THE NEW TORPEDO IN CHARLESTON HARBOR.

It has always been a favorite project with a certain school of military aud naval men, to destroy ships by means of large quantities of powder placed in water-tight vessels, sunk in the channels of harbors or rivers. These torpedoes, as they are called, are sometimes fired by contact with vessels, by clockwork arranged to run a specified time—with lines run to the shore, where a man concealed pulls a lanyard—by percussion, or the liberating of a set of hammers—by the aid of galvanic batteries; in short, they have been projected upon all possible schemes, and with but very little success. It would be a curious item for the statistician if we could ascertain how many tuns of powder are lying at the bottoms of the several rivers, lakes, bays, and bayous in the south, and what number of water-logged, sunken, and misshapen cases drift to and fro, at the mercy of the current, utterly powerless for injury. To prevent suspicion and allay any fears caused by floating torpedoes, they have been made in the shape of barrels and sent down with the tide upon unsuspecting ships; but by some miscalculation on the part of the autbors of the intended mischief, they have in nearly all cases gone wide of the mark; and out of the countless number made at different periods of time the few casualties arising from them can be counted on the fingers. In the war of the Revolution, the British man-of-war *Rinaldo* (?) which lay near the town of Norfolk, Virginia, was the recipient of a favor of this kind, which was floated down the Elizabeth river. It exploded close alongside and threw an immense body of water on deck; so frightening the crew that they jumped overboard in large numbers. During the present war, torpedoes have been sown like grain in all southern waters, where it was thought they might be efficient; but every one conversant with the gallant deeds of the Navy, can easily remember how many of them have proved fatal. The Mississippi river had quantities of these "queer fish" scattered along its eddies, and near the banks of the stream, where the current was not too rapid; the rebels also sent torpedoes down stream, whenever they thought they could do mischief; but not one that we ever heard of took effect. The catfish may have been astonished by an uproar in their domains, but the ships were unharmed. It is only quite recently that the rebels have obtained any success in the discharge of torpedoes. At the time the *Montauk* assailed Fort McAllister, near Savannah, a torpedo exploded under her stern, and raised the vessel a foot out of the water; but although the submerged hull is only of ½ inch plate iron, it was not even caused to leak, or if so, knowledge of it was withheld from the public. Still later the *Commodore Barney*, a gunboat made out of one of the ferry boats that ply in our harbor, exploded a torpedo in the James river, and was much injured thereby. Yet another infernal machine of this class was forced under the Monitor *Weehawken*, but without any decisive result. The wonder is that all on board these vessels were not destroyed. It is not strange that the hulls were uninjured; for while a violent shock may be given to a vessel by a torpedo, the resistance interposed by the elastic cushion of water will tend to prevent any penetration, or crushing in of the hull, unless the torpedo be near the surface. They are therefore practically useless. The newest invention of this kind is illustrated above, from drawings made by officers in Government employ. It was intended to float with the tide, and explode on any vessel it came in contact with. The machine itself is elliptical in section, and made of wooden staves hooped with iron; the outside being well coated with pitch, to make it water-tight. The cast-iron flanges, A, are fitted to the outside of the torpedo, and screwed to it by bolts. The projecting bosses, B, have the hollow brass plugs, C, screwed into them; this plug is fitted with a plunger, *d*, and a stuffing box, *i*, which keeps the same water-tight. The bottom of the plunger is larger in diameter, as seen at *e*, Fig. 2, so that it cannot slip out. The brass nipple, *f*, is screwed into the lower part of the plug, and has the friction tube, *h*, inserted in it: this is surmounted by a circular piece of wood, *g*. The leather washer, *j*, makes a tight joint at the bottom of the plug flange. The swell of the sea is supposed to throw the torpedo against a vessel with sufficient force to cause an explosion. The charge is about 50 pounds of coarse powder. This machine did no damage, being picked up adrift before it had exploded. Whether it would have injured the iron-clads is a matter of some doubt; but there is no question that a wooden ship would have had a hole stove in her side by this torpedo if suffered to explode as designed.

Fig. 1 Fig. 2

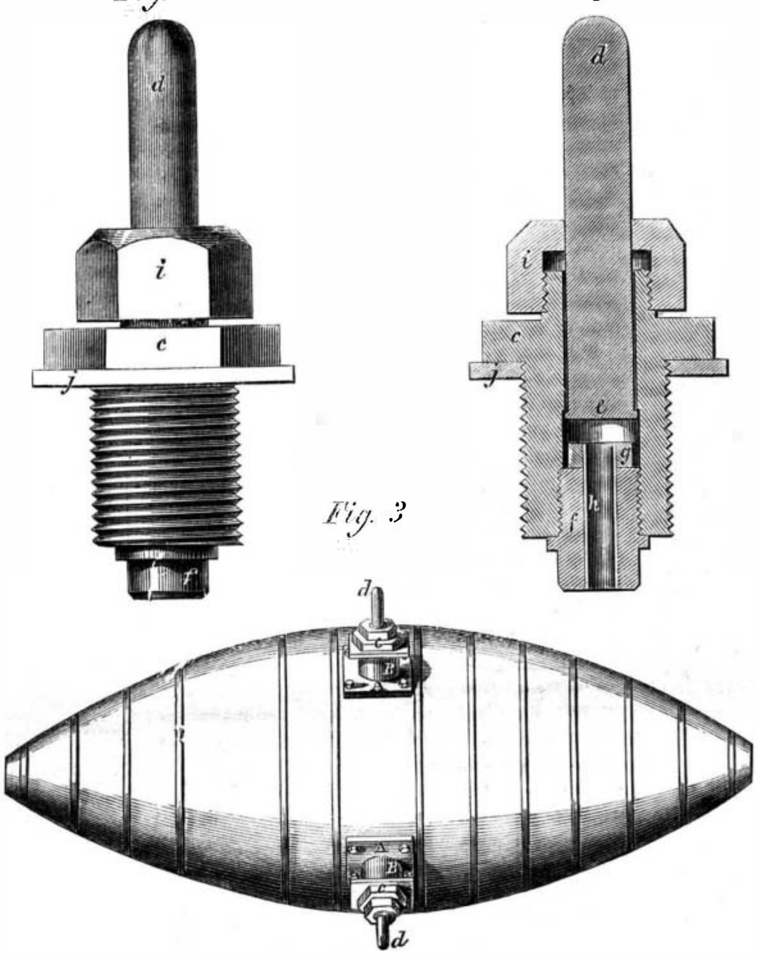


Fig. 3

IRON RAFTS FOR HARBOR DEFENSE.

The latest English papers bring advices respecting the progress toward completion of the new Anglo-rebel iron-clad fleet. Three of these formidable vessels are nearly ready for service; one of them is now on the graving dock at Liverpool, another is ready to launch at Birkenhead, opposite the first-named city, and the third is well under way at Glasgow. These ships are first-class in all respects, having rams, turrets and heavy plating. They are not intended to rust idly in English dockyards, until emergency shall call them forth; but are destined for immediate and urgent duty. Long ago we were informed of the intentions of the rebels respecting our large seaports; and we see now the active steps they are taking to put their threats in force. Supposing this city to be the most desirable point for them to wreak vengeance on, may we not inquire pertinently what means are at our disposal to repel them? It is idle to talk of stone forts; useless to point at the huge guns now mounted at the entrance of the port. Forts and guns are alike ineffectual against opportunity, as found in a foggy morning, or the darkness and obscurity of night. The *Monitor* batteries, invulnerable as they are, might do efficient service; but at this writing, and in all probability for some time to come, their services are required elsewhere, for duty equally as important as the defense of this port. Not only are these facts to be considered, but it must be also recollected that the harbors to be defended are many, and the *Monitors* comparatively few. If the enemy can cross the ocean, he can go anywhere on the coast, and burn cities or compel a ransom for them, which it will be hard for us to pay. These, and other points are to be taken into account when settling the problem of harbor defense. The experience of the past year amply attests the inefficiency of stationary forts, or in fact any fort, stationary or revolving, unless some auxiliary be brought to bear, to detain under fire the ship or ships endeavoring to pass.

The lesson this nation has to bear in mind is that one learned before Charleston. The attack on that city in April last was futile, and the present one proceeds slowly to ultimate success. And why? Fort Sumter is a dust heap, the frowning batteries that encircled it are irregular masses of sand, although their guns are yet formidable; neither the darkness of the night nor the invulnerability of the *Monitors* avails as yet against the other obstructions which thwart our efforts to obtain a speedy success. The inner line of obstructions—the concealed piles, hulks, torpedoes, or whatever the nature of the barricade may be—obstinately bars the approach and renders the utmost caution and skill necessary. These are the defenses on which the rebels relied, and of which they boasted not without reason. They delay our progress at this writing: they defy us utterly: and were they as perfect as they could be made, no entrance to Charleston could be effected.

We believe that the mouth of a roadstead may be most effectually sealed up against invasion, by submerged obstructions; but the nature of such an impediment is the one thing to be carefully studied, and looked at in all situations before it is adopted. If such a hastily gotten up and constructed defense as that at Charleston delays the consummation of the siege, with how much more certainty we can argue that a properly built raft or barricade would be utterly impervious to all assault from an enemy's ship or ships. To our mind the raft forms the best method of obstructing the entrance of our harbors; but the plan of it is, as before remarked, all-important. It will not answer to have this defense rigid and unyielding, for the reason that sufficient force could be brought to bear upon it to destroy it; but it must be elastic and yet strong, and above all inaccessible to the enemy, so that he cannot operate it with any hope of success. Such a raft comprises in itself the essential features of an efficient harbor defense. It is proposed by the inventor, Mr. Theodore Timby, the inventor of the revolving turret, to construct the chains of which this raft is composed from 3-inch iron, and to buoy them up with metallic buoys at a specified distance from the surface; say seven feet, or at any depth deemed most suitable for the object in view. The raft is to be composed of sixty chains, each of the size mentioned, which are stayed to each other by shackles, or other device of an equivalent nature, so that any assault upon the outer chain would be distributed throughout the whole gang, until the force of the shock was lost. If it is argued that the buoys may be pierced, and so destroyed, we have only to point out the depth of water which covers them, as well as the want of knowledge of their exact situation, to make it apparent to the reader that tuns of shot might be fired at them before they could be struck, and that the piercing of one, or two, would not destroy the efficiency of the raft. The cohesive strength of the best cable iron is 46,000 pounds to the square inch, and it is easy from these figures to calculate the enormous resistance, aside from the buoys, which the chain would possess, and the tensile strain necessary to sever its links. It is no argument to say that the weight of the cable would militate against its usefulness: for there is no weight upon it, the same being sustained by the buoys. The practical reader can conceive in his own mind the effect that would follow upon the collision of a ship with this barrier; presenting as it does an area of 60,000 superficial feet to repulse the foe. A blow upon it would only cause it to recoil, one chain upon the other, until the impulse was lost among the several cables; and the futility of attempting any mechanical operations upon it is apparent when we consider the 180 guns of the revolving fortress, which it is intended to use in connection therewith, discharging once a minute. Without explaining further, every unbiased mind must see that there are few criticisms to be passed upon the principle of this obstruction; that the inventor may modify its arrangement is, of course, possible. The termini of the chains, where they enter the towers, is capable of being guarded efficiently, and no agency but a lawful one can slip its fastenings. In a case like the present, where time is all important, this raft is peculiarly applicable; as it can be made and stretched in comparatively short time, from materials all ready at hand in the navy yards: then in connection with the stone forts, even, and the *Monitors*, we shall present so threatening a front that the rebel vessels will not dare to enter or approach this port. Perhaps, at some future day, when the *Alabama*, or other inimical ship, appears off this harbor and demands tribute, we shall raise a sum to buy her goodwill that would have paid for two such rafts. But in the meanwhile the Government is taken up with issues of the gravest importance. Why should not the State act in this matter, and trust to remuneration from the central Government when the war is over?

THE MOTION OF THE MOON AMONG THE STARS.

The moon moves more rapidly among the fixed stars than any other of the heavenly bodies, with the exception of meteors and some of the comets. While she rolls around with the sky every day from east to west, she is moving in the opposite direction at the rate of a little more than 13 degrees a day, completing her revolution in about 27 days. This motion of the moon is so rapid that it may be easily observed without the aid of instruments. If we notice one evening what stars the moon is among, we shall find it the next evening among stars a considerable distance to the eastward. The moon does not follow the same track in the heavens as the sun, but it is sometimes about 5 degrees north of the ecliptic, and at others about 5 degrees south. In other words, the moon runs both higher and lower than the sun. This motion of the moon is interesting, as being the single case in all the phenomena of the heavens in which the real motion is the same as the apparent motion. The moon appears to revolve monthly around the earth—and it does so revolve. Its orbit is inclined about 5 degrees to the plane of the earth's orbit.

It is easy by direct observation to understand the causes of the changes of the moon. At the time of the new moon we can always see that the moon is nearly in line between us and the sun, so that only a crescent edge of the illuminated half is turned toward us; while the full moon is always upon the side of us opposite to the sun, rising as the sun sets, and thus turning toward us the whole of its illuminated half. As eclipses of the sun are caused by the moon coming between us and him, these can take place only at the new moon; while the eclipses of the moon being caused by the earth coming between the sun and moon, these can take place only at the full moon.

Dissolving Views.

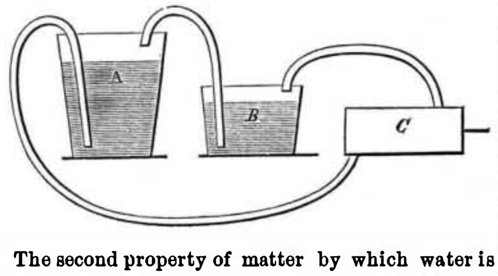
There is no more interesting optical illusion than dissolving views. You sit before a large canvas screen, on which there is a beautiful picture of the interior of a church, with the seats unoccupied; while you sit and watch the picture, the seats become filled with people. Or the church may at first be dark, and the lights silently and gradually come forth upon the picture. There are endless varieties of scenes, which may be changed in a similar manner. These wonderful results are all produced simply by means of two magic lanterns. One has a slide upon which is a picture of an empty church, and the other a slide with a picture of the same church filled with people; the light is first passed through the picture of the empty church, and is then gradually shut off from this and passed through the other—the shadows of both pictures being thrown upon precisely the same part of the screen.

A good subject for a dissolving view would be two aspects of the inhabitants of Charleston. The first picture representing that patriotic people at the time of the rebel capture of Fort Sumter—and the second showing the same boasters taking their departure for the interior counties, when the shells of General Gilmore began to fall among them.

PLANS FOR COOLING WATER.

There are three properties of matter which have been rendered available in cooling water.

The first and most common is latent heat, or the caloric of fluidity. When one pound of ice is put into 130 pounds of water, if the ice is at a temperature of 32°, it will, by simply melting, without having its own temperature raised at all, reduce the temperature of the water 1°. By the change in its state, from the solid to the fluid form, water absorbs 140° of heat; which heat is not perceptible to the feeling, or to the thermometer; it is hidden—latent. Then the pound of ice-cold water further reduces the temperature of the 140 pounds of water, and has its own temperature raised to an average or mean proportion between the two by mixture.



The second property of matter by which water is cooled is also latent heat, but in a different form—the caloric of evaporation. Water, in changing from the solid to the liquid state, absorbs 140° of heat; but in changing from the liquid to the gaseous state, it absorbs about 1,000° of heat. Consequently, one pound of water in changing into steam or vapor, will cool 1,000 pounds of water 1°; provided that all of the heat absorbed and made latent by the one is taken from the 1,000 pounds. In practice this can seldom if ever be done. But if a vessel of water is surrounded by a cloth jacket which is kept constantly wet, as the water in the jacket evaporates, it will take enough heat from the water in the vessel to cool the latter pretty rapidly. A still better plan is to have the vessel made of porous earthenware, so that the water may exude and evaporate from the surface. This is practically the best of all known modes of cooling water, where ice cannot be obtained. The vessel should be set in a current of air, when the evaporation will go on more rapidly.

A third property of matter which has been used for cooling water is the power of gases to absorb heat in proportion to their expansion. If air is allowed to expand by reducing the pressure upon it, a portion of its heat is rendered latent; and to bring its temperature to an equilibrium with surrounding bodies it will absorb a portion of their heat—thus cooling them. On the other hand if air is compressed, a portion of its latent heat is made sensible, and a share of this it will impart to surrounding bodies. In this way matches may be lighted, by means of a cylinder and piston. Now, if air is compressed in a cylinder and kept compressed till it has parted with its excess of sensible heat, and then is brought into contact with water and allowed to expand, it will absorb heat from the water, and the water will be cooled. We have known the case of an ingenious mechanician keeping a machine shop employed nearly all winter constructing apparatus for cooling water on this principle. But he did not take into account the difference between the intensity of heat and the quantity. He did not consider that it would take the same sixteen times longer to cool a pound of mercury than it would to cool an ounce, and thirty-three times longer to cool a pound of water than it would to cool a pound of mercury; owing to the fact that water has thirty-three times greater capacity for heat than mercury. He could lower the mercury in a thermometer 20 or 30 degrees in five minutes; but he could not cool a large vessel of water 3 degrees by active pumping for two hours.

Professor Seely has devised a plan for making water very cold, by evaporation. He proposes to force a quantity of air through a vessel, allowing it to become saturated with vapor; then to pass the air through some substance which has a strong attraction for water—the chloride of calcium, for instance—to take out the vapor; and then to force this cold and dry air again through the same vessel of water to carry off another load of vapor. The annexed diagram will explain the apparatus, A being the vessel of water, B the chloride of calcium, and C the force pump by which the circulation of the air is produced.

The efficiency of this apparatus would be greater were it not for the rapidly diminishing capacity of air for moisture as its temperature is reduced. While a cubic foot of air at 100° will absorb 25½ grains of water, the same volume of air at zero will hold but half a grain.

The Principal Defect in Our Monitor Turrets.

At the first bombardment of Fort Sumter, the *Monitors* had so many of the bolts in their turrets driven in, that a number of persons were disabled, and now Captain Rodgers, one of our most valuable officers, has been killed by a similar disaster.

As our readers are generally aware, these turrets are 11 inches in thickness, made of plates 1 inch thick, bolted together by numerous bolts. The terrible concussion of large shot breaks the bolts, and knocks off the nuts on the ends of them, which are very dangerous to all persons standing near. We know of no more promising field for the employment of inventive genius than improvements in the mode of building up these turrets. Inventors who may turn their attention to it will do well to bear in mind the inexpediency of forging and fashioning very large masses of wrought iron.

The Lesson of Fort Sumter.

The demolition of Fort Sumter by guns placed at a distance of two and five-eighths miles, has demonstrated the necessity of facing our forts with plates of wrought-iron. When Gen. Totten made his experiments some years since, it was found that plates 8 inches in thickness, when well backed by solid masonry, were practically impregnable by the artillery in use at the time; but the introduction of rifled cannon has so greatly increased the efficiency of ordnance that it may require two 8-inch plates to protect the walls of the forts. This would be enormously expensive, but in the end will be the best economy. Any money expended in building and maintaining an inefficient fort is simply wasted.

In this connection we will renew our suggestion to mount the upper tier of guns in revolving turrets.

Dull Black Color on Brass.

The *Practical Mechanic's Journal* (Glasgow) states that the dull black so frequently employed for brass optical instruments, may be produced as follows:—First rub the brass with tripoli, then wash it with a dilute solution of a mixture of one part of neutral nitrate of tin, and two parts of chloride of gold; allow the brass to remain without wiping for about ten minutes, after which wipe it off with a wet cloth. If there has been an excess of acid, the surface will have assumed a dull black appearance. The neutral nitrate of tin is prepared by decomposing perchloride of tin in ammonia, and dissolving the precipitated oxide thus obtained in nitric acid.

The Potato Rot.

Thomas Carpenter of Battle Creek, Mich., communicates the following, as his mode of fighting off the potato rot:—

Now I will tell you how I manage; premising that I never yet had potatoes rot in the ground, and that I am 63 years old. I plant my potatoes in the latter part of April or fore part of May, and in the old of the moon. When they get up six inches high, I