erly stand near the poor representation of the depot than in the way of the advancing train.

Commodore Vanderbilt is widely known as a "self-made man," and he has stuck to the one idea of self with wonderful pertinacity. On the whole, we conclude that this brassy compliment, in its gross unfitness in purpose and execution, can only be regarded as a huge joke in brass.

ELECTRO-PLATING WITH IRON.

The Hon. Cassius M. Clay, late U. S. Minister to Russia, has recently returned from St. Petersburg, bringing with him some fine specimens of iron electrotypes, done after the process of Prof. Jacobi and Klein. We have before alluded to this important discovery. By its use, nearly all forms of electro-plating, such as engravings, stereotypes, medallions and ornaments, may be done in iron, with a fineness of texture which is really surprising.

Its importance and value will be appreciated when we reflect that the iron electro-plates are about five times more durable than the ordinary copper electro-plates.

Mr. Clay has presented us with an iron electro-plate copy of a copperplate engraving of the Prince Imperial of Russia. This plate is six inches square, and beautifully done. It is one thirty-second of an inch in thickness, and has a color closely resembling that of zinc. These iron electrotypes are now used by the Russian Government with complete success for the printing of bank notes.

The process was patented in this country through the Scientific American Patent Agency, Sept. 29, 1868, and further information can be had by addressing C. M. Clay & Co., 45 Liberty St., New York.

The following description of the process we copy from the patent specification:

"Our invention consists in the application of a practical galvano-plastic process as to the deposits of iron on molds, or any other form, for reproducing engravings, stereotypes, and for other useful or ornamental purposes.

"The galvano-plastic bath we use is composed of sulphate of iron, combined with the sulphates of either ammonia, potash, or soda, which form, with sulphate of iron, analagous double salts.

"The sulphate of iron may also be used, in combination with the chlorides of the said alkalies, but we still prefer the use of sulphates.

"The bath should be kept as neutral as possible, though a small quantity of a weak organic acid may be added, in order to prevent the precipitation of salts of peroxide of iron.

"A small quantity of gelatin will improve the texture of the iron deposit.

"As in all galvano-plastic processes, the elevation of the temperature of the bath contributes to the uniformity of the deposit of iron, and accelerates its formation.

"For keeping up the concentration of the bath, we use, as anodes, large iron plates, or bundles of wire of the same metal.

"Having observed that the spontaneous dissolution of the iron anode is, in some cases, insufficient to restore to the bath all the iron deposited on the cathode, we found it useful to combine the iron anode with a plate of gas-coal, copper, platinum, or any other metal being electro-negative toward iron, and which we place in the bath itself.

"As a matter of course, this negative plate may also be placed in a separate porous cell, filled with an exciting fluid, as diluted nitric or sulphuric acid, or the nitrates or sulphates of potash and soda.

"For producing the current, we usually take no more than one or two cells of Daniels' or Smee's battery, the size of which is proportioned to the surface of the cathode.

"It is indispensable that the current should be regulated, and kept always uniform, with the assistance of a galvanometer, having but few coils, and therefore offering only a small resistance.

"The intensity of the current ought to be such as to admit only of a feeble evolution of gas-bubbles at the cathode, but it would become prejudicial to the beauty of the deposit if gas-bubbles were allowed to adhere to its surface.

"The same molds, as employed for depositing copper, may also be used for depositing iron, only it is advisable, in employing molds made of lead or gutta-percha, to cover them previously with quite a thin film of galvanic copper, formed, in a few minutes, in the usual way, and then oring them, after having washed the molds with water, immediately in the iron-bath.

"The film of copper may be removed from the deposit either by mechanical means, or by immersion into strong nitric acid.

"The deposited iron is very hard, and rather brittle, so that some precaution must be taken in separating it from the mold. By annealing, it acquires the malleability and softness of tempered steel.

Condensed Food.

Experiments have recently been made with satisfactory results to test the practicability of supplying the North German army and navy with compressed or condensed food. The principal object was to ascertain the best means of furnishing the soldier in the field with a three days' stock of provisions reduced to a minimum of weight and bulk. It has been found that a sort of meat-bread is admirably adapted for this purpose, as it may either be eaten dry in the form of cakes or can be converted with very little trouble into soup. Similar attempts have been made to compress hay and other provender for horses.

[We find the above item in a recent number of the *Evening Post*. The idea of using condensed food in the manner described was first patented in 1850, by Gail Borden, Jr., then a resident of Galveston, Texas, since better known in connexion with Borden's Condensed Milk, an article of large consumption in this and other cities. Mr. Borden has devoted a great deal of attention to the preparation of condensed food, and may be regarded as the pioneer in that branch. His patent of 1850 consisted in the concentrated extract of alimentary animal substances, combined with the vegetable flour and meal, made into cakes and baked into bread, and was readily converted into a wholesome food.—Eds.

AERIAL NAVIGATION.

NUMBER THREE.

Mr. Porter considers the proper form of an aerial float to be the "revoloidal spindle," round in its transverse section, its sides curving uniformly from end to end, and having its length ten times its diameter. But this may be varied according to the business for which it is intended, and made longer for great speed, or larger in diameter for carrying freight. It should be made of the strongest linen cloth, varnished on both sides with a varnish that will not injure the strength of the fiber; and the strips of cloth should be sewed together with double seams, the seams being covered with thick elastic varnish. The cloth is supported inside by twenty rods of white spruce, extending the entire length, the joints being secured by tin tubes, and the cloth being attached to the rods by tack nails, driven through strips of white oak or elm, half an inch wide and one-eighth thick; the tacks being two inches apart.

A medium-sized float should have a capacity of 266,796 cubic feet. The longitudinal rods for a float 400 feet long should be one and one half inches in diameter, but tapering to three fourths at the ends. The buoyant power of 266,796 cubic feet of hydrogen gas, is 19,051 lbs. The weight of the cloth, including two transverse partitions, is 2,000 lbs., and that of the rods 2,000 lbs., leaving a net buoyancy of 15,051 lbs. The proper proportional length of the saloon is 133 feet, and its diameter 10 feet; being square in its transverse section, and having its four sides covered with painted duck, and curving to a point at each end. The engine room should be in the center, 10 feet long by 6 feet wide, leaving a passage way of two feet on each side. There would then be space for two cabins 20 feet long, and a ladies' room, and kitchen, each 8 feet long. The spaces left forward and aft, would be used for baggage and stores. The saloon would have ten windows on each side, the central two being each seven feet long, and sufficiently prominent at the center to enable the pilot to look forward or downward. The engine room should have a large skylight. The sides of the saloon should be supported in their position by very light frame work, and 100 steel or copper wires, whereby it should be connected to various parts of the float. The floor should be made of spruce boards 3 inches wide and one eighth thick, supported by sleepers 40 inches long, 2 wide, and three eighths thick, and 6 inches apart; and these should be supported by four longitudinal sills, 28 feet long, 4 inches wide, and seven eighths thick. These sills should be supported at every ten feet by wires from the float above. The floor or platform which supports the boiler should also be connected to the float by wires, independent of the saloon, and so arranged as to be readily detached from the aeroport at any time. In the center of the forward cabin, there should be an elevating car, 10 feet long and 39 inches wide, surrounded with a balustrade and furnished with seats; the floor of this car constituting a part of the floor of the cabin, but not connected thereto. This car should be supported by four ropes attached to its four corners, passing up over four pulleys to a revolving windlass connected to the engine, which may be disconnected at pleasure. Upon this windlass shaft, should be placed a grooved wheel, around which is a coiled cord, one end of which should be attached to the grooved periphery, and the other end to a small crank windlass, in the center of the said car, so that parties may thereby, either lower or elevate themselves, as occasion may require.

The form of rudder preferred, is a hollow square, ten feet long and five feet in diameter, made of painted cloth stretched over a light frame, open at both ends, with a rod of wood in its longitudinal center, the forward end of which is connected to the float by a universal joint. From the four forward corners of this rudder, four cords, steering lines, extend forward, pass over four pulleys, and thence down to the pilot's window in the saloon below.

Every alternate longitudinal rod of the float is connected to the alternate nine at each end; but the other ten have a slight longitudinal liberty, so that they may occasionally be drawn toward the longitudinal center for the purpose of reducing the size and capacity thereof; and for this purpose a series of cords are attached to the free rods, and passing to the center, and over a corresponding number of central pulleys, unite in one cord, which, passing centerward and over another pulley, extends down toward the bottom of the float and connects to a vertical wire, which, passing through an air-tight stuffing box, goes down to the engine room. Other sets of cords and pulleys are arranged at different points, and all uniting at the main center as described, the engineer can at any time, compress either section of the float as occasion may so require.

In addition to this arrangement, two flexible pipes or hose, ascend from the engine room to the float, and passing to the interior, and longitudinal center, turn right and left, and extend to both ends of the float and up through the upper side; so that the exhaust steam from the engine may be occasionally turned into those pipes, for the purpose of warming and thus expanding the gas within the float; the compressing cords being slackened for that purpose. By these means the float may be made more or less buoyant, without increasing the quantity of gas, or discharging ballast. But in general the float may be readily made to ascend by means of the helm only.

The engine room should be furnished with a self-regulating gas replenisher, which may be described as follows: A square box, four feet long, two feet wide, and twenty inches deep, is made of pine boards fastened with copper nails, coated outside with shellac varnish and inside with beeswax. Within this box is another, in length and breadth two inches less than the first, and six inches deep, covered without and within with beeswax, and open at the top. This box should contain twenty plates of zinc, each plate being five inches wide, one fourth of an inch thick, and long enough to extend across, enter, and be secured to vertical grooves in the sides of the box. Both ends of this box should be half an inch higher than the sides, so that being inverted within the larger box, the ends only rest on the bottom. In the center of the top of the smaller box should be a hole one inch in diameter, to admit the end of a lead pipe, which, passing up through the top or lid of the large box, is to be cemented air-tight thereto, and the said lid is to be screwed down air-tight and covered with beeswax cement. This lid should have another hole near one end, through which a fluid may be poured in. A waxed cork or lead stopple may be used to stop this hole. This vertical lead pipe, ascending one inch above the lid, should have a lever valve at its top, mounted on a fulcrum pivot at or near the side of the pipe, and having an arm or beam of the lever extending horizontally eight inches. The valve end should be a flat plate, having attached to its under side a disk of leather, fitting and pressing upon the top of the pipe. Around this valve, and attached to the box lid, should be a circular ledge eighteen inches in diameter, two inches high, and one inch thick; and having attached to the top one edge of a flexible leather circular belt nine inches high; the upper edge being attached to the periphery of a disk of pine board of the same diameter, thus constituting a circular bellows that will collapse by the weight of its top. To this bellows' top the end of the valve lever should be connected by a cord or chain; so that by the inflation of the bellows and elevation of the disk, the valve would be closed. Through one side of the circular ledge, is to be pierced a horizontal hole, having one end of a small flexible pipe fitted to it, which extends up to the float. The box below is to be furnished with a mixture of one part sulphuric acid to five parts water, to the depth of from five to six inches; this immediately acts upon the zinc plates, and hydrogen gas is produced, and ascends through the bellows and flexible pipe to the float; but when the float is sufficiently full, so as to produce a reaction down through the pipe to the bellows, the top will be lifted and the valve thereby closed. The accumulation of gas within the box of plates will then expel the fluid from the box, and relieve the plates from the action of the acid, until the top of the bellows descends, and thus opens the valve, liberating the gas and allowing the acid to renew its action upon the plates. The effect of this arrangement is to hold the valve so nearly closed, that no more gas can be produced than sufficient to keep the float uniformly inflated. The zinc plates will require to be renewed about once a month.

The two propelling wheels would be each twelve feet in diameter, having each eight radial fans; each being four feet wide at the outward end, and set at an angle of 45 degrees with the shaft. Each fan would be also curved forward so as to counteract, in a measure, the tendency of the air encountered, to escape radially by its centrifugal force. The fans are best made of light-painted cloth, each stretched between two arms radiating from a shaft five feet long and six inches in diameter at the part where the arms are set, and tapering thence to the ends. Their pivots should be two inches long and half an inch in diameter, running in composition boxes, each of which has four short radial arms. Each arm should have a small hole through the end to receive a wire whereby it is supported; two of the wires ascending to the float, and two descending to the saloon. The pivots should have heads or nuts to prevent drawing out of the boxes; and upon each shaft should be a wheel 16 inches in diameter, with chain cogs six inches apart, to receive the links of a chain belt, whereby the fan wheels are made to revolve in contrary directions, the upper fans moving outward from the main center. Upon the top of the engine room, two other chain wheels should be placed to receive the lower bout of the chains, having cranks, which are operated by two pitmans connected to two engines below. The pitman cranks are to be placed at the rear ends of the wheel shafts, and at the forwards ends are two other six-inch cranks set in opposite directions and connected to each other by a rod of wood, the two ends of which are mounted upon the two crank pivots. To the center of this rod is connected by a pivot a vertical rod, suspended from a pivot six feet above. The horizontal rod is three inches wide and half an inch thick, sharpened at its edges to obviate resistance, and supported by wire braces above and below to give it the requisite stiffness. The effect of this arrangement is to cause the two-wheel shafts to revolve in contrary directions; and the two pitman cranks being adjusted at right angles with each other, the application of the power of the engines to the wheels is alternate, and consequently more uniform.

It has been remarked that one main obstacle to aerial navigation by steam power has been the excessive weight of steam boilers; but the boilers invented especially for this use have been repeatedly proved to produce five times as much power in proportion to their weight as any other boiler in use. A twelve-horse power boiler is described as follows by Mr. Porter: Two iron pipes, five feet long by an inch and one half in diameter, are placed parallel, three and a half feet apart, and each end of each pipe is screwed into one side of a three-inch cube of cast iron. Three other parallel pipes are

arranged at equal distances between the two first, and each end of each is attached by a nipple to a transverse pipe three feet and four inches long, the ends of which are inserted into the corner cubes, and an iron rod three eighths of an inch in diameter, passes through each short pipe and through the corner cubes, and terminates in a screw nut at each end. Another like arrangement of seven pipes is placed four feet above the first, and secured in that position by one hundred vertical copper tubes, two inches in diameter, made of No. 24 copper plate; and each end of each copper tube has a brass head brazed in, with a projecting nipple one inch in diameter, extending an inch and a half from the end of the tube. These nipples are hollow nearly to the ends, and have a half-inch aperture on one side of each, in the center of an indenture curved to fit the sides of the long horizontal pipes above and below; one side of each pipe being perforated to match the corresponding holes in the sides of the nipples; and the nipples being attached to the side of each pipe by short brass straps, the two ends of each of which are fastened to the pipes by screws, while the center, being curved, passes over the nipple, holding it fast to the pipe. Twenty vertical tubes in each of five rows, are thus attached to the ten horizontal pipes above and below, and thus all the pipes and tubes have free communication with each other, and are so connected that one or more of the tubes may be readily detached without disturbing the others; or all the tubes and pipes may be taken apart for cleansing, and reconnected as occasion may require.

A grate nine inches wide, is placed between each two rows of pipes, at the bottom; and the lower portion of the tubes, to the hight of two feet, is incased in a double casing of sheet iron, lined with thin plates of soap-stone, or fire brick. Between each two rows of tubes, is a hollow lid two inches thick, with a handle, to be removed for feeding the fire with charcoal. The edges of these lids rest upon strips of iron plate, fitted to each side of each row of tubes, and plastered over with clay. The entire weight of this boiler is 550 lbs. The water required to fill it half full is 30 gallons. The amount of fire surface is 100 square feet; its working capacity, twelve-horse power. The smoke-pipe—four inch tin—extends horizontally 200 feet, rearward. The two light brass engines, are plain and common, possessing no special novelty.

The buoyant power of the float, as estimated, is 15,051 lbs. The weight of the saloon 1,000 lbs; weight of boiler 550 lbs.; weight of engines, propellers, and other machinery, 200 lbs.; weight of replenishers, 200 lbs.; weight of smoke-pipe, rudder and wires, 201 lbs.; weight of water, fuel, and furniture, 900 lbs; thus leaving a net balance of 12,000 lbs., sufficient to carry 140 passengers with light baggage.

When the float is inflated, the saloon must be partly freighted with boxes of sand provided for that purpose; and when passengers or freight are received, an equal weight of ballast will be discharged, and *vice versa*. When not in use, the aeroport will be safely moored at a convenient hight, to some permanent object. A large screw, on the principle of a cork-screw, to be screwed into the ground by means of a hand-spike, will be employed for holding the aeroport when moored. Moreover, for better security, a small line connected to the large safety valve of the float, will be brought to the ground with a small weight attached: so that should the aeroport escape by any means from its moorings, the weight will hold the valve open until it descends to the earth.

Whenever there is occasion to come to land, the rudder is depressed so as to turn the head of the float downward until the saloon comes near enough to the earth to send down the elevator. If there is wind, the aeroport will be brought to head to the wind, and the motion of the engine slackened until the aeroport becomes horizontally stationary, and descends vertically. When the float is inclined in either direction the tendency of the gas will be towards the highest part, and this tendency must be sometimes counteracted by means of the compressing ropes.

It will not be expedient, generally, to run higher than from 500 to 1000 feet; but in case of an approaching squall, or thunder gust, the aeroport may readily ascend high enough to pass over them. Prof. Wise has on several occasions, enjoyed a beautiful sunshine, and serene atmosphere, while a violent thunder-storm was raging below him. In case of running above the clouds, or in foggy weather, the altitude may be generally ascertained by the barometer; but it will be sometimes requisite, especially for the purpose of ascertaining the course, or direction of the wind, to drop an arrow-shaped rod of light wood, which will descend perpendicularly while the wheels are stopped; and as soon as it strikes the earth or water, the change of the direction of the twine attached to the rod, will show both the direction and velocity of the wind. But when the earth or water is in sight, a simple plano-convex lens, with a piece of semi-transparent paper placed in its focus will promptly show both the direction and velocity of the aerial vehicle.

With regard to guiding the aeroport, when a side wind prevails, the pilot has only to head the float to windward, according to the relative velocity of the aeroport and the wind. For instance, if the aeroport is running due west, with a speed of eighty miles an hour, while a gale from the north is traveling at the rate of forty miles, the float must be headed four points, or twenty-two degrees, to windward, in order to hold its westerly course. The pilot will know what direction he is moving, by the direction which the trees and other objects on the earth, *apparently* move.

A compass with a large dial, may be mounted at the hight of two feet from the floor of the saloon; and near it, an apperture, two inches in diameter, may be made through the floor, and a convex lens, of four feet focus, set therein. Then by adjusting a mirror one foot above the compass dial, the most conspicuous objects on the earth will be reflected upon the dial, and their movements thereon will plainly indicate both the direction and velocity of the aeroport; and the size of the objects upon the dial, will in measure indicate the altitude. For this purpose, the compass dial should be partly shaded from the direct light of the windows; and if the central part of the dial be crossed with lines one fourth of an inch apart, crossing each other at right angles, these indications will be the more readily comprehended.

Whirls or circular currents in the air will be readily indicated by the variation of the course of the aeroport, which will be counteracted by a change of helm; and if not, the aeroport will quickly shoot out of the whirl. And in case of encountering vertical currents in either direction, it is well known that they never occur suddenly, but so gradually as not to change materially the horizontal position of the float; and a ready counteraction may be effected by the rudder, without either expanding or compressing the float.

It has been supposed by some that common linen cloth, either French or Holland, would not be strong enough to sustain so much weight. To refute this conjecture, it may be proper to explain, briefly, the nature and principles of the buoyant power, which is to sustain the aeroport and its freight. Aerial buoyancy, does not, as generally supposed, consist in the tendency of the hydrogen gas to ascend, and press against the upper interior of the float; but in a greater pressure of the atmosphere against the bottom of the float, than upon the top thereof. The weight of a column of air, one square foot and forty feet high (the diameter of the float) is three pounds; therefore, the atmospheric pressure against the bottom of the float is greater by three pounds per square foot, than that upon the top, and this would be the true force with which the balloon would ascend were it not for the weight of the hydrogen gas, which, being three ounces per forty cubic feet, reduces the buoyant force to about two and three-fourths pounds per foot of the central portion of the float, and this is the greatest force or pressure that is to be sustained by the cloth. Yet it is readily shown by experiment that the ordinary linen, will sustain more than twelve times that amount of pressure, when supported by the longitudinal rods of the float. Moreover, the float may be kept so full of the gas, by adding a little additional weight to the bellows of the replenisher, as to counteract, in measure, the atmospheric pressure upon the lower part.

It has been supposed by some, that if a rent should occur in the float, the whole apparatus would rapidly descend. But the float having several compartments, if a rent should occur in either one, the descent of the aeroport would be so moderate, that the pilot would have ample time to select his ground to land upon. And should such descent occur over water, the saloon is to be provided with an ample supply of inflated sacks attached to the floor under the seats, which constitutes it an excellent life-boat. A rent is readily and easily repaired, and a small balloon will be kept in readiness, and may readily be inflated, whereby a man or boy may ascend and repair the rent. But as only the bottom of the float is liable to get damaged, the gas would not readily escape. All parts of the saloon will be rendered incombustible by saturation with borate of soda, applied to the materials prior to its construction.

Mr. Porter thinks there would be no difficulty in constructing an aeroport or flying ship, capable of carrying 500 passengers safely to any part of Europe, in three days or less. Even if strong and heavy canvas should be employed in the construction of the float, there would be ample buoyant power to support it with an engine of 100-horse power, and fuel and provisions for ten days. That disasters *may* occur, he does not deny, but maintains that this mode of traveling will be incomparably more safe than by either marine vessels or railroads.

ORANGE MARMALADE.—Cut the oranges in half, then take out the pulp and juice, separating all the skins and pips. Put the rinds into salt and water for a night; the next morning put them into a stewpan with fresh water. Let them stew until soft, so that a straw can be run through them easily; cut the peels into thin strips. To every pound of fruit add one pound and a half of coarse white sugar. Put the juice, pulp, and peel, with the sugar, into the stewpan, and let it boil twenty minutes. Seville oranges must be used, and the marmalade is better if kept six months. The juice and grated rind of two lemons to every dozen oranges is a great improvement.—*Jessie Piesse.*

NEW PUBLICATIONS.

STRUGGLES AND TRIUMPHS; or, Forty Years' Recollections of P. T. Barnum. Written by Himself. 8vo., pp. 780. J. E. Burr & Co., Hartford, Conn.

Many years ago, Barnum, then in the heyday of his glory as a showman and manager of the American Museum, wrote and printed a book of life sketches, which had a large sale. Nevertheless its publication brought down upon him much undeserved criticism and abuse. The people knew that he styled himself the "Prince of Humbugs," and, moreover, they enjoyed the fun of his book, wherein he told them exactly how, and in what way he had prepared his curious feast of funny things to gratify their appetites; but somehow the newspaper critics made some people believe that it was a naughty thing in any man to humbug and then tell all about how it was done. Well! times have since changed. Barnum has passed through an eventful career, of much tribulation, and more success, and now at the age of sixty years he comes out on the successful side with a new book, very unlike the old one, wherein he tells the story of his career from boyhood, introducing for that purpose many spirited illustrations, unique and laughable anecdotes, and a great variety of personal experiences as a youthful trader. Editor, preacher, traveler, showman, farmer, politician, lecturer, financier—indeed it would be difficult to say what Barnum had not been up to during these 40 years of struggles and triumphs. His hospitality is princely; his fund of humor inexhaustible, and, taken altogether, Barnum is one of the rarest specimen of human nature to be met with. His book will afford instruction and amusement to the thousands who read it.