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THE UNITED STATES DRILLING SCOW, EAST RIVER.

It is now just ten years since the United States Government made its first grant of money for the improvement of Hell Gate and the reduction of the reefs obstructing the East River portion of New York Harbor.

During these years the appropriations have been irregular and sadly inadequate, in view of the magnitude of the work to be done and the commercial interests involved; nevertheless the prosecution of the task has exhibited some of the most noteworthy and successful feats of submarine mining ever accomplished. In no other part of the world has there been so many or such extensive removals of rock masses by blasting under water; and in no place has the work of harbor improvement been carried on under conditions so difficult, complicated, and exacting.

Our readers are already familiar with that phase of this great work which was so splendidly illustrated in the dry mining operations at Hallett's Point. There the work was done by headings run from a shaft sunk at the base of a rocky point near the shore line. At Flood Rock substantially the same method is being employed, except that in the latter case the shallower parts of the reef, which cover several acres, have been converted into an island for the accommodation and protection of the engine house, hoisting apparatus, and other necessities for dry mining.

For the removal of the more or less deeply submerged rocks and reefs, lying in the channel at Hell Gate and in that part of the harbor between New York and Brooklyn, an entirely different method had to be adopted; and though popular interest has centered almost entirely upon the more accessible parts of the work, as at Hallett's Point, the strictly submarine part has been vastly the more difficult, and has called for a far greater degree of boldness and originality in the invention of novel means and processes.

The conditions, as already noted, were peculiar and uncommonly severe. The rock masses to be removed were large; they were washed by tides of unusual force and swiftness; the channel was thronged with shipping, and, at first, the pilots were decidedly unfriendly.

The experience of the earlier contractors had demonstrated that the intentional or accidental destruction of their drilling apparatus, by collisions with passing vessels, was by no means the least of the difficulties to be obviated or overcome. The experiment of surface blasting had proved a failure, save for the removal of projecting points. To break up the broad rock masses nothing short of deep drilling and the use of high explosives would answer. This also had been attempted, but the fixed platforms supporting the drilling engines had been knocked into deep water by colliding vessels, and the devices adopted for protecting the divers

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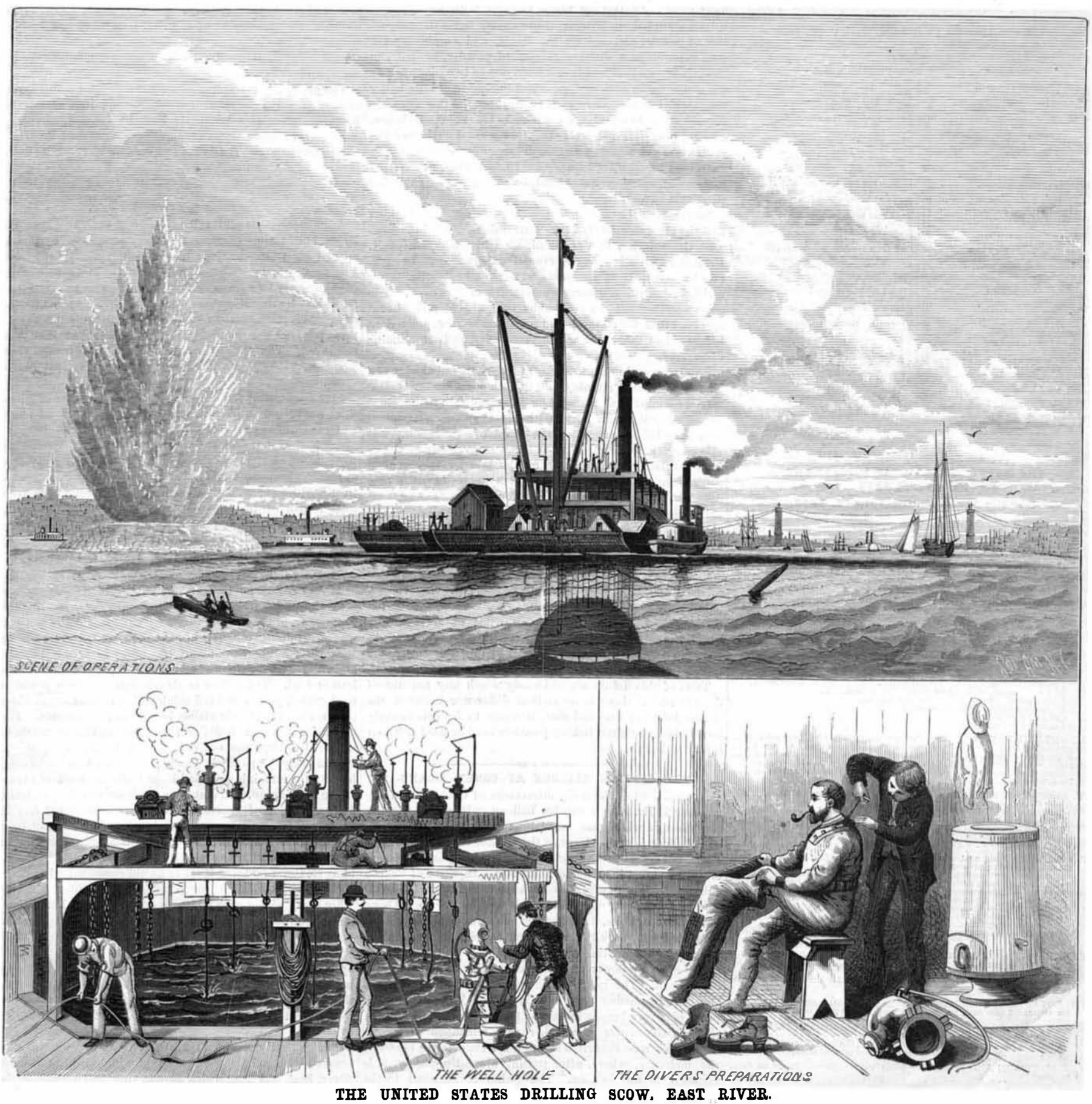

THE UNITED STATES DRILLING SCOW, EAST RIVER.

less elaborate in decoration. He finds the frog a form common to them all, and so the cougar's or tiger's face. But the Mexicans usually sculptured a face or figure, head downward, upon the external aspect of each leg of the tripod, a feature seldom or never seen in this ruder work. They also ornamented their jars with hieroglyphic inscriptions (which have never been deciphered, by the way), and the latter have no place in the collection of Mr. Lamson, with a single doubtful exception. Professor Putnam did not attempt to assign any special age to these remains.

THE UNITED STATES DRILLING SCOW, EAST RIVER.

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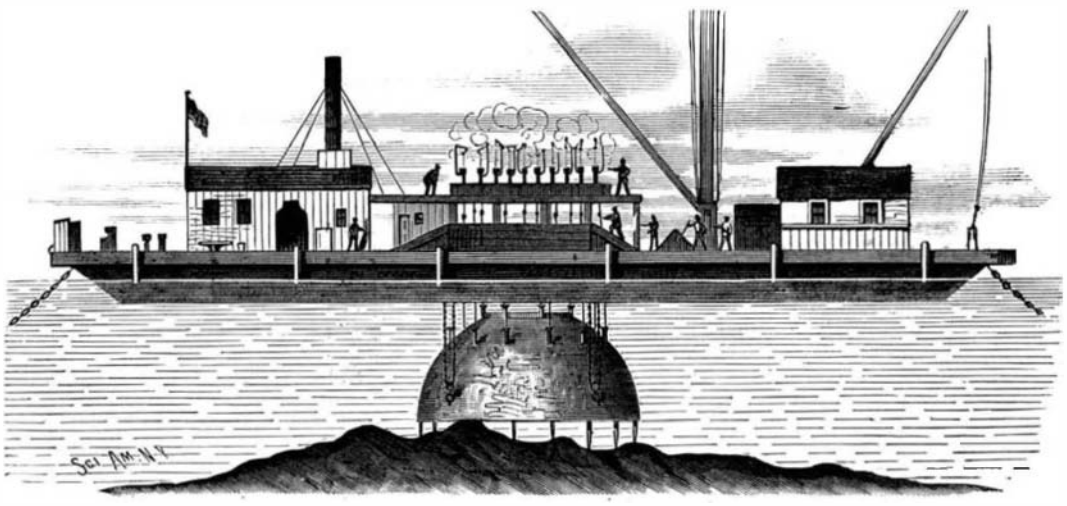
and steadying the drills while at work had proved inadequate. At this stage of the undertaking the management of the East River Improvement was intrusted to Major-General John Newton, U. S. Engineer, whose first work was to devise means for meeting the difficulties which had defeated his predecessors. The result was the drilling scow, the construction and working of which is illustrated by the accompanying engravings.

The scow is at once a boat, a machine shop, and a fortification. Its great size, massive structure, and overhanging guard, faced with iron, were necessary for the protection of its works against collision. At first such nominal accidents were of frequent occurrence. In a little while it was demonstrated that the colliding vessels were sure to get the worst of the encounter, and since then the pilots have given the scow as wide a berth as possible. Still strictly unavoidable collisions are of almost daily occurrence, owing to the necessary position of the scow while at work, the narrowness of the channel, and the severity of the tides.



SCOW AND DOME IN POSITION.

In the center of the scow is a well hole 32 feet in diameter, in which is hung a hemispherical dome of boiler plate on an iron frame. This dome, or caisson, is 30 feet in diameter, open at top and bottom, and carries a number of strong iron tubes for the protection of the drill bars. It is also furnished with a dozen stout legs, so arranged that they can be let go all at once, when one edge of the dome touches the reef to be operated on. The legs are held by self-acting cams, so that, when extended to fit the uneven surface of the reef the dome is to stand on, they are securely locked, and thus support the dome in an upright position. The hemispherical shape was chosen for the dome on account of its superior stability under the action of the fierce currents. By converting the transverse pressure of the moving masses of water into a radial pressure downward, the dome is sure to stand firm.

The dome, as shown in the cross section, is attached to the scow by chains connecting with the hoisting engines, by which it is raised and lowered. The drill engines are carried by the stout framework inclosing the well, and are so mounted that they can be placed directly over such drill tubes as may offer the best positions for drilling. Within the dome is another ingenious device, by which a drill tube can be brought directly over any point on the bottom within the 15 foot circle of the upper opening of the dome. It is rarely possible and never necessary to drill as many holes as there are drill tubes provided; the larger number—20 are in the outer circle of the dome, and an unlimited number possible in the inner circle—being furnished to make it easy to locate the drill holes to the best advantage. The drills and drill rods are together about 10 feet long, and weigh between six and seven hundred pounds each. The cutting edges of the drills are in the form of a cross, and are 5½ inches in length. Originally the drill holes were 3½ inches in diameter, but the speed of cutting was found to increase with the enlargement of the bits, and now the larger size is used exclusively. The cutting is done by the impact of the falling drill bar, which drops from two to three feet. The drill rods are connected with the piston rods of the drilling engines by ropes, a flexible coupling being necessary on account of the liability of the scow to slight movements caused by shifting currents and frequent collisions, while the dome is fixed. The length of the rope is regulated by a feed gear, to suit the changing level of the scow due to the rise and fall of the tides. The operations of the scow are grandly simple. With the dome swung by the chains the scow is anchored over the rock to be operated on, head to the tide, by stout chains fore and aft, and side anchors to insure steadiness. The anchor chains are strong enough to withstand not only the stress of the tides, but also the shock of colliding vessels. The site of the blast has already been fixed by the divers, and the scow, when in place, lies so that the dome is directly over the spot selected. Then the dome is lowered, and as soon as it touches bottom the legs are let go and the dome is unhooked from the scow. The diver next selects the most suitable points for drilling, and the drill tubes are brought into position, if within the upper circle of the dome; if not, the nearest available tubes are selected. The drilling engines are then placed, the drill rods are inserted, and the work is set going. The average penetration of the drills during a shift of 8 hours is from 7 to 10 feet, according to the nature of the rock. The average penetration for each hole ranges from 8 to 12 feet. One sharpening of the drill bit usually suffices for a hole.

THE DOME.

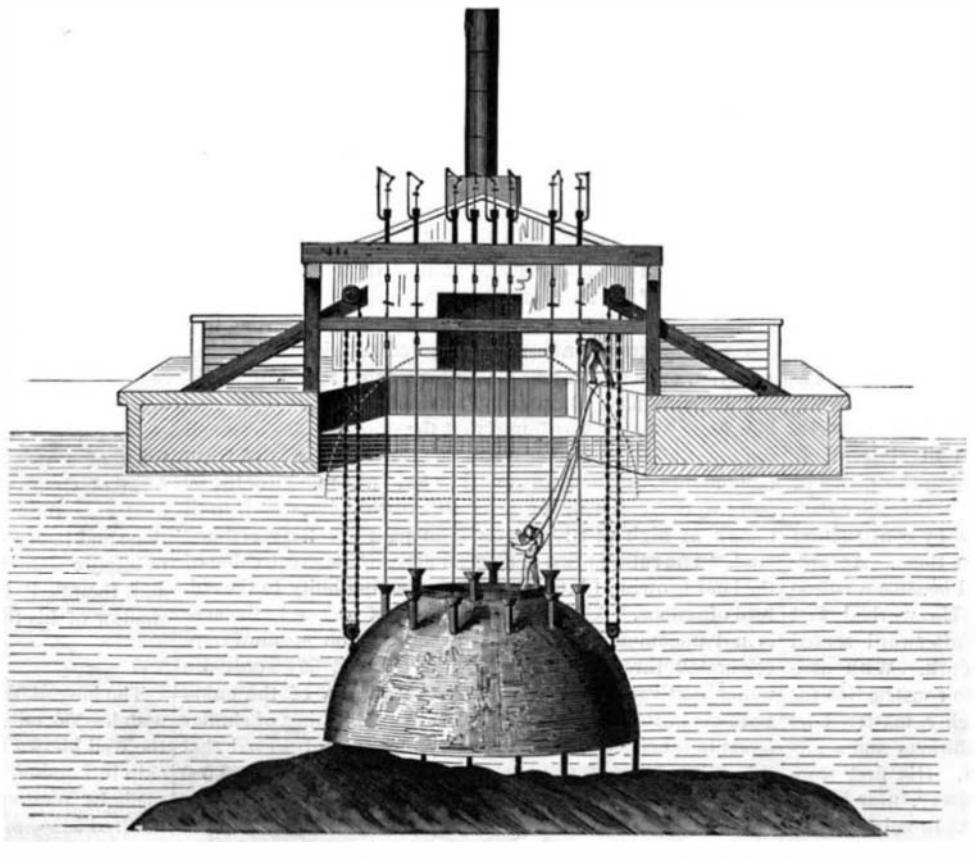
The drilling completed, the diver descends and stops the holes with wooden plugs to keep them from filling with sand and mud, connects the plugs by cords, and the last one by a line to the surface. Then the chains are hooked to the dome, the dome is raised clear of the bottom, and the scow is swung out of position or taken to some other reef.

The charges, inclosed in tin cases about 10 feet long and 5 inches, tapering to 4 inches, in diameter, are conveyed to the site of the blast on a small scow. Guided by the main line of the stoppers the diver, at slack water, descends to the first hole; the charge is passed down to him and inserted; then he proceeds to the next in order, and so on until all the drill holes are charged. In each cartridge is an exploding fuse, from which a fine wire leads to the exploding battery on the scow. When all the charges are down the diver returns to the scow, which is withdrawn to the proper distance and the blast is fired. The visible effect of the blast is the elevation of the water over the reef like a huge dome, which instantly bursts, sending up a huge tower of foam, water, and rock fragments from 50 to 200 feet in height. The appearance varies, of course, with the depth of water, the number of charges, and the amount of explosive used. The prevailing type under favorable conditions is that figured by our artist.

As many as twenty-one holes have been simultaneously fired on Diamond Reef, with a total charge of eleven hundred and forty pounds of nitro-glycerine. During recent operations the location of the dome has been determined by sextant observations, and its separate position and the position of each drill hole have been carefully laid out on a special plan of the reef. At first, the object being to remove with the greatest dispatch the more prominent points of the reef, no attempt was made to secure a uniform removal of the rock. Latterly the work has been conducted by face blasting, with a view to the most complete and economical breaking up of the reef and to facilitate the removal of the rock, which is raised by grappling.

The scow has been used for the removal of the rocks and reefs known as Diamond Reef at the mouth of East River, between Governor's Island and the Battery; Coenties Reef, six hundred yards northeastward, in East River; Pot Rock and the Frying Pan, in Hell Gate; Way's Reef, Shell Drake, and a rock opposite 125th street, Harlem River.

During the past three years, though idle much of the time for lack of appropriations, a considerable portion of Diamond Reef has been reduced to the twenty-six foot level at low water; Way's Reef has been reduced from seventeen to twenty-six feet; Coenties Reef from fifteen to twenty-five feet; and the Harlem River Rock from nine to fourteen feet. Considerable work has also been done on Pot Rock and the Frying Pan.



CROSS SECTION OF SCOW, SHOWING WELL HOLE.

MISCELLANEOUS INVENTIONS.

An improved window shade hanging, patented by Mr. Joseph Hemkeler, of Lowell, Mo., consists in combining with the curtain roller a second roll hung in loops of flat belts that are attached at one end to the window frame and connect the flanged spools on the ends of the rolls.

An insulator for telegraph wires, formed of a piece of glass perforated longitudinally, and a screw adapted to the perforation and having a round head provided with a square mortise for securing a key or screwdriver for driving the screw home, and having at each end a rubber ring, has been patented by Mr. J. H. Bloomfield, of Concordia, Entre Rios, Argentine Republic.

Mr. John Sherreff, of Dedham, Mass., has patented an improved mail box, provided with rawhide bunters or protectors. Its body is composed of stout paper board or vulcanized paper or fiber.

An improved article of hard rubber manufacture, formed of strips or sheets of metal foil and caoutchouc, has been patented by Messrs. Daniel F. Connell, of Brooklyn, and Edward Fagan, of New York, N. Y. The strips or shreds are distributed through the rubber to give it increased weight and density.

Mr. Prince H. Foster, of Babylon, N. Y., has patented an improved sanitary mask to be worn in sick rooms and in other places where persons may be exposed to infected or malarial air. It consists of a mask made of rubber or other suitable material, and secured air-tight to the head of the wearer by an elastic band. It is provided with valves and filters at the nose and mouth, and has transparent eye plates or windows.