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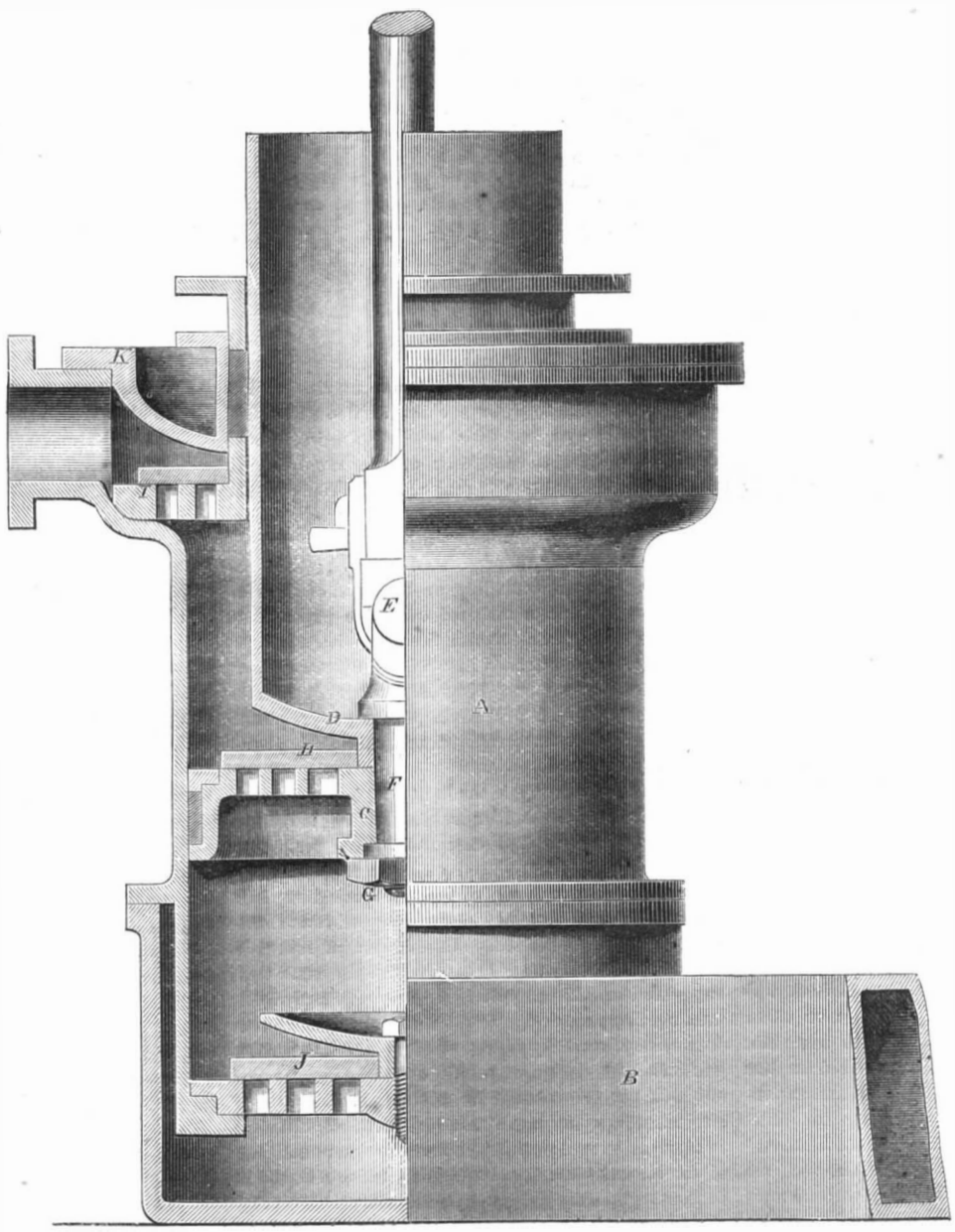
Improved Air-Pump.

Quick-working steam engines, when running at high speeds, are liable to shock and jar, from the rapid opening and closing of the valves and pistons that are brought into contact with water. The air-pumps especially, when the engines are of the condensing variety, have a heavy load to overcome; it is desirable to obviate the evil alluded to, as far as possible, by easing the bucket of the source of a portion of its labor. We herewith illustrate a device for this purpose. The pump barrel, A, sets upon and descends into the channel way, B, to which it is bolted. In this barrel the bucket, C, attached to the trunk, D, works. The spade-handle bearing, E, to which the connecting rod is attached, is a continuation of the pin, F, which goes through both the trunk and bucket and is there secured by the nut, G. The bucket has a series of radial openings or grates disposed about its center, which constitute the seat for the valve, H. A similar grating and valve may be seen at, I, there is also a foot valve shown at, J. The operation of this pump and its valves is as follows. When the condensed water flows into the channel-way, the motion of the bucket and its trunk causes the foot valve to rise and admit the hot water; as the bucket descends, its valves also raise and upon the return stroke close and carry the load with it. Now when the engine works rapidly, if no yielding surface was interposed between the water and the air-pump covers, K, the latter would be subjected to a series of severe shocks; these shocks distribute their force through all parts of the machinery and tax its endurance greatly. To obviate this the inventor employs the valve, I, which by rising as the water meets it, eases the blow and permits the water to overflow into the hot well, or out-board discharge, without further delay. This attachment would seem to add very materially to the effective action of the pump and to subtract very much from the concussion and consequently the jar of the machinery and liability to carry away important parts of the engine. This invention was patented Sept. 9, 1862, by John Vial, and for further information address him at Cleveland (west side), Ohio.



VIAL'S PATENT AIR PUMP.

THE INVENTOR OF IRON-CLAD VESSELS.

On the 22d ult., Senator Cowan, of Pennsylvania, presented a petition in the Senate from A. Stewart and others, asking for a pension to the widow of Thomas Gregg; it being claimed that he was the original inventor and patentee of iron-clad vessels. This is a new phase of this subject, and a brief history of the invention, according to the information we possess, will therefore be of some public interest just now. It is generally admitted by European engineers that although iron-clad gunboats were first brought practically into use during the Crimean war, the late Robert L. Stevens and E. A. Stevens, of Hoboken, N. Y., were the inventors of them. Vessels protected with angulated iron plates were proposed by them as early as 1816, and for coast and harbor defense a description of such vessels was afterward submitted to a Government board, consisting of Commodores Stewart and Perry and Colonels Thair and Totten, in 1841. It was stated in the document proposing the construction of such a vessel for the defense of New York, that plates of iron four inches in thickness were equal to five feet four inches of oak in resisting a ball at point-blank distance; and with the guns then in use it was supposed that none of their shot could penetrate a vessel clad with such armor. In 1843, a contract was formed between our Government and Messrs. Stevens for the construction of such a floating battery, and $500,000 was furnished by Government and expended on the battery now at Hoboken.

During the Crimean war in 1855 it was found that wooden steam frigates were totally useless in attacking granite casemated forts defended by big guns firing shells. An application of Stevens's invention was suggested, and several iron-clad gunboats were then built for the French and English navies. A few of these were employed at the siege of Kinburn and were decidedly successful. This led the Emperor of France to extend the application of iron plates to one of his large frigates—*La Gloire*—which was completed three years ago, and was the first regular iron-clad war ship ever built. Since then several have been constructed for the French and English navies—the American invention having thus been first carried into practical use in Europe. The first American iron-clad boats were those that were built for the Western rivers in the winter of 1861 and 1862, and which have been very serviceable on several occasions. The next was the *Monitor*, and now we have a considerable fleet of iron-clads in commission and a large number more in the course of construction. The *Ironsides*, built at Philadelphia, and the *Roanoke*, which is now being completed in this city, are the only iron-clad frigates belonging to our navy that may be justly called "sea-boats"—all the other iron-clads are floating coast batteries and river boats. We will now refer to the claims of Thomas Gregg. An illustrated description of his iron-clad vessel was given on page 352, Vol. VI (new series), of the SCIENTIFIC AMERICAN. It is there stated that specifications and drawings of his iron-clad boat were filed in the Patent Office 48 years ago—1815—which ante-dates the claims of Messrs. Stevens's invention by one year.

Such are the facts in relation to the history of iron-clad vessels, so far as we understand them.

Hooping Cough.

At this season of the year hooping cough more or less makes its appearance in parts of a large city like this, and many people are at very great efforts to keep their children out of its reach. If one-half the pains were taken to carry them successfully and wisely through it, that there are to prevent the infection of it reaching them, it would no doubt be found that in the great majority of cases the hooping cough is the means of conferring an actual constitutional benefit, so that the child will come out of it stronger and better in health, and with more fully developed lungs than before it was attacked. Even as it is, the benefit to a family is on the average much greater than the danger. Not above one in twenty are supposed usually to die of this disease. It may, however, be doubted if one ever dies of the hooping cough, except by its producing some other secondary affection, not a necessary part of it, but to which there has been some constitutional tendency, or which is the result of carelessness or accident. In most of these cases fatal disease either would have ensued without or might have been averted. The disease itself seems to produce no necessary effect upon the lungs at all traceable in dissection. The coughing may and generally does produce more or less inflammation, and this in turn mucus, and all these things put together may in weakly children, or where the symptoms are neglected, produce a great number of ultimate evil consequences. But the cough itself is strictly a spasmodic cough arising from a convulsion of the nervous system, as decidedly as laughing or crying, and it is not, like most coughs, a convulsion caused by some inflammation producing irritating effects, though often causing it. It is a disease, therefore, throughout all its three stages, whose bark is worse than its bite, if properly watched. Indeed, it is only astonishing the amount of suffering a child will go through from its paroxysms one minute, and except fatigue, be perfectly free from pain and all inflammatory symptoms the next. Many children are even observed to have a better appetite and finer spirits and general health, even nearly all the time that the hooping cough is upon them, than at any period of their lives.

Of course the strain of these paroxysms of itself, apart from all the expectoration, makes a heavy draft upon the constitution, and hence when the child is weakly or debilitated by other sickness, care should be taken to avoid exposure to it. Young infants, not knowing how to expectorate, should be kept from the contagion. It is also preferable not to have children take it in the Fall, as it is apt to affect them all winter. But beyond that there is no reason for taking pains to avoid it, where children are of proper age and in good health. On the contrary, it is to be allowed to pass through the family, not as a disease so much as something sent probably to produce a higher development of health than could be attained without it. Whether it is that it takes from the system a certain lymphatic or other peculiarity which, though desirable up to a certain stage, it is now equally desirable to expel from the system, or whether it is simply through the expansion of the lungs, occasioned by coughing, certain it is that it often produces a marked constitutional improvement. If any person, child or adult, will but take a quill and draw a deep, full inspiration, so as slowly to expand the lungs to the utmost, and repeat this for five minutes daily, the chest will soon measure four or five inches more in circumference, and in proportion to the greater amount of oxygen thus inhaled, the lungs will be kept freer from disease, the amount of food digested will be increased, and the vital energy, the real being and living power of the individual, will be augmented. Hooping cough, therefore, should be looked forward to, when it comes into a family, as a messenger sent indeed to make fresh demands upon parental care and watchfulness of every symptom, but sent also to prepare and as it were compel the child to expand its lungs afresh and on a larger scale, on entering on a new period of its existence, just as the cries of its earliest infancy are designed to give expansion to its lungs at first.—*Philadelphia Ledger.*

Transparent Painting on Linen.

Very fine muslin is the best material for painting upon; and before you begin to paint, a straining frame must be made of beech or hard wood. It should consist of two upright bars, mortised at each end, with holes into which top and bottom cross-bars, tenoned at the sides, can slide, much after the same pattern as the ordinary embroidery frame, but it is rarely required larger than suitable for a window-blind. Along the inner edge of the frame a strip of webbing is permanently nailed, and to this the muslin must be sewed before it is stretched. Having stretched the muslin it is ready for the first preparation, which is sizing. The best size is that made from parchment cuttings; you must have a pitkin to hold about a quart of water. Having cut up the parchment into small strips, fill the pipkin with water and put them to simmer but not to boil. When this operation has gone on for a couple of hours you will have sufficient size, which should be allowed to cool, and then you will have a clear transparent jelly. Remove the dregs from it and boil in a clean pipkin as much as you will require; but recollect the more careful you are in the preparation of the size, the better will be the result of your workmanship.

After the muslin is sized it will be found to relax in the frame and has therefore to be again fully tightened. A second or even a third coating of size is to be applied when the former is dry and the muslin again stretched if it slackens. After a couple of days or more, when the size is quite hard, it must be rubbed smooth with pumice-stone—a smooth face may be obtained to the pumice-stone by grinding it on a stone flag with water. This operation of smoothing the size is very necessary, as the colors take better to the material than when this process is omitted. The muslin being now in a fit state to receive the paint, the subject of the design must be drawn upon it. In order to secure accuracy—for no "rubbing out" can be effected on muslin—it is a common practice to draw the intended outline first upon cartridge paper with a bold stroke in ink, so that when fixed to the back of the muslin with threads it can be seen through the fabric, and the picture be traced out on the muslin with a dark pencil. Another way of tracing a design is to employ the pounce-bag and a perforated pattern; thus, for instance, take a natural leaf, such as that of the vine or ivy, lay it upon a strip of cartridge paper, then perforate the paper all round the leaf with a pointer or a thick needle fastened into a handle. On removing the leaf a few perforations may be made to indicate the arteries. If several strips of paper are placed under the leaf at once, repetitions of the designs can be readily obtained.

The best pounce-bag is made of a couple of folds of muslin tied up like a laundress's blue-bag and filled with a finely-powdered charcoal. The perforated paper patterns being placed on the muslin they are then pounced over, when the charcoal dust falls through the holes on to the muslin, and thus transfers the design of the leaf. If a border of leaves is required, it is only necessary to repeat the same leaf, but placed in different positions—now left, now right, then overlapping each other. The same may also be done with a butterfly or any similar object. Having perforated the design of a bird on the wing, it will not look like the same if its position is considerably altered, now flying up in mid-air, now alighting on to a bough, then descending; the subsequent coloring of the leaves, birds and butterflies, being also modified, changes their general appearance.

Many very elegant designs can be perforated by folding the paper once, twice or four times; thus, whatever pattern is perforated will then be repeated through the other sections. In this way corners and centers are formed. The design thus placed in outline on the linen is now to be colored. We, of course, presume that persons employing themselves thus will have some knowledge of art, and it is now that their taste can be displayed. The rules which govern art are applicable to transparent painting, but our observations are limited to the specialities required to put it in practice. A fine sponge forms a good tool to lay on the tints for clouds and sky or distant hills, and coarse honey-comb sponge does well for luxurious foliage, rocks, &c. Flat hog's-hair brushes, the same as are used for oil painting, do admirably for this work. Varnish colors, tempered with japanners' gold size and turpentine, are the best; the paints sold in tubes will be found convenient, copal varnish and pale drying oil being used as a vehicle.

Young persons who can draw, and are in want of a little occupation, either for amusement or as a means of income, can now from these hints turn their attention to transparent painting; and there are too many ugly back windows to hide in every town for them to fear any lack of employment.—*Septimus Piesse.*

Production of Copper.

The following extracts are from the *Lake Superior Miner*:—

"In 1830, the total productions of the copper mines of the world was about 25,500 tuns of metal, and of this amount Great Britain produced 13,200, or more than 50 per cent of the whole, while the United States and Canada furnished but 50 tuns or two-tenths of one per cent. The Russian Empire then produced nearly 4,000 tuns; the Austrian Empire 2,150 tuns; the whole of Asia some 2,500 tuns. In 1853, twenty-three years later, Britain had only increased her annual product to 14,500 tuns, her percentage of the whole amount receeding to 26; while Chili, in South America, which in 1830 only yielded 200 tuns, had raised her product to 14,000 tuns, or over 25 per cent of the total production. From that period forward to the present time, the copper production of the Chilian mines, we believe, exceeded those of any other country; the value of their exports in that metal alone amounting to $10,760,000 in 1857, while the value of British mine products for the same year was worth about $9,500,000. The Russians had increased the yield of their mines to 6,500 or 11¾ per cent of the whole; the Austrians to 3,300 tuns, or 6 per cent; the whole of Asia only 3,000 tuns, or 5½ per cent; while the United States and Canadas raised that year 2,000 tuns, over 3½ per cent of the total products for that year, which were about 55,700 tuns; Australia and New Zealand produced about 3,000 tuns; Cuba, 350 tuns; Scandinavia, 2,000; the German States, 1,450 tuns, and the rest of Europe, exclusive of the countries above-named, 1,000 tuns.

"During the past ten years the mines of Lake Superior have probably increased their production more rapidly than those of any other country, the exports for 1861—7,500 tuns of metal—being about twelve times greater than those of 1851. That our ratio of increase in the coming ten years will be as great should not probably be expected, as that would amount to 90,000; more by at least 40 per cent than the present product of the world's mines. Of the 80 miles of copper range east of us, and 40 to 50 miles west, comparatively few mining properties have yet been explored."

To Cure Bacon.

The following method of curing bacon in England is described by a correspondent of the London *Grocer*:—

"The general custom in the eastern and midland counties is to remove the hair and bristles, &c., by immersing the animal (after it is slaughtered) in a tub of scalding water, when the impurities are readily removed. The system of scorching the pigs first, and afterward using hot water, has been adopted by several individuals for many years. The dead pig is covered with loose straw, which is set on fire, and the hide is slightly scorched; it is afterward immersed in hot water and scraped. The bacon prepared in this way has a peculiar flavor, and is much preferred by some; but the practice is rarely adopted on account of the trouble."

Smoking and Photography.—The Paris correspondent of the London *Photographic News* states that tobacco-smoking in the room of a photographer, where the pictures are developed, has an injurious effect. He states that an artist in Paris attempted an instantaneous process in the presence of several smoking photographers, and every negative was "fogged." Next day he repeated the same process, after the room had been thoroughly aired and ventilated, and the images came out perfect. Numerous facts serve to prove the truth of these observations; and photographers who are in the habit of smoking in their operating rooms may rest assured that this is the cause of numerous inexplicable failures.

Cultivation of Tobacco.

The following is from the *California Farmer* by a contributor who has had an experience of several years in the cultivation of tobacco :—

"In order to grow strong tobacco plants the ground must be well prepared and worked very fine. In preparing the seed-bed I have found that the best way is to light a large fire on the ground ; the soil is thus rendered loose and friable, and is easily reduced very fine. If it is not convenient to make a fire, mix the earth with a large dose of wood-ashes and small charred dust. By this means the ground becomes so loose that, when the plants are ready for transplanting, a good sprinkling from the garden-pot will make the ground so soft that each plant will bring with it a small ball of earth, which almost insures the plant's growing, and it must be borne in mind that young tobacco plants require very careful handling. It is better to have a large shallow basket or box to carry the plants in when transplanting, as by this means the plants do not loose the ball of earth or get bruised so much as if taken in the hand.

"The seed-bed being made fine with the rake, take the seed and mix it well with ten times (by bulk) as much fine earth and ashes. This enables you to sow the seed so thin that in drawing the larger plants you do not disturb the smaller ones.

"The ground being prepared and the seed well mixed as directed, proceed to sow, taking care to scatter the seed as equally as possible. Do not rake in the seed, but give the bed a slight beating with the back of the spade, and see that the earth does not rise with the spade. Let the seed-bed be in a sheltered situation. When the plants are about the size cabbage plants usually are at transplanting, operations may commence, making choice of a cloudy or even a rainy day for the business. The ground for the crop must be well worked and well manured with decayed manure ; and it is better to have two shingles or other pieces of timber about six feet high, to stick on end in the ground, meeting over the plant so as to protect it from being scorched with the noon-day sun or nipped with the morning's frost. A light, sandy soil suits the tobacco well, if well worked and manured. In another communication I will explain the summer culture and gathering."

An old tobacconist of Sacramento informs the *Bee* that all the California tobacco he has seen has been spoiled in curing. It is cured in houses which are so hot that the leaf is burned and destroyed. The entire substance is taken out of it, and nothing but the coarse vegetable matter left, without any or scarcely any of the qualities of the plant. And this, he says, must ever be the result while the leaf is dried as it has been here. He proposes that it be dried under trees, through whose branches the sun does not penetrate and through which the air can freely circulate, in order that the leaf may not be bleached of all its properties.

Applications of Benzine.

Benzine is applicable to a great many useful purposes. It is the product of the naphtha of distilled coal tar, and its uses were first most clearly described in a patent granted in 1853 to F. Crace Calvert, the eminent English chemist. The method of preparing it is described as follows :—Take limpid coal naphtha and put a suitable quantity to be treated in a leaden or stoneware vessel. To this add small quantities of sulphuric acid until it ceases to produce coloration. The quantity of acid required therefore varies with the relative purity of the naphtha.

The naphtha so treated is next washed with water containing a small quantity of alkali dissolved in it ; then it is distilled in a common still. These operations, if repeated two or three times, will produce very pure benzine. In order to obtain benzine, not perfectly pure but suitable for most purposes, it is only necessary to distil common naphtha at a temperature of 212° Fah.—that of boiling water.

Benzine is useful for the removal of spots and stains caused by fatty or oily matters, tar, paint, wax or resin from cotton, woolen, silk and other fabrics ; and owing to its great volatility no mark or permanent odor remains on the fabrics operated upon. It also removes fatty or oily matters from hair, furs, feathers and wools and other articles made of leather, hair, fur and wool. It is applied to articles of small size by rubbing them with it ; but, for things of a larger size, the articles and fabrics to be operated upon are placed in a suitable vessel and the benzine is allowed to flow into the vessel, and, after leaving them in contact for several hours, the fluid is run off and the articles and fabrics are squeezed so as to remove a great portion of the benzine containing the paint, tar, grease, oily or fatty matters in solution, which is separated from the liquids by distillation in a suitable vessel, and the benzine may thus be used over again.

Furs.

It is said that London is the fur mart of the world, although the climate of England is such that furs are but little used there. Russian sable is the most valuable of all furs, and the skins are exceedingly scarce. According to the latest statistics, only twenty-five thousand of them were produced in the Czar's dominions. The prices paid for them are enormous. The sable for lining one of the emperor's cloaks, exhibited at the World's Fair in 1851, was valued at five thousand dollars. One kind of the Russian sable is called silver sable, on account of the long white hairs which are conspicuously mingled with the dark brown, which is its usual color. This commands a very high price, partly from its rarity and partly because it cannot be imitated as readily as the brown. The peculiarity of this fur is its great softness and the length and heaviness of the hair. The ermine has a value of its own from its delicacy and beauty, although it is not so expensive as the Hudson Bay sable, which ranks next to Russian. As the Hudson Bay Company get their skins very far north they are often very nearly equal in elegance to the Russian, although they cost rather less than half the amount. The American sable is got south of the dominions of the Hudson Bay Company. It stands third in the list of furs. Next are the mink and the stone-martin. For the last few years fashion has given a value to the mink which it formerly gave to the stone-martin. It has no equal for durability and in appearance is sufficiently elegant for all ordinary purposes. It varies very much in quality. The most valuable skins have long dark hair and are quite soft. French sable means any very inferior fur dyed to imitate a valuable one. The Siberian squirrels are much used, and are just as useful for warmth and fully as durable as any other. For sleigh robes the black bear is highly valued. The white fox and the black fox, which is a Canadian fur, are highly valued in Europe. Raccoon skins and muskrat are commonly used and answer very well, but are not as comfortable as those which have longer and heavier fur. The old Buffalo robe is still useful in its place.

Curious Importations.

Butcher Birds.—Many years ago, when rice was dear in Eastern China, efforts were made to bring it from Luzon, where it was abundant. At Manilla there was, however, passed a singular law, to the effect that no vessel for China should be allowed to load with rice, unless it brought to Manilla a certain number of cages full of the little "butcher birds," well known to ornithologists. The reason for this most eccentric regulation simply was that the rice in Luzon suffered much from locusts, and these locusts were destroyed in great numbers by butcher birds.

Sparrows.—A somewhat similar business is carried on between England and New Zealand. This latter country, at particular seasons, is invaded by armies of caterpillars, which clear off the grain crops as completely as if mowed down by a scythe. With the view of counteracting this plague, a novel importation has been made. Mr. Brodie has shipped 300 sparrows on board the ship *Swordfish*, carefully selected from the hedge-rows in England. Their food alone, he informs us, cost £18. This sparrow question has been a long standing joke in Auckland, but the necessity of farmers having small birds to keep down the grubs is admitted on all sides. There is no security in New Zealand against the invasion of myriads of caterpillars, which devastate the crops.

Toads.—The most singular branch of such traffic is the toad-trade. On some of the market gardens near London, as many as five crops are raised in one year, the principle object being, however, to raise the finest possible specimens for high prices. Under such a system of culture, slugs and other insects are very formidable foes, and to destroy them, toads have been found so useful as to be purchased at high prices. As much as a dollar and a half per dozen is given for full-grown lively toads, which are generally imported from France, where they have also been in use for a long time in an insectivorous way.

Cinchona—Quinine.

The cinchona or Peruvian bark is obtained from shrubs and trees in South America, and it is one of the most important medicines in use for intermittent fevers and agues.

The genus cinchona belong to the same natural order (*Cinchonaceæ*) which embraces the coffee plant. The plants of this genus are natives of the intertropical valleys of the Andes, and are found principally on the eastern face of the Cordilleras, growing commonly at hights varying from about 4,000 to nearly 12,000 feet above the level of the sea. The cinchona region extends from Santa Cruz de la Sierra, in Bolivia, through Peru and Columbia, nearly to Caracas. The plants exist both as small shrubs and large forest trees, with evergreen leaves and commonly showy flowers. They require great moisture, and a mean temperature of about 62°. The most important varieties of it are crown bark, silver bark, yellow bark and red bark. The name cinchona was given to the genus by Linnæus, in compliment to the Countess of Cinchon, whose husband was the Viceroy of Peru. She had derived great benefit from the bark during her residence in South America, and on her return to Europe, in 1639, she brought with her several specimens. The medicinal use of the bark was first made known in Europe by the Jesuits.

Whole forests of the cinchona have been destroyed to obtain the bark, without their places being attempted to be supplied, and fears have been entertained that it would soon be exterminated. Acting upon this idea, some English capitalists have lately began to cultivate it in the Neilgherry hills, in the East Indies. Several plantations of it have been laid out, and 72,500 plants have been placed in them. Peruvian bark was used in a state of powder for medicine—chiefly as a tonic—till 1820, when Pelletier, a French chemist, obtained from it the stimulating principle with sulphuric acid, forming a salt called the sulphate of quinine, in which condition it is now used. Eight grains of the sulphate of quinine produces an effect upon the human system equal to one ounce of the bark. Quinia wine is chiefly used in Italy for fever and ague, it cousists of a mixture of the sulphate of quinine with weak wine.

The Mortality and Sickness of the Army.

Mr. Elliott, Actuary of the Sanitary Commission, in a preliminary report on the mortality and sickness of the volunteers, estimates that the number of deaths in the volunteer forces of the United States during the war ("home guards" and other bodies not in active service being excluded) has been at the annual rate of fifty-three per thousand men, of which about forty-four were from diseases and accidents, and nearly nine from wounds received in action. Assuming the same rate of mortality for those discharged and deserted, and the annual rate of deaths is about sixty-five per thousand. The rate of mortality for the autumnal months is twice nearly that for the summer months, and the winter nearly double that of autumn. The mortality in the armies of the West is three times as great as that in the volunteers of the Eastern and Middle States. The deaths from wounds are five times as great in the Western army. To supply losses among the enlisted men in our Eastern armies requires recruits at the rate of nineteen per 1,000 per month, or 226 per 1,000 per annum. To supply such losses in our Western armies requires recruits at the rate of nearly twenty per 1,000 per month, or 234 per 1,000 per annum. The number of desertions from the Eastern army is double that from the Western army. To secure in the field a constant force of 500,000 effective men, recruits are required of 123,000 men per annum, as long as the war lasts, besides maintaining 58,000 in hospitals. Of these 123,000 annual recruits, 83,000 are to supply losses by death and discharges from service (exclusive of discharges for expiration of term of enlistment) ; 34,000 for desertion and missing in action ; and 6,000 to supply other losses specified and unspecified.

VICE *versus* VIRTUE.—Vice is concealed by wealth, and virtue by poverty.