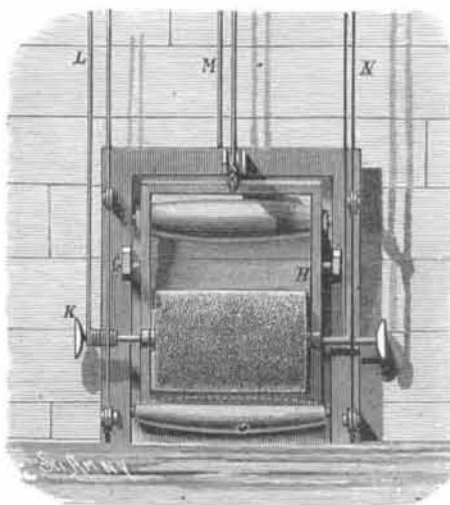
IMPROVED FORM OF BELL.

An improved construction of farm, factory, church, and other bells, whereby greater vibration is secured for the upper portion of the bell, a more powerful tone is obtained,



BOWERS' IMPROVED FORM OF BELL.

and the bell is less liable to break from strain of metal in casting, has been patented by Mr. M. M. Bowers, of 29 Camden Street, Baltimore, Md. The body of the shell is in the form of a truncated cone whose height from 3 to 4 H is equal to half its base, and its top also equals half its base. The head portion is one-fourth the height of the cone. The base line of the cone is divided into six equal parts, and from 1 and 5 are drawn upwardly converging lines to and through the top circle. This gives the proper slope of the head. The exact form of the upper part of the head is clearly shown in the engraving. The whole height of the shell of the bell is divided into five equal parts as shown by the dotted lines, 1 H to 5 H. The hammer swell is made wholly within the shell, and its length is limited by the first of the five spaces. By concaving the top of the head,



COOPER'S NEW SHIP CLEANER.

greater ease is secured for the vibrations of the shell, and there is less strain of the metal in casting. The form of the hammer swell and its arrangement within the shell, instead of outside, have a greatly improved effect.

Canned Goods and Adulterations.

A bill was recently proposed in the New York Legislature requiring all canned goods sold in the State to be stamped with the date of packing. The proposition was vigorously opposed by those interested in the canning interest, and did not become law. The annual production in this line in the United States—in fruit, meat, fish, and vegetables—is placed at 500,000,000 tins, or about ten for every man, woman, and child in the country, and such a law, it was claimed by the manufacturers and dealers, would seriously check if not destroy a now prosperous business.

It is not strange, however, considering the many forms of adulteration and sophistication in articles of food which have grown up in a few years past, that people are very open to suspicion, and sometimes propose severe remedies. A great deal of glucose was sold in sugar and sirup and as honey before people suspected it, and the war between oleomargarine and butterine and dairy butter seems now to be further than ever from a settlement, on account of the passage by the Legislature of a law generally deemed unconstitutional. The latest of these most conspicuous adulterations has been found in the recently discovered adulteration of green coffee by New York and Brooklyn dealers. The cheap Maracaibo and Guatemala coffees differ in appearance from the more valuable Java and some other varieties, the former being of a dull greenish hue and without luster, as compared with a glossy yellow color in the Java. Thence was started a practice of treating the cheaper coffees by rolling the former in heated cylinders and sprinkling with gum arabic water, to polish the beans and give them more the appearance of Java. After this came the use of other coloring matters, and the officers of the Sanitary Bureau state that now both arsenic and lead are used for this purpose, as well as chrome yellow, Prussian blue, yellow ochre, amber, Venetian red, and lampblack. The coffee dealers say the injurious articles are used in quantities so infinitesimal that no harm can possibly come of their employment, but this is a statement of which the public may well be highly incredulous; the coloring matters have been used simply and only as a means of palming off a cheaper article for a better, and the health officers have concluded that every cup of coffee made from the colored beans contains one-sixtieth of a grain of arsenious acid, a virulent poison. In buying coffee and many other articles of consumption the consumer will do well to be on his guard.

Brass Driving Boxes.

The practice of the Baltimore & Ohio road in the matter of solid brass driving boxes presents some advantages, a knowledge of which may be useful to other roads that have brass foundries and make their own brass castings. These boxes are charged upon this road at 16 cents a pound, which is the ordinary rate for all brass work, and the old brass is received back by the foundry and credited at 11 cents per pound. The boxes can be finished up at about half the cost of finishing cast iron boxes, and being solid no labor is expended in fitting a brass into the box. It has been found that these boxes, when made of the right mixture, will wear as long as combination boxes. When an accurate system of accounts is kept, with a knowledge of every source of waste in the foundry, there are many parts of an engine which can be made from solid brass more economically than from a combination of brass and iron. The loss in remelting being known, together with the cost of the raw material and of the labor expended in the process of making and turning out, it is easy to determine what iron castings can be economically replaced with brass. But if the attempt is made to substitute brass for iron without an accurate knowledge of the details of expense, it is easy to make mistakes that will be wasteful instead of the contrary.

A NEW SHIP CLEANER.

The construction of the ship cleaner recently patented by Mr. J. L. Cooper will be plainly understood from the accompanying engraving. A steel brush, whose shaft is journaled on a movable frame, H, which is pivoted in blocks projecting from the main frame, is made to revolve by means of two ropes wound in contrary directions upon the ends of its shaft. These ropes may be operated from any convenient station—either from the deck, the dock, or a float. From the sides of the main frame project four arms, each of which is furnished with two wheels, between which pass the tightly drawn guide ropes. These ropes can be carried down one side of the ship, under the bottom, and up the other side. The frame is kept a short distance from the surface to be cleaned by rollers. The apparatus can be readily raised or lowered, or moved sidewise, so as to bring the brush against any part of the ship's surface. By the aid of a rope attached to the upper cross bar of the movable frame the pressure of the brush against the ship can be regulated. With this device the sides and bottom of a vessel can be quickly gone over, and barnacles, rust, paint, etc., removed.

Further particulars concerning this useful invention can be obtained by addressing Mr. James O. Cooper, No. 165 Fourth Street, Portland, Oregon.

On his way to the Cape, Captain Gordon landed at the Seychelles Islands. There is a curious grove of palms there which grow in pairs, side by side. If one is cut down, the other dies. Gordon at once indicated an official dispatch to say that he had discovered the original Garden of Eden, and that trees of good and evil were still flourishing in it.