

## THE PANAMA CANAL WORKS.

The Panama Canal impresses the visitor as being one of the most gigantic engineering enterprises of modern times. Among the many difficulties to be overcome are those of taking the canal through the Chagres River some twenty times, through a hill several hundred feet high by means of a deep cutting, and through numerous swamps and beds of rock. When completed, it will be over fifty miles in length, twenty of which are now so far finished as to admit water, three miles having a depth of 25 ft. and the remaining seventeen a depth of 8 ft.

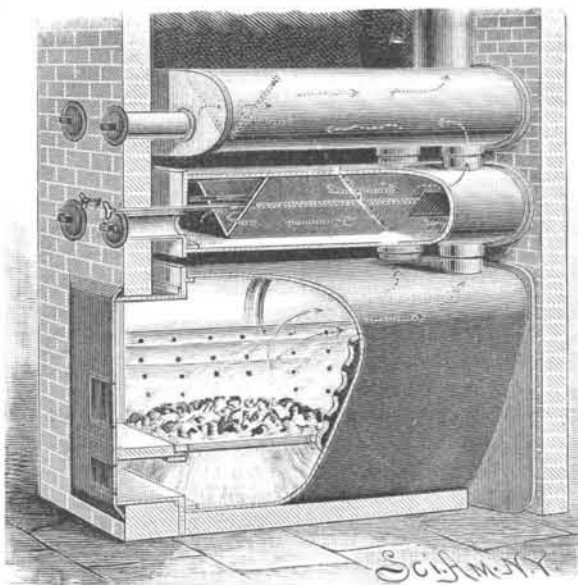
Among the sketches, the port of Colon, or Aspinwall, at once attracts attention, with its extensive wharves and sheds running out into the sea. Alongside these huge ships of all nations are so secured as to be ready "to slip" at short notice, in case of a gale coming on—a very necessary precaution, as not long ago seventeen large vessels were driven from their moorings and totally wrecked by the violence of a tropical storm. The sea there is never still, and to guard against its violence the entrance to the canal has been protected by a large breakwater run out into the sea, formed of concrete blocks, at the end of which is a large statue of Christopher Columbus, presented by the Empress Eugenie. At Mindi and other places are to be seen the bungalows of the engineers and workmen employed on the canal. These look beautifully clean and cool, and compare most favorably with the shanties of the negroes and Chinamen, who swarm about these parts.

The Cite de Lesseps—named after that illustrious Frenchman—is only a collection of huts, built of bamboos and any old refuse, and supported mostly on piles, often overhanging the muddy river, over swamps—in fact, anywhere. The canal cuts through the Chagres River there, and two large steam dredgers may be seen at work on the river discharging the dredged-up refuse far over the river's bank, through a long chute. Not only are there dredgers on the rivers, but on the land also, as at Las Cascadas, where a large locomotive dredger scoops up the earth and empties it into trucks the other side, by which it is taken away to form embankments, as at Bas Obispo.

Culebra presents a most animated scene—gangs of negroes, engines of novel construction in great numbers, all at work cutting through a hill some hundreds of feet high, through which the canal must pass. It is "man versus nature." With the exception of the engineers, negro labor only seems to be used, and as there is little sickness and good pay, the black man comes and works for a month or two, and then goes home and does nothing for the rest of the year. Wherever he is, he is always laughing, happy, and lazy. Our sketches and the above description are by Lieut. F. H. Boyer, R.N.—*London Graphic*.

## HOT AIR FURNACE.

Above the furnace proper, or fire box, are placed radiators, the whole being inclosed by walls of brick. The furnace is made heart-shaped in cross section, so that the fire box is wider at the top than at the bottom, thus causing the fuel to settle together upon the grate bars as it burns away, the result being a better combustion. The walls of the furnace are stiffened by a casting, bolted to the inner surface, so that they will



PAINE'S HOT AIR FURNACE.

not warp or sag if overheated. The grate bars are supported upon cross pieces, one at the center and one at the forward end of the furnace. Back of the grate bars is a perforated plate. The space below the grate and plate forms the ash pit. The interior of the furnace above the grate and plate is lined with corrugated and perforated fire bricks, which are held a short distance from the furnace walls, so as to form air spaces which communicate with the ash pit. A circulation of air is thus maintained between the fire box and walls of the furnace to protect the latter from intense heat.

Just above the furnace is placed a radiator, elliptical in cross section, and divided into three longitudinal compartments by two partitions, so inclined as to make the central compartment V-shaped. The partitions are of less length than the radiator, and as they abut the back of the radiator a passage is formed between their front ends and the front of the radiator. The rear ends of the side compartments are connected by flues with the furnace, so that the current caused by the draught will be forced through the side chambers and back

through the center one, and then through flue openings to the upper radiator, which is in all respects like the lower one, and the rear end of its center chamber is connected with the chimney flue. Connected to the front plates of the radiators are short pipes extending through the brickwork, and, provided at their outer ends with caps, by removing which the interiors can be cleaned.

In each partition of the lower radiator is an opening, closed by damper plates operated by rods leading to the front of the furnace. These openings are in line with the flues, so that when the dampers are opened, the draught will pass directly from the furnace to the upper radiator. The lower radiator may thus be thrown out of action when desired. By setting the radiator partitions at opposite inclinations, the heat is confined near the surfaces at both sides and at the top, thereby causing the radiator to give off the maximum amount of heat. The intense heat produced at the front by the meeting currents is largely given off through the front plates of the radiators. This reverberatory action causes the smoke to be consumed and effects a better utilization of the fuel.

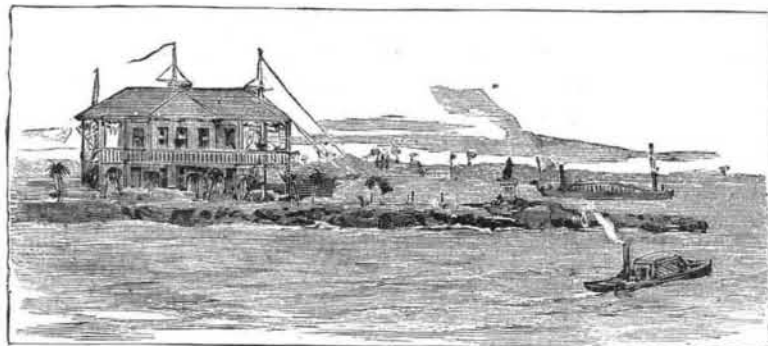
This invention has been patented by Mr. A. B. Paine, of Vermontville, Mich.

## Through Suez at Night.

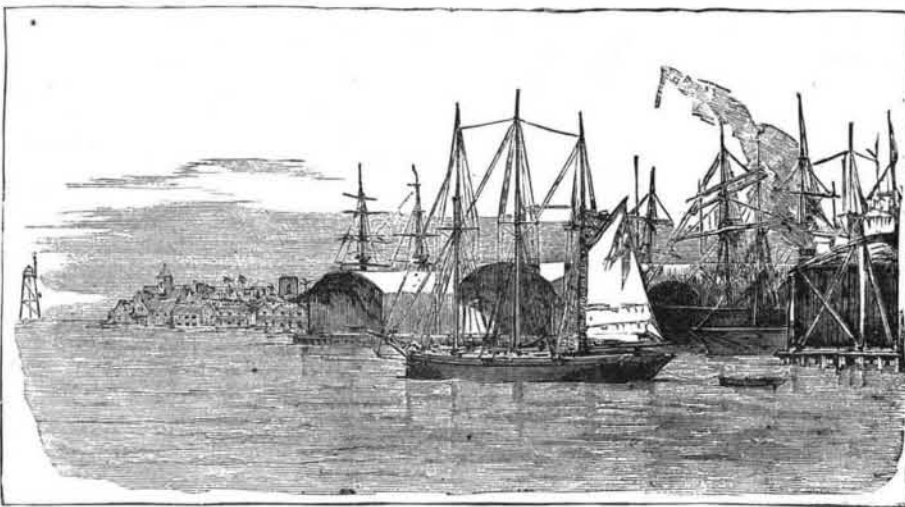
It is quite a common thing for a big steamer to go through the Suez Canal at night. But what is, perhaps, not generally known is that the steamer itself, and not the Suez Canal Company, has to supply the requisite electric light apparatus for the nocturnal passage. What the company does is to prescribe the amount of illuminating power which the apparatus must possess. For instance, no steamer is allowed to start on a night transit that is not fitted with an "electric projector" which is capable of throwing a light for at least 1,200 meters ahead. And on the upper deck, too, there must be an electric lamp and shade powerful enough to light a circular area some 600 meters in circumference. Big steamers are beginning to carry this apparatus, but there is a company both at Port Said and Port Tewfik which lets out the necessary projectors and lamps on hire.

## Fidelity and Intelligence of the Dog.

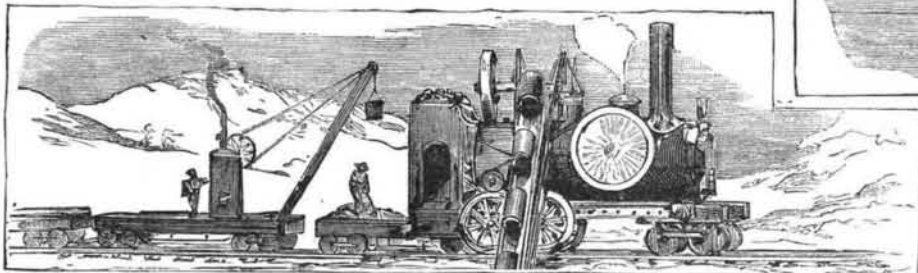
The New York *Sun* says: "A Missouri farmer, driving home at night from St. Louis, dropped a coat and a bag of oats from his wagon without knowing it. His dog knew it, though, and lying down by them watched them for three days, despite all efforts to coax or drive him away. At the end of that time the farmer came back. He said that he had been wondering what had become of his coat, bag, and dog, and hearing of a dog acting strangely on the road, came to see if it was his."



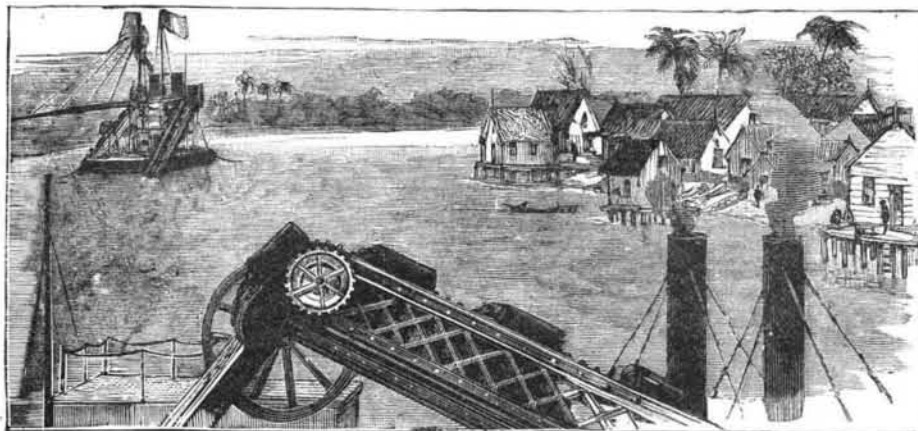
ENTRANCE TO THE CANAL AT COLON, AND STATUE OF CHRISTOPHER COLUMBUS



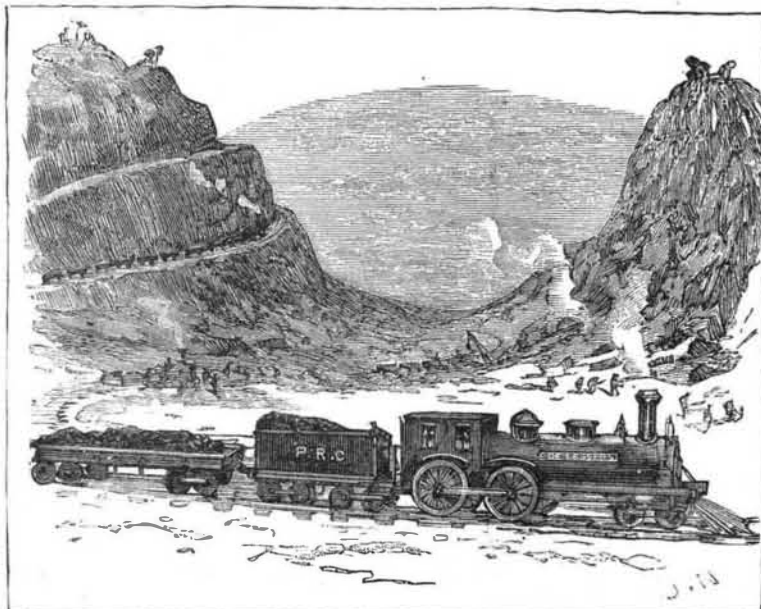
THE PORT OF COLON, OR ASPINWALL



LARGE LOCOMOTIVE DREDGER, LAS CASCADAS



CITE DE LESSEPS, WHERE THE CANAL FIRST CUTS INTO THE CHAGRES RIVER



DEEP-CUTTING THROUGH THE MOUNTAINS, CULEBRA

## VIEWS OF THE PANAMA CANAL WORKS FROM THE ISTHMIUS RAILWAY.