SCIENTIFIC AMERICAN

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## A NEW SUBMARINE BOAT.

The submarine boat Goubet (so called from its inventor), the adventures of which are already celebrated, has just entered upon a new phase. It has, in fact, left the Napoleon basin, where it has been stored for fifteen months in an unoccupied corner of the Cherbourg Military Arsenal, in order to proceed to definite experiments—a trial in diving in the Commerce basin.

It was six weeks ago that these curious experiments took place before the eyes of hundreds and thousands of witnesses, and, if we are to believe the accounts that our correspondents have transmitted to us, they were all wonderfully successful.

Thus, on the 31st of January, the Goubet started all alone, without guide or tow boat, from the maritime arsenal, and, after a few evolutions in the roadstead, that lasted less than an hour and a half, entered the Commerce basin without hesitation, and without turn or zigzag, in spite of the difficulties and obstacles without number in this place in the way of buoys, dead bodies, ships at anchor, and intercrossed mooring chains. This little promenade took place *on the surface* without doubt, but it was none the less a peremptory demonstration of the manageableness of the Goubet, and its capability of steering straight. There was no lack of persons, in fact, to believe and say that if the Goubet resembled a fish it was a "drunken" one, and that it would never be capable of traversing a channel ever so narrow and variable without bumping against the walls.

To the honor of the new torpedo boat, it is well to add that the currents are at times very strong at the entrance of the port of Cherbourg, and that upon this day the sea was very rough.

Two days afterward the Goubet proceeded to new experiments. Without any fastenings, and consequently given up to its own forces and resources, the strange boat sank several times to different depths, with its two navigators hermetically immersed within its sides of bronze. It remained stationary for four hours successively at one meter and three and a half meters, thus proving its perfect stability, its habitability, and its curious faculty, apparently contrary to all physical laws, of remaining immovable beneath the water as long as it pleases and at a definite depth.

During this immersion, the navigators passed away their time in playing numerous games of piquet and in breakfasting. Owing, in fact, to a supply of oxygenated gas strongly compressed in tight tubes, and which an ingenious arrangement automatically distributes at the ordinary atmospheric pressure, while a pump expels the gaseous residue, it is as easy to breathe in the boat as it is in the open air.

We know that at the time of the first official experiment, the two navigators of the Goubet remained eight full hours under water without any other communication with the outside world than the telephone wire that they used to give their impressions, which, by the way, were of a cheerful character. When they made their appearance, they were fresh, well, and lively, having been able to attend to all the functions of life, and being ready to begin again. There was still in the tubes enough oxygen to last twenty hours.

It has been said of the Goubet that it is a realization of the dream conceived by Jules Verne in his "Twenty Thousand Leagues under the Sea;" but the Goubet is better than that. It is not only one romance, but it is rather two of the great amuser's romances amalgamated. It is both "Twenty Thousand Leagues under the Sea" and "Doctor Ox" in action!

It is well to note, by the way, that the Goubet is not only the sole submarine boat that has remained for eight hours under water with men inside, but also the sole one from which a like power has been required. The conditions imposed upon the inventor by the contract were, in fact, exceptionally hard. But, in the serenity of his assurance, and with that superb faith that mocks at the worst difficulties, Mr. Goubet accepted all.

Figs. 3 and 4 represent two of the phases of the dramatic eight hour experiment. In Fig. 3 the Goubet is preparing to disappear, in Fig. 4 it has come to a rest at a depth of one meter, to remain there for twenty minutes. How the Goubet realizes this paradox it is impossible to say. That is a secret between the inventor and the government.

As may be seen from Fig. 1, where it is represented suspended by the chains of a crane, the Goubet has the form of a stubby cigar, or rather of an elongated egg. It was cast in bronze in a single piece. It is 5·6 meters (18 ft.) in length, and 1·53 meters (5 ft.)

(*Continued on p. 310.*)

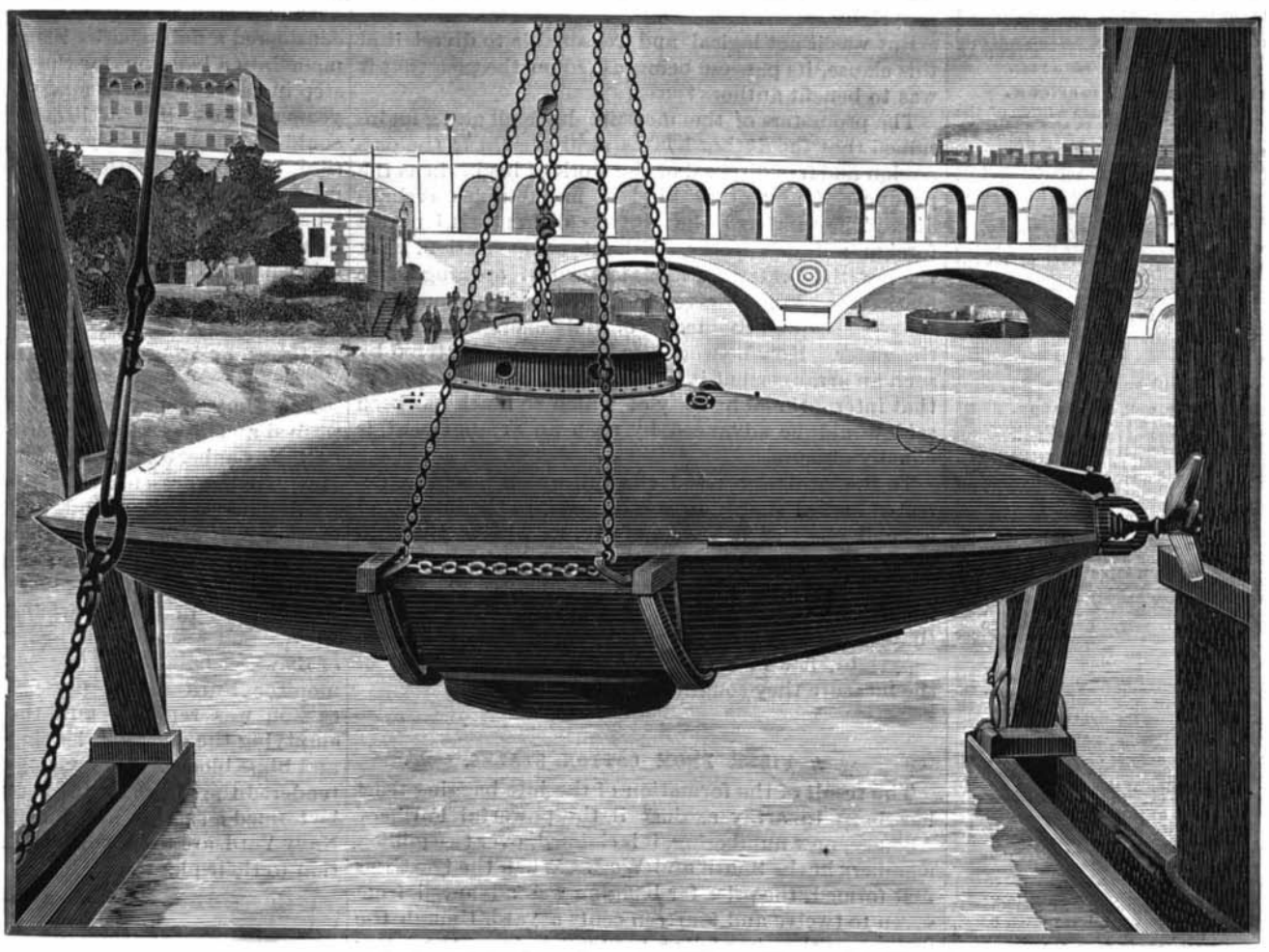

Fig. 1.—THE GOUBET SUSPENDED FROM A CRANE.

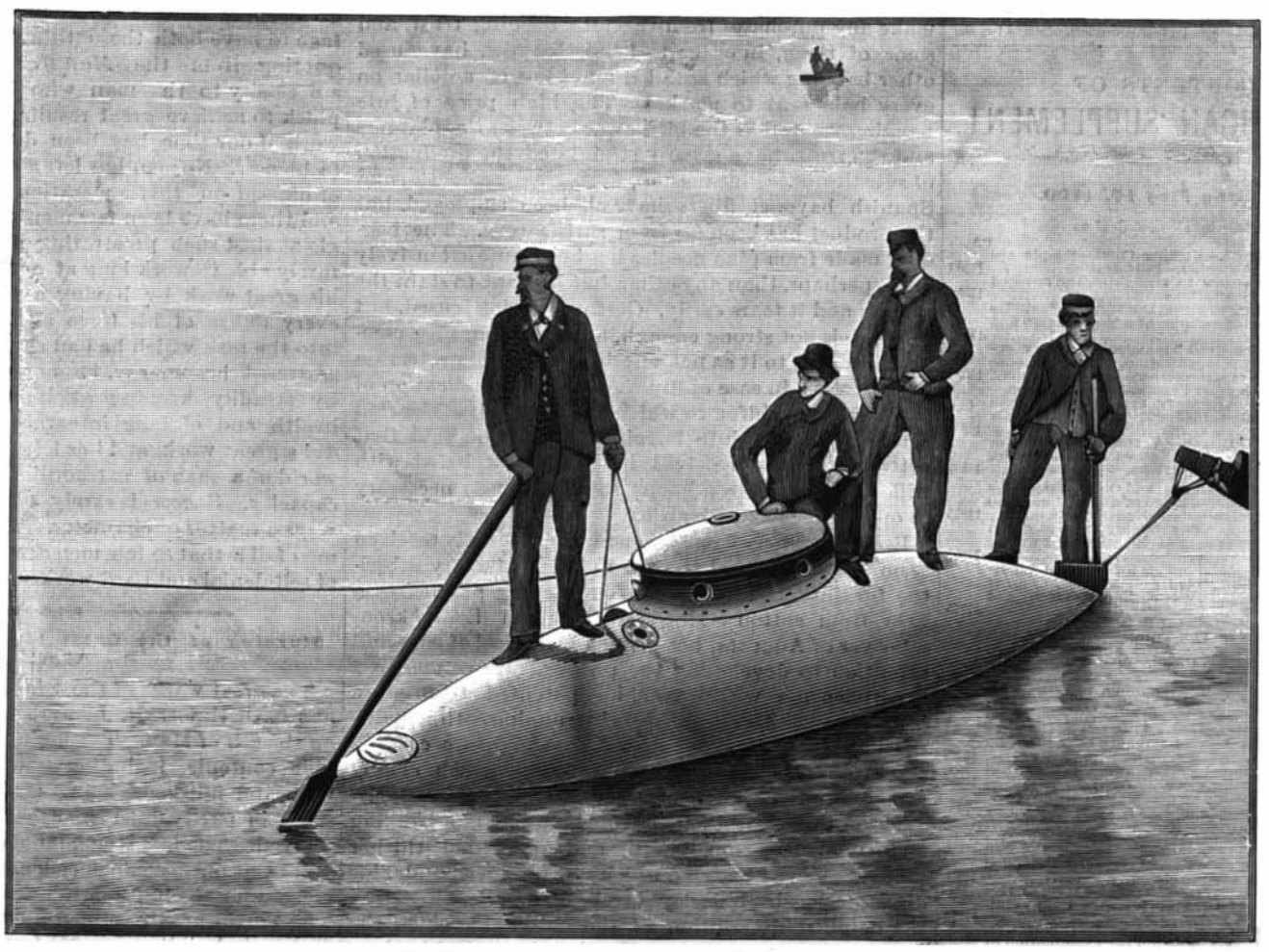

Fig. 2.—EXPERIMENT IN STABILITY.

## A NEW SUBMARINE BOAT.

(*Continued from first page.*)

In diameter, and weighs, all armed, 6,000 kilogrammes (13,200 pounds), thus permitting of its being carried from one end of the world to the other, like a package or a ship's launch, upon a railway truck or on board of an ironclad.

This relative lightness does not prevent its having, by reason of its lines, a wonderful trim, and of being remarkably seaworthy. When it is floating on the surface, even during a rough sea, it carries two or three men very well upon top (Fig. 2) without rocking.

The Goubet is provided underneath with a mass of lead of 900 kilogrammes (1,980 pounds), which may be freed by turning a bolt. This is termed the safety weight.

It remains to state that the boat is capable of being steered under water, in spite of the opacity of the medium and of the disturbance of the compass near the dynamo that furnishes the motive power. The Goubet can run by oar, but its submarine paddles can be used only for running forward. It is not possible with their aid to back water. Mr. Goubet, therefore, had to remove the rudder helix, movable in all directions, which he uses both for running and steering, and to replace it by a provisional apparatus which will permit him to perform all the evolutions desirable, without the help of electricity, for the entire time of the experiments. This change had to be made because the administration of bridges and highways would not allow Mr. Goubet to run his boat by electricity in the Commerce basin.

Mr. Goubet is studying a play of mirrors that will permit him, when immersed, to perceive, within a certain radius, all the objects rising above the surface of the water, and also a combination designed to protect his compass against the disturbing influence of the electric motor.—*Abstract from Le Monde Illustre.*

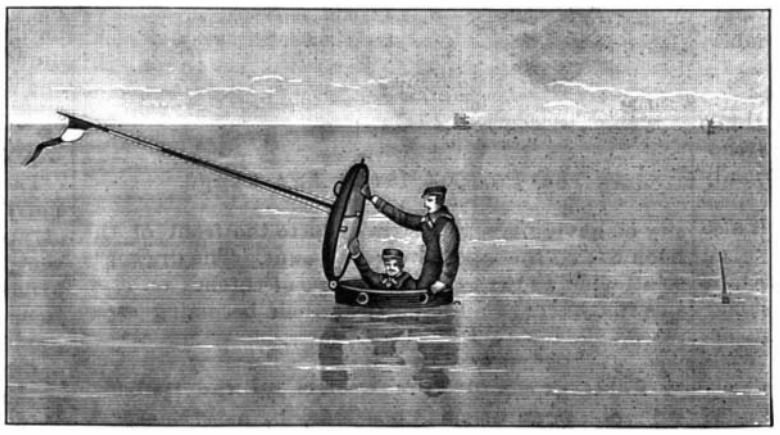

Fig. 3.—THE GOUBET PARTIALLY SUBMERGED.

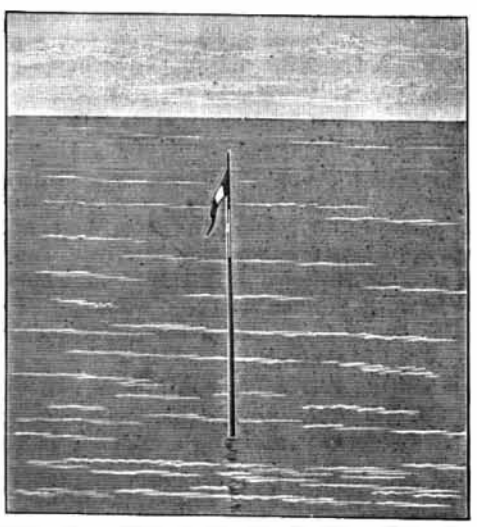

Fig. 4.—THE GOUBET COMPLETELY SUBMERGED.

## Optical Illusions.*

If any one wishes to make an emphatic statement about an occurrence or thing, and says, "It must be so, I saw it myself," he considers the matter is settled. To-night I shall try to show that seeing is not always believing, and that many things we see are merely optical illusions and not to be entirely depended on as facts.

I use the term as a title in the widest possible sense, and intend including in the subject any case in which we see, or think we see, anything differently from what it is in reality. My paper will be divided, more for convenience than with scientific accuracy, into three parts. First, illusions depending on optical contrivances—reflection and refraction being the chief causes of deception; secondly, illusions depending on the structure of the eye—here we shall discuss color, irradiation, and binocular phenomena; and thirdly, optical illusions depending on the brain, or the interpretations of the sensations received by the eye. In this section I shall give instances in which the judgment is misled, and conclude with a few words on apparitions.

*I.—Illusions Depending on Optical Contrivances.*—Probably the best known optical illusion is Pepper's ghost. Here a plate of plane glass is placed at an angle of 45° near the front of the stage, before it the stage floor is some feet lower, and any strongly illuminated object on the floor in a horizontal position appears upright and on the stage. One of my friends recently showed me a device depending on the same principle, by which a photograph on glass is superposed on an ordinary carte.

Reflection is responsible for some of the tricks of the Davenport Brothers and for the curiosities known as living heads without bodies, etc. The converse of this may be seen in the palace of Versailles, where a combination of mirrors makes spectators appear headless.

The "optical paradox" enables one apparently to see through a brick, but really four plane mirrors carry the light round the obstacle.

In the "phantom bouquet" concealed flowers are made by a concave mirror to appear in a vase. Concave and convex cylindrical mirrors cause strange and amusing distortions of the faces of those looking at them.

Refraction makes a pond appear shallower than it is, and a stick put in water appears bent. By refraction of light through layers of air of different densities, the strange illusions known as mirages are produced.

If a wine glass is partly filled with water and inverted on a plate with a coin on it, refraction causes the coin to appear on the surface of the water, and it is also seen directly, but enlarged. By means of the double refraction of Iceland spar, a dot placed under it appears as two.

*II.—Illusions Depending on the Structure of the Eye.*—Several interesting illusions depend on the fact that an image on the retina lasts about an eighth of a second. In the thaumatrope a card has an object drawn on each side, say a bird on one side and a cage on the other; if the card is rotated, the images are superposed and the bird appears in the cage. In the zoetrope and the phantascope a moving object, as a swinging pendulum, is drawn in successive stages, and while the series is rotated and viewed through slits, the pendulum appears to be swinging backward and forward. For the same reason a vibrating string appears as a flat plate, and we think lightning lasts much longer than it actually does, while without this "persistence" fireworks would lose most of their beauty. The rotating vacuum bulbs form a very pretty illustration of this, but as the illumination is intermittent, the tube appears as a rayed star and not as a continuous circle.

That white light is composed of all colors may be shown by rotating a disk with segments, colored in proper proportions, when the colors are blended, and it appears white, or more correctly gray.

Physiologically, white light is made up of the three colors, red, green, and violet, which we probably perceive by three sets of nerve fibers of the retina. On the border of the retina the red-perceiving nerve fibers are absent. We can see this by holding a red pencil in front of the eye at arm's length, and while keeping the eye fixed moving the pencil round sideways, until we reach a point at which the pencil is visible but appears black. If the eye has an excess of one color presented to it for some time, the nerve fibers corresponding to that color are incapable of acting for a short period, and a white surface appears tinged with the complementary color. This effect has been largely used by a certain firm for advertising purposes. Similarly a strip of white paper on a piece of bright green covered with white tissue paper appears pink.

An ingenious advertisement has blue figures on a red ground. When these are viewed in the shadow and slightly moved, the blue marks appear to dance about the paper, for when the eyes are in focus for the red, an image for the blue is formed in front of the retina, and is therefore indistinct; when the blue is right, the red is indistinct; as the red rays converge to a point behind the retina, the rapid changing of the focus of the eye from one to the other position makes the edges indistinct, and gives the idea of motion.

If santonin is taken, white appears yellow, as this drug has the property of destroying the violet-perceiving fibers.

If a thin platinum wire is made incandescent with an electric current, its apparent thickness is greatly increased; this is due to "irradiation," or the encroaching of bright parts on darker ones; similarly, any one looks larger in light than in dark clothes, and a white wafer on a black ground looks larger than a black wafer on a white ground. The effect of background may be noticed in a snow storm; the snow looks black against the light sky, but white against the dark earth. Irradiation also explains the appearance of a pole with the sun as background, when the pole appears narrower, or even discontinuous, where in front of the sun's disk. A piece of black thread held in front of the gas shows the same phenomenon.

A defect of the eye, known as spherical aberration, causes the eye to see a bright point as a star. Gas lamps in foggy weather show this well.

Milk looks white and blood red because the eye has not sufficient magnifying power to perceive that colored or opaque particles are floating in a colorless liquid.

The part of the retina where the optic nerve enters the eye is quite blind; to observe this, put a dot and a cross on a piece of paper about three inches apart, close the left eye, and fix the right eye on the cross to the left of the paper, and at a certain distance (about nine inches) the dot entirely disappears.

If a pin be held by the point quite close to the eye, and a pin hole in a card be held between the eye and a light, the pin will appear head downward, owing to the upright shadow being inverted by the judgment, as if it were the inverted image usually received on the retina.

The experiment known as Scheiner's is curious. By looking at a pin through two holes very close together two pins are seen, as an image on the retina is produced by the rays of light passing through each of the holes.

Our having two eyes make some strange illusions possible. Let a paper tube be placed to the left eye and the hand be placed by the right side of it, when a hole will appear in the middle of the hand. This property of the brain of combining the images of the two retinas is occasionally of use in tracing the form of an object under the microscope without the aid of a drawing prism.

The stereoscope gives the appearance of solidity by combining two slightly different views by means of prismatic eyepieces. Two somewhat similar "cartes" placed under it are blended to a curious composite portrait. If two banknotes are observed in it, and there is any appearance of solidity, they are not identical, and therefore one is forged.

That our judgment of distance largely depends on having two eyes, may be amusingly shown by trying to thread a needle with one eye closed.

The pseudoscope is a combination of prisms which inverts the normal relation, and makes near objects appear distant, and *vice versa*, in a most bewildering way.

The curious rotation of "strobic circles" partly depends on persistence and partly on the fact that the curvature of the eye is not exactly the same in the vertical and horizontal direction.

Pictures must be classed as optical illusions, for all artists attempt to make objects on a flat surface appear to have three dimensions. So well is this done at times that we think the eyes of a picture follow us as we move about a room.

The effect of neighboring forms in misleading the judgment may be shown by placing two exactly equal somewhat horseshoe-shaped pieces of cardboard with the narrow part of the one opposed to the broad part of the other, when the latter will always look larger.

How big does the sun look? is a question which would get various answers; or, to put it more definitely, what is the diameter of a sphere which just hides the sun's disk at a certain distance, say ten feet? As far as I can answer the question, I should say between three and four inches. This is an example of the difficulty of estimating the size of an object with nothing to compare it with; when on the horizon, the sun appears larger, for there we may have comparison objects. When we see people walking on the top of a small hill, the summit of which is sharply defined against the sky, they appear gigantic. The "Specter of the Brocken," a shadow cast by the rising sun, may also be mentioned.

An amusing error of judgment is often made when one attempts to show the distance from the floor a hat on a gentleman's head would reach.

If a square is divided in one direction by parallel lines, it appears elongated in the direction of the lines; in dress this is useful, for vertical stripes make a lady look taller and thinner.

Illusions of motion are common. We may watch a waterfall till the water appears to stand still, and the rocks behind it move up. While sitting in a train and watching another train passing, it is impossible, if the latter be of closed coaches (like a mail train), to say which of four things is happening. The other train may be at rest, or we may be at rest, both trains may be moving in the same direction, but ours quicker, or in contrary directions. We can only settle the question by looking out of the other window.

On looking at a bright sky I can see spots moving up and down, and looking like snakes. These are known as muscæ volitantes, and are due to moving opaque particles in the vitreous humor of the eye throwing a shadow on the retina.

[The lecturer introduced other examples of optical

*Extracts from a paper read at a meeting of the Midland Counties Chemists' Association, February 18, 1890. By J. F. Liverseege, A.I.C., M.P.S.

illusions which one frequently observes, the cause of which is a mystery to him; but the above selections are among the best examples produced.—ED.]

### A Balloon Ascent.

Great excitement was caused at Croydon, England, on a recent Saturday afternoon in connection with the ascent of Professor Higgins, the parachutist, and for several hours doubts were entertained as to his safety. The balloon, which had that day been named "The Duke's Motto," and which was of the capacity of 12,000 cubic feet, was fully charged by five o'clock. Higgins said the direction of the wind, which was northeast, would necessitate his traveling a considerable height, but he hoped to return to the field in about half an hour. When he gave the signal to the attendants to "let go," the balloon gradually rose and appeared to go in the direction of Norwood. Upon reaching an altitude of something like 4,000 feet, the parachute became detached from the net of the balloon, which was rising at a great rate. It was evident that something had gone wrong. The balloon rapidly disappeared in the clouds. When darkness set in and no news had been received of the parachutist, much anxiety was evinced as to his fate. Shortly after eight o'clock, however, all fear was dispelled by the receipt of a telegram stating that Higgins had landed safely near Tonbridge. Higgins returned to East Croydon by the 9:20 train. In an interview with a correspondent, Higgins stated that he had experienced the most wonderful of all his aerial voyages. When he had reached a height of 4,000 feet he began to get into a strong current, and the balloon twisted right round. The current then caught his parachute, causing the wooden ring of it to catch him very tightly under the arms. The test cord which held the parachute then broke. Directly that happened he saw that the parachute was hanging below him fully inflated, and the pressure on him was so great that it was impossible for him to descend into the middle of the town with anything like safety. He thereupon opened his penknife with his teeth and cut the parachute away. This caused the balloon to shoot up 6,000 feet higher, and, on reaching that altitude, he met another current, which brought him back, and he saw nothing until he passed through some sleet and snow. He could hear, however, the sound of trains. He was in this snow storm for at least ten minutes, and when he had passed through it the sun was shining beautifully. He could see the sun glistening on the water at Brighton. He found the air getting very sharp and keen; icicles were hanging from his mustache. For a few minutes he was quite deaf. He now seemed to be descending, and he thought he was getting near Hastings or Brighton. He could smell the sea. When he was 2,000 feet from the earth, he prepared to descend by hanging by one arm on to his trapeze rope as if he were using his parachute. When his feet touched the ground the balloon, which was in front of him, dragged him for ten yards, and then rebounded some sixty feet in the air, between two trees. Two laborers, in response to his signals, arrived just as he came down a second time, and held the balloon until he let out the gas. He found that he had landed on a farm in the occupation of Mr. Nash, at Penshurst, about thirty miles from Croydon. In reply to questions, Higgins said that at one time he must have been five miles above the earth —the highest he had ever been. He added that the balloon had no escape valve.

### The Farmers' Trust.

At last the farmers have a *sure* remedy for depressed prices. A company has been incorporated in Illinois, with headquarters at Chicago, under the awe-inspiring title of the Farmers' Co-operative Brotherhood of the United States. The incorporators propose to do business with $50,000,000, which will be subscribed by the farmers. When the stock is all taken, the brotherhood will be informed by the farmers what price they desire for their grain, and the brotherhood will go into the market and push the price up to the desired point. Thus farmers can sell their grain, and buy more stock in the brotherhood, and in a short time the brotherhood will have the grain and the farmers will have the stock. The scheme is very simple and will undoubtedly prove a howling success—that is, the farmers will howl for their grain, which the promoters have successfully made away with. The Farmers' Brotherhood are to get rich by buying their own grain. The "farmers" who are in the scheme probably all live in Chicago. The curious part of this and all similar plans for increasing the price of the farmers' produce is that it utterly loses sight of the fact that the farmers of the United States do not raise all the grain in the world. In fact, any very great advance in the price of wheat, for instance, would be almost certain to bring Russian wheat to our shores, in spite of the tariff. The farmer has not had a very good time of it of late years; but his redemption will not be brought about by any such scheme as the brotherhood proposes, or the equally brilliant plan of the Detroit gentlemen who proposed that farmers could instantly double the price of wheat by burning half of their crop.—*American Miller.*

## Correspondence.

### Cedar Oil.

*To the Editor of the Scientific American*

Noticing your reply to H. W. H., in the SCIENTIFIC AMERICAN of the 19th inst., I wish to say that cedar oil is made in this vicinity by distillation, the small branches being used. As the branches can be obtained wherever the cedar grows, and as the shavings cannot be easily obtained, this may be of value to your correspondent. W. J. STANTON.

Lyndon, Vt., April 21, 1890.

### Pittsburg a Great City.

*To the Editor of the Scientific American:*

In a late issue of your paper you published a table giving the estimated comparative rank of the cities of the United States in 1890, in which you rank Pittsburg as the fifteenth in population.

To persons familiar with the Pittsburg of to-day this seems a guess without knowledge of the facts. Intelligent estimates of the present population of Pittsburg put it at about 450,000, which would entitle it to rank about eighth, or above Cincinnati, San Francisco, or New Orleans.

The clearing house statements for the week ending 26th inst., now before me, seem to conclusively prove this. In this statement Pittsburg ranks the sixth city, being about 25 per cent above San Francisco, 35 per cent above Baltimore, 50 per cent above Cincinnati, 100 per cent above Kansas City and New Orleans, etc. It seems to us inexplainable that a city should rank sixth in business transacted and only fifteenth in population. JOHN T. FINDLEY.

Pittsburg, April 29, 1890.

### Tin Roof Painting.

*To the Editor of the Scientific American:*

To allow a new tin roof to become rusty before being painted is like closing up the bunghole of a barrel and letting the liquid flow from the spigot. A rough surface secures the paint better, but gives the tin a start toward rusting, and the rust will sooner or later destroy it. This is based on the fact, and proved by experience, that iron once started to rust will continue on to rust, when water or dampness is present, until in time it is entirely destroyed, even though the best of paint is laid on to protect it. In these days, when the lowest and most unscrupulous bidder usually receives the contract to build, the painter can hardly be blamed for "closing the bunghole" by means of cheap iron ore paint, and allowing the tin, *that should be protected*, to waste through the spigot by rust. It is by far the better way to repaint the roof when the paint is too much flaked off, than to permit the tin roof to rust. The main cause of paint flaking or peeling off tin is owing to the polished surface, as no polished metal will properly hold paint. This accounts for painters preferring a slightly rusted roof to work upon, because it fastens the paint better, although it at the same time damages the tin. When iron ore paint hardens, it contracts, cracks, and loses its hold on polished surfaces, which increases to an astonishing degree in cold weather, where the least vibration will loosen its hold. Some of the finest and most costly Chinese paintings on polished metal have been instantaneously destroyed by that means. No competent carriage builder will allow any polished iron, axles, springs, hub bands, etc., to pass into the paint shop without previously roughing their surfaces, either by filing, grinding, or sandpapering, to prepare them for adhesion for paint. This plan is also observed by the sign painter when using sheet tin. The question now is: What paint will best protect tin on roofs? I have answered this repeatedly in former communications, and still know of nothing better than red lead ground in raw, cold-pressed linseed oil, applied the same day it is mixed, which forms the most tenacious and weather-resisting paint of all paints known to me. I treated the roofs of my factory, eighteen years ago, with two coats of red lead on both sides of the tin, having since repeated the painting of the upper side every three or four years (through persuasion) with iron ore paint. The result is, there is little flaking of the red lead, but no end of trouble from the iron ore paint, which in some places peels off from the red lead in large patches, leaving the red lead on the tin. I close with the remark, "All paints not poisonous, and requiring driers to insure hardening, are unfit for durable painting." LOUIS MATERN.

Bloomington, Illinois.

THE survey of the mouth of the Columbia River, recently made under authority of the Secretary of War, shows that great and beneficial changes have taken place upon the bar since the survey of 1885, about the time of the commencement of the construction of the jetty. The same channel depth over the bar which was available for a width of 1½ miles in 1885 is now available for a width of 5 miles, with indications that a much deeper channel is forming through about the middle of the bar.

### An Ingenious Device for Lighting the Bottom of the Sea.

In the investigations that were undertaken by the Prince of Monaco in deep-sea soundings, an ingenious method was adopted to obtain specimens of the living creatures existing at the bottom of the ocean. The apparatus used was shown at the Paris exhibition. The cage in which the submarine animals were caught, according to *Le Genie Civil*, consisted of a cylinder of wire having three conical entrances, like those of a lobster pot, and weighted for submersion with detachable weights. It was, however, very unlikely that at these immense depths, where the darkness is practically total, any fish would voluntarily find their way into the trap, and steps were taken to attract them by a light placed inside it. Obviously, no light was available but an electric light, but to get an electric light to burn a mile or two under water was not easy.

The only resource was to supply the incandescent wire from a battery in the trap. Here, however, another difficulty occurred. It was necessary to inclose the battery, which had to be of considerable power, in a box of some kind, and as the hydrostatic pressure at such depths was six or seven hundred pounds to the square inch, it was found impossible to make a box which was not crushed before it reached its destination. At last, however, this trouble was overcome by the curious device of connecting the box with a balloon. The balloon was made of cloth dipped in India rubber, and so arranged that the air in it was in communication with that in the battery box.

On sinking the apparatus, the hydrostatic pressure, being virtually uniform all round the balloon, compressed it equally on all sides, forcing the air out of it into the battery box, until the pressure inside the box and balloon exactly balanced the pressure outside. This process went on to any extent, so that at the bottom of the sea, although the balloon was reduced by the enormous force exerted on it to a small fraction of its original size, it still kept the internal and external pressure equal. On raising the apparatus again it expanded as the pressure diminished, and brought the battery box to the surface uninjured. So successful was this device that, not content with capturing deep-sea fish, the prince and his assistants propose on their next expedition to send down a photographic apparatus and bring back negatives of the bottom of the ocean, as seen by the electric light.—*Gas Light Jour.*

### Export of American Machinery.

American trade journals take it as an unquestionable fact that the export of American machinery is increasing. The demand from abroad, they say, for American textile machinery has of late been more active than ever before, and is undoubtedly to be attributed to the numerous patented improvements that have been and are constantly being added to American machines for cotton and woolen manufacturing, and which are now bringing them prominently to the front. These devices, the result of American ingenuity and invention, have been patented both in America and foreign countries, thus fully protecting the rights of inventors and manufacturers, and foreigners are not slow to recognize their merits. In the case of the American loom this is especially true, for it is generally thought that for speed and good workmanship combined it is superior to all its foreign rivals. As a result it is being gradually introduced in many English factories, where practical test has clearly demonstrated its uses. In the United States the ring spinning frames are largely taking the place of mules in many of the mills, and they are now beginning to force themselves upon the attention of foreign manufacturers, who, though slow to adopt new methods, and conservative in the extreme, cannot afford to neglect any improvements, from whatever source they may come, which will give them any advantage, however slight, over their competitors. The same is true with regard to many other machines used in the textile industry, in which the inventive genius of the New World has suggested valuable improvements over existing methods, and which are certain to come to the front in foreign countries as soon as their value is appreciated. During the past twelve months the value of cotton and woolen machinery exported from Boston alone has amounted to nearly $325,000, which shows an increase of almost $100,000 in comparison with the year previous.—*London Engineering.*

### Electricity in the Home.

Prof. R. H. Thurston, in a recent article, gives a graphic description of what electricity will do in the near future. He says it will break up the present factory system and enable the home worker once more to compete on living terms with great aggregations of capital in unscrupulous hands. Great steam engines will undoubtedly become generally the sources of power in large cities, and will send out the electric wire in every corner of the town, helping the sewing woman at her machine, the weaver at his pattern loom, the mechanic at his engine lathe, giving every house the mechanical aids needed in the kitchen, the laundry, the elevator, and at the same time giving light, and possibly heat, in liberal quantity and intensity.