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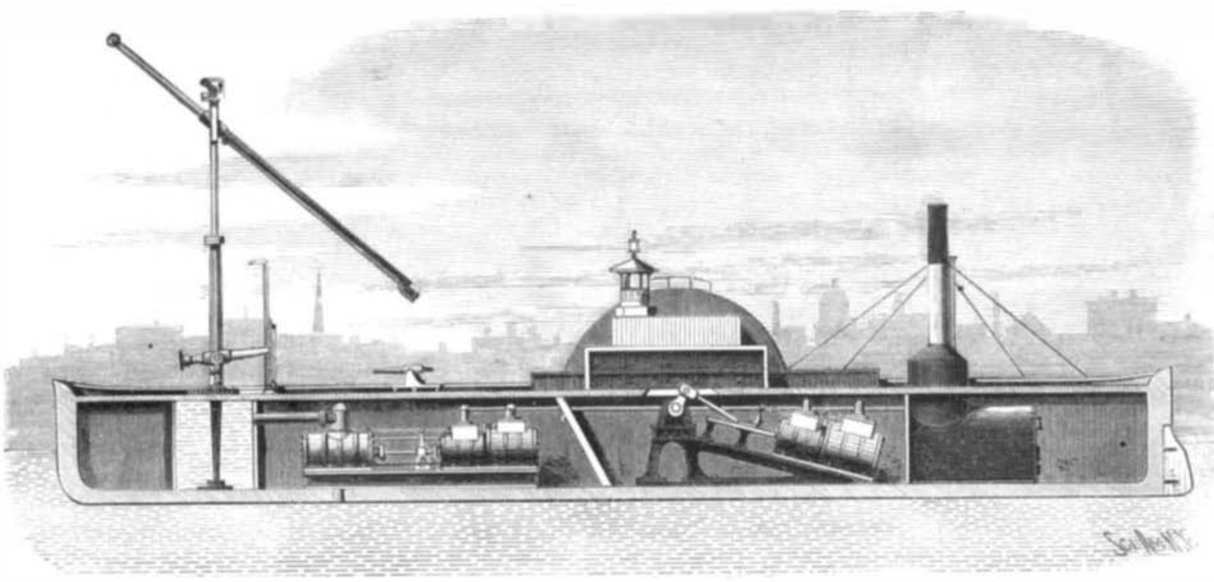
MAMMOTH FIRE BOAT.

The tendency, of late years, to erect large and high buildings has been such that our present system of combating fires is in many cases wholly inadequate for the purpose. Buildings are now erected double and treble the height they were twenty years ago, while our means of combating fires in them remain practically the same. The miniature fire engine used in Turkey has its use in extinguishing fires in the shops and bazaars of that country, but would be wholly useless here or in London or Paris. Our old hand engine did good duty when we had small two-story houses, but it had to give way to its more powerful rival, the steam fire engine, when our cities became larger and buildings higher. But the present steam fire engine, powerful though it be, has in many cases shown itself completely inadequate to combat fires in large and high buildings. Many of our large structures have a thousand tons of combustible material in them, each ton of which, in burning, will give off heat sufficient to evaporate ten tons of water. Therefore the heat generated would dissipate ten thousand tons of water, and, moreover, only a small fraction of the water used ever reaches the fire.



LONGITUDINAL SECTION OF FIRE BOAT.

Fully one half of the fires in New York and Brooklyn are confined to the river front, where an unlimited supply of water is at hand, only requiring steam power to place it where it will do the most good. In our engraving on this page will be seen a new fire boat, which has been designed by H. S. Maxim, M.E., of this city. Mr. Maxim proposes to make a fire boat on a grander scale than has ever been thought of heretofore — one that shall have power sufficient to completely and almost instantly extinguish any fire, great or small, that may be within its reach. The hull is of iron, 250 feet long and 40 feet beam. She has two complete engines, so that one wheel may back while the other goes ahead, thus enabling her to turn, as it were, on a pivot, or to move in almost any direction. The space below the deck is full of machinery. The boilers, 3,000 horse power, are so constructed that their full force may be used either on the paddle wheels or on the pump. The engines are of the compound type, using steam at 80 pounds pressure to the square inch. The pumps are of the compound duplex pattern, and are of great size and strength, being able to convert the full energy of the boilers into power for projecting a stream of water. The novel features of this boat consist of the vertical stand pipe and the two discharge pipes mounted on trunnions, as shown in the engraving. The stand pipe connects with the pump below deck, and may be revolved in any direction, while a telescopic joint admits of running it up or down. The lower discharge pipe is designed to extinguish fires on shipboard or for sinking a ship. It has a nozzle of 20 inches diameter, which, of course, is immense, considering that it has the sea for a supply and 3,000 horse power to force it. The top

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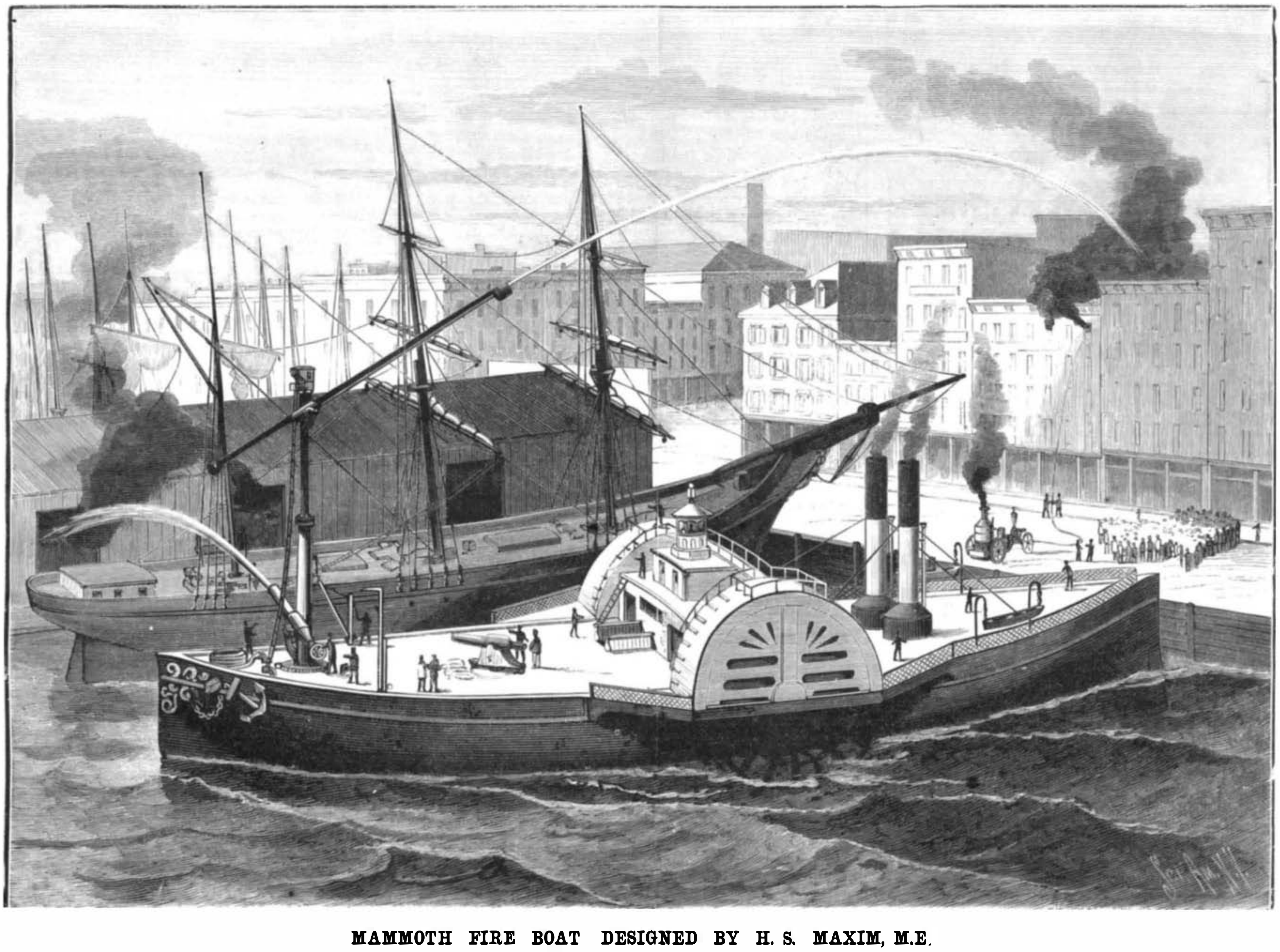

MAMMOTH FIRE BOAT DESIGNED BY H. S. MAXIM, M.E.

MAMMOTH FIRE BOAT.

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discharge is 60 feet above deck, and the nozzle is 60 feet long from the trunnion. It may be moved up or down or turned in any direction; when at its highest elevation the nozzle is 100 feet above the deck.

A novel feature connected with this discharge pipe is the variable sizes of discharge nozzles, which are arranged in a cylinder like the chambers of a revolver, and may be changed without stopping the flow of water. The cylinder has five separate nozzles; namely, 6 inch for great distances and very high pressure, 8 inch for less distance, 10 inch for fires near at hand, and a sprinkler, consisting of one hundred three-quarter-inch diverging openings. The nozzles may be changed and the discharge directed by a single operator placed in a cab situated on top of the stand pipe. All the movements are made by the agency of small steam engines. When we consider that this boat can throw a ten inch stream of water, which is 100 times the size of a steam fire engine nozzle; that, instead of being thrown from the ground and nearly all its power lost in raising it to the fire, it is thrown from a height of 100 feet, and with a force great enough to break through iron blinds, wooden shutters, doors, or roofs, and that the force of the water would be such that it would be dashed into a spray of sufficient volume and density to fill every nook in a large building; that a large floor could be flooded in one minute, and that the largest fire possible in any building now erected could be extinguished as quickly as a fire in a drygoods box or barrel could be extinguished with old appliances—some idea of its great power can be formed. In addition to the fire-extinguishing features, she is also provided with a means for demolishing walls, staving in sides of ships, and for making fast to ships that are in flames.

For demolishing buildings in case of great fires, the usual mode has been to place under or near to them a large quantity of gunpowder. This was resorted to in Boston, but with poor success; its action is uncertain and unreliable. It often occurs that a fire is inclosed in a strong room with heavy walls, and that there is no means of getting a stream of water on to it. In such cases it becomes necessary to make an opening in the wall. To accomplish this, Mr. Maxim has invented a peculiar kind of a gun, which will throw a wooden projectile with any degree of force necessary. The projectile is of hard wood, 4 feet long and 16 inches diameter. The force used is gunpowder of a very coarse and slow grade. The powder chambers are from 2 inches to 6 inches diameter, and may be changed at will. For instance, if a charge of powder filling a breach tube, 3 inches diameter and 4 feet long (ignited at the end nearest the wood), should fail to penetrate a wall or the side of a ship, then a larger tube would be used with more powder, until, by experiment, a blow could be given with precision in the exact spot needed. When the fire is on shipboard, and it becomes necessary to make an opening in the deck, one of the two mammoth picks or hammers may be used. They are drawn up by steam and may be dropped at any height like a pile driver. A hole could thus be made instantly, while the same when only slightly embedded in the deck may be used to make fast and thus pull the ship out into the stream to sink, or to remove it from others which are on fire.

A boat of this kind, aside from a fire boat, would be well calculated for breaking up the ice in the harbor. Her great power and independent wheels would enable her to go anywhere.

Large fires, when within two or three blocks of the river front, could be reached with hose from this boat. It would supply over one hundred lines the same size as used by the steam fire engine, or better, four large lines twenty-five times as large (4 inch or 5 inch nozzles). The discharge pipes would have to be mounted on wheels like a field piece, and would constitute, as it were, the artillery of the fire department. Linen hose can now be made of any size and strength. With proper appliances, hose 8 inches diameter could be readily put down. What is wanted is a stream of water of mammoth proportion, one that will reach 200 or 250 feet, and will have volume sufficient to deluge any building within its reach.

Suppose a boat of this kind should be anchored off the Battery with a lookout, and also connected electrically with the fire alarm system of the three cities. Suppose the boilers all connected and a fire constantly in one of them; the furnaces of the rest carefully charged with cannel coal, as in steam fire engines. One single fire would keep the water in the whole at the steaming point, therefore steam would be always up with a single fire burning. Now, suppose a fire to break out, the lookout sees it, or the alarm is sounded at once, the torch is applied to all the furnaces, steam is turned on to the donkey engine, the anchor comes up, and at the same instant the paddlewheels move; by the time the fire is reached all the furnaces are burning, the steam is up to 80 pounds, and anthracite coal is put on. When the boat stops she turns the steam off her engines and allows it to be used on the pumps.

The cost of a boat of this kind would, it is true, be great, but there has not been a year during the last decade that such a boat would not have paid for herself; and, moreover, the cost of maintenance would be much below proportionately that of steam fire engines, such as are now in use. Many great fires have destroyed millions of property simply because the water pipes were not sufficiently large to supply the water for the engines. There are streets in New York and Brooklyn where, in case of a great fire, the supply of water would not be sufficient to supply the engines. In this respect the boat would have the advantage of an unlimited supply.

We are informed by Mr. Maxim that this boat is the result of a careful investigation of facts and observations, and that he designed it some years ago after witnessing the destruction of some large ships and warehouses by fire.

The fruitless attempts of the puny engine and fire boats to extinguish the fire proved to his mind that something new must be designed to meet the new demand. The result was the system here shown, which we think admirably adapted for the purpose, and which we must eventually adopt.

Any further particulars may be obtained from H. S. Maxim, 120 Broadway, New York.

How Artificial Pearls are Made.

Many persons have no doubt been frequently struck with the great beauty of artificial or imitation pearls. Those who make it their business to produce such articles of ornamentation have attained to a high degree of perfection in their art; so much so that in 1862, at the London Exhibition, a Frenchman who was an adept at their manufacture exhibited a row of large real and imitation pearls alternately; and without close inspection, we are assured, it would have been impossible even for a judge to have selected the real from the unreal. Some translations from French and German works on this manufacture have recently been communicated to *Land and Water*, and from these it appears that the art of making imitation pearls is ascribed to one Jacquin, a chaplet and rosary manufacturer at Passy, who lived about 1680. Noticing that the water after cleaning some whitefish (*Leuciscus alburnus*), a species of dace, was of a silvery appearance, he gradually collected the sediment, and with this substance—to which he gave the name of *essence d'orient*—and with a thin glue made of parchment, he lined the glass beads of which he framed his rosaries, and afterward filled them with wax. The method of making the round bead is by heating one end—which has first been closed—of a glass tube, which then, when blown into two or three times, expands into a globular form. The workman then separates the bead, places the end which has been heated on a wire, and heats the other end. This process is called bordering or edging. The best pearls are made in the same way, the holes of the tubes being gradually reduced by heat to the size of those of the real pearls, the workman taking each bead on inserted wire, and, by continually turning them round in the flame of the lamp used, they become so true as to be strung as evenly as the Oriental pearls.

The process of coloring the pearl is commenced by lining the interior of the ball with a delicate layer of perfectly limpid and colorless parchment glue; and before it is quite dry the essence of orient is introduced by means of a slender glass blowpipe. It is then allowed to dry; the pearl is filled with wax, and if intended for a necklace is pierced through the wax with a redhot needle. The essence of orient, as it is called, is the chief ingredient in the manufacture of the pearl. It is a very valuable substance, and is obtained from the fish above named by rubbing them rather roughly in a basin of pure water, so as to remove the scales; the whole is then strained through a linen cloth, and left for several days to settle, when the water is drawn off. The sediment forms the essence referred to. It requires from seventeen to eighteen thousand fish to obtain about a pound of this substance! Besides the French imitation pearls, as those above described are called, there are the Roman pearls, which are made of wax, covered with a kind of pearly luster. But these do not look so well as the French pearls; while, in a heated room, they are apt to soften and stick to the skin. A very extensive trade is now done in the manufacture and sale of French artificial pearls.

Astounding Fungi in Nevada Mines.

A gentleman who recently had occasion to explore the chambers, drifts, and caverns of the old deserted Mexican and Ophir mines, says that fungi of every imaginable kind have taken possession of the old levels. In these old mines, undisturbed for years, is found a fungus world in which are to be seen counterfeits of almost everything seen in our daylight world. Owing to the warmth of the old levels and to the presence in them of a certain amount of moisture, the timbers have been made to grow some curious crops. Some of the fungi in the old chambers are several feet in height, and, being snow white, resemble sheeted ghosts. In places are what at a little distance appear to be white owls, and there are representations of goats with long beards, all as white as though carved in the purest marble. The rank fungus growth has almost closed some of the drifts. The fungi are of almost every imaginable variety. Some kinds hang down from the timbers like great bunches of snow-white hair, and others are great pulpy masses. These last generally rise from the rocks forming the floor of the drifts, and seem to have grown from something dropped or spilled on the ground at the time work was in progress years ago. These growths have in several places raised from the ground rocks weighing from ten to fifty and even one hundred pounds. Some of the rocks have thus been lifted more than three feet.

In the higher levels, where the air is comparatively dry, the fungi are less massive in structure than below and are much firmer in texture. Some resemble ram's horns, as they grow in a spiral or twisted shape, while others, four or five feet in length and about the thickness of a broom handle, hang from the cap timbers like so many snakes suspended by the tails. One kind, after sending out a stem of the thickness of a pencil to the length of a foot or two, appears to blossom; at least produces at the end a bulbous mass that has some resemblance to a flower. In all the infinite variety of these underground fungi it is somewhat strange that not one was seen at all like those growing upon the surface in the light of day. Nothing in the nature of toadstools or mushrooms was found.—*Virginia City* (*Nev.*) *Enterprise.*

AGRICULTURAL INVENTIONS.

Messrs. William G. Kennedy, Leonard Z. Preston, Franklin A. Morand, and Edgar H. Kennedy, of Warren, Kansas, have patented a revolving harrow attachment for plows. The invention consists in attaching to the beam of a turn plow a frame in which a skeleton cylinder is set at a slight incline to the line of draught and provided with teeth rearwardly inclined.

Mr. Henry B. Sherwood, of Westport, Conn., has patented a hand cultivator so constructed that the hoes can be adjusted at any desired inclination, will break up the crust or baked soil, and protect small plants from soil moved by the hoes. The hoes, being held down by spring pressure when at work, are prevented from jarring the operator when obstructions are encountered.

Mr. Daniel G. Martz, of Mauzy, Va., has patented a seed drill so constructed that under ordinary circumstances the shovel will be held to its work; but when the shovel meets an obstruction the boot will yield and swing back, and return to its place as soon as the obstruction is passed. The shovel may also be reversed and moved down or up as may be required.

The Eyes of Railway Men.

The annual report of the State Board of Health of Connecticut gives the following statistics relative to the visual power and capacity of the railway men of the State, as determined by the official examiners, Dr. W. T. Bacon and Dr. W. H. Carmalt. Dr. Bacon reports that he examined 326 employes of the New York and New England road; 211 of the New York, New Haven, and Hartford road; 76 of the New London and Northern; 121 of the Norwich and Worcester; 98 of the Connecticut Western; 59 of the Connecticut Valley; 133 of the New York, Providence, and Boston; and 5 of the South Manchester road. Total, 1,029. Of these 160 were engineers, 157 firemen, 100 conductors, 327 brakemen, 90 switchmen, 97 station agents, 98 flagmen, and other signal men. Of the total number 35 were red or green blind, 13 defective in color perception, 78 less than normal vision. Total defective, 120. Dr. Carmalt examined 921 employes on the New York, New Haven, and Shore Line, Housatonic, Naugatuck, Northampton, Air Line, Danbury and Norwalk, Shepaug, New Haven and Derby, and New Canaan railroads. Of the engineers he examined 131, and found 23 with defective vision, and 5 dichromatic (two colors); of the 128 firemen, 6 had defective vision, and 2 dichromatic; of 102 conductors, 14 had defective vision and 3 dichromatic; of 308 brakemen, 38 had defective vision and 13 dichromatic; of 137 switchmen, 22 were defective in vision and 2 were dichromatic; of 115 station agents, 25 were defective in vision and 3 dichromatic.

THE last stone of the masonry of the Brooklyn approach to the East River Bridge was laid February 17. The first eight floor beams of the superstructure were laid the same day. About 400 tons of the 5,000 tons of the steel required in the superstructure have been delivered, or enough to construct about one hundred feet on each side of the Brooklyn tower where the work has been begun. The engineers believe that the superstructure will be completed by next fall, and the bridge opened for travel by January 1, 1882.

The Density of Snow.

According to Sig. G. Bignami Sormani, of Milan, the density of snow, and consequently the weight of it, which roofs, gasholders, etc., may have to carry, varies in a range of as much as eleven times the minimum. A cubic yard of snow from one snowstorm will sometimes weigh 814 pounds, while an equal bulk from another fall will only weigh 71 pounds. This indicates that any flat surface upon which snow may be drifted to the depth of only 3 feet may be called upon to sustain a weight of snow equal to a pressure of about $814 \div 9 = 90\cdot5$ pounds per square foot; or it may only be loaded under like conditions to the extent of $71 \div 9 = 7\cdot9$ pounds per square foot. The weight of a cubic foot of the densest snow recorded by Sig. Bignami Sormani being 30·14 pounds, while a cubic foot of water weighs 62·5 pounds, it therefore appears that, under certain conditions, the density of snow may be almost half that of water. Snow of this character will, however, in all probability be little different from ice, and would be rarely met with in this country, at least in any serious quantity, except on the ground or very near it. If it were otherwise, it is certain that much more destruction than is at all usual would be the consequence of a thick fall of snow on exposed lofty surfaces. The lowest named weight from new-fallen snow, only 2·68 pounds per cubic foot, is abnormally light, being only about one twenty-fourth of the density of water. It is usually assumed that the density of snow is ordinarily about one-eighth that of water, and this allowance, therefore, falls well within the range of Sig. Bignami Sormani's figures.