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.