sect that requires heat and drought, to long-continued spells of which the Western States are much more subject than the older provinces of Canada. There is, however, great danger of its importation from Minnesota into Manitoba, where the climatic conditions are very similar. It has been seen in Canada, and in 1866 the writer published a description of it in the *Canada Farmer*, from specimens which had been forwarded to him from Grimsby. It attacks other grains besides wheat, and like many other insect pests, it is hibernating, existing throughout the winter in its perfect state. In the Western States, where it is abundant, there are a great number of broods during the year. One of the remedies used is the application of wator. A heavy thunderstorm during the seasons of its ravages is worth millions of dollars to the farmers of the Western States. It attacks the heads of the grain, clustering round them, and extracting their juices by means of its proboscis. A number of the larger carnivorous insects prey upon this creature, such as the lady-bird, the lace-winged fly, and the syrphus fly.

The same parasites are useful in this case as in the case of the grain fly, or *Aphis avenæ*. This latter belongs to the widely distributed family of *aphidæ*, or plant lice, which were so destructive to flowers grown in conservatories, windows, etc., and which were consequently well known to everybody. The ravages of the grain aphis were never so serious as to give any cause for alarm, though in 1861 it was quite a plague to the farmers of the Province, but it had not been very destructive since. Its diminution was attributable to the parasites which he had already mentioned as preying upon this insect in common with the chinch bug. Thunderstorms also wash off and kill large quantities, as they have no means of regaining their position on the plant.

The joint worm, or *Isosoma horder*, is especially injurious to barley, but it is not common in America, though in 1866 and 1867 it was somewhat prevalent in Ontario. It attacks the grain near the second joint, and the result of its work is to raise a gall or excrescence somewhat like a joint, hence its name. It does not attack the ear. The best artificial mode of dealing with it is to burn the stubble of the grain infested by it.

The army worm, *Hencania unipuncta*, is much more common in the United States than in Canada, and receives its name from the fact that it assembles in large numbers when its food is exhausted in any particular locality, and moves away in search of fresh supplies. New Brunswick was lately visited by this pest in such numbers as to put a stop to railway trains through the quantities slaughtered on the tracks, but they have never yet visited Ontario in anything like considerable numbers. A good way to meet this approach is to dig a deep trench and allow them to accumulate in it, afterward covering them with straw or shavings and setting the trench on fire. A number of parasites both of the ichneumon and beetle kind prey upon the army worm.

The wire worm, or *Agriotes mancus*, is sometimes very troublesome to wheat. It receives its name from the fact that it is a long, slender grub; it attacks the root of the plant underground, and is consequently seldom observed by the farmer. It is sometimes seen in plowing, and where it is observed, a good plan would be to have children follow the plow and gather the insects up and destroy them. Turkeys and ducks also eat them.

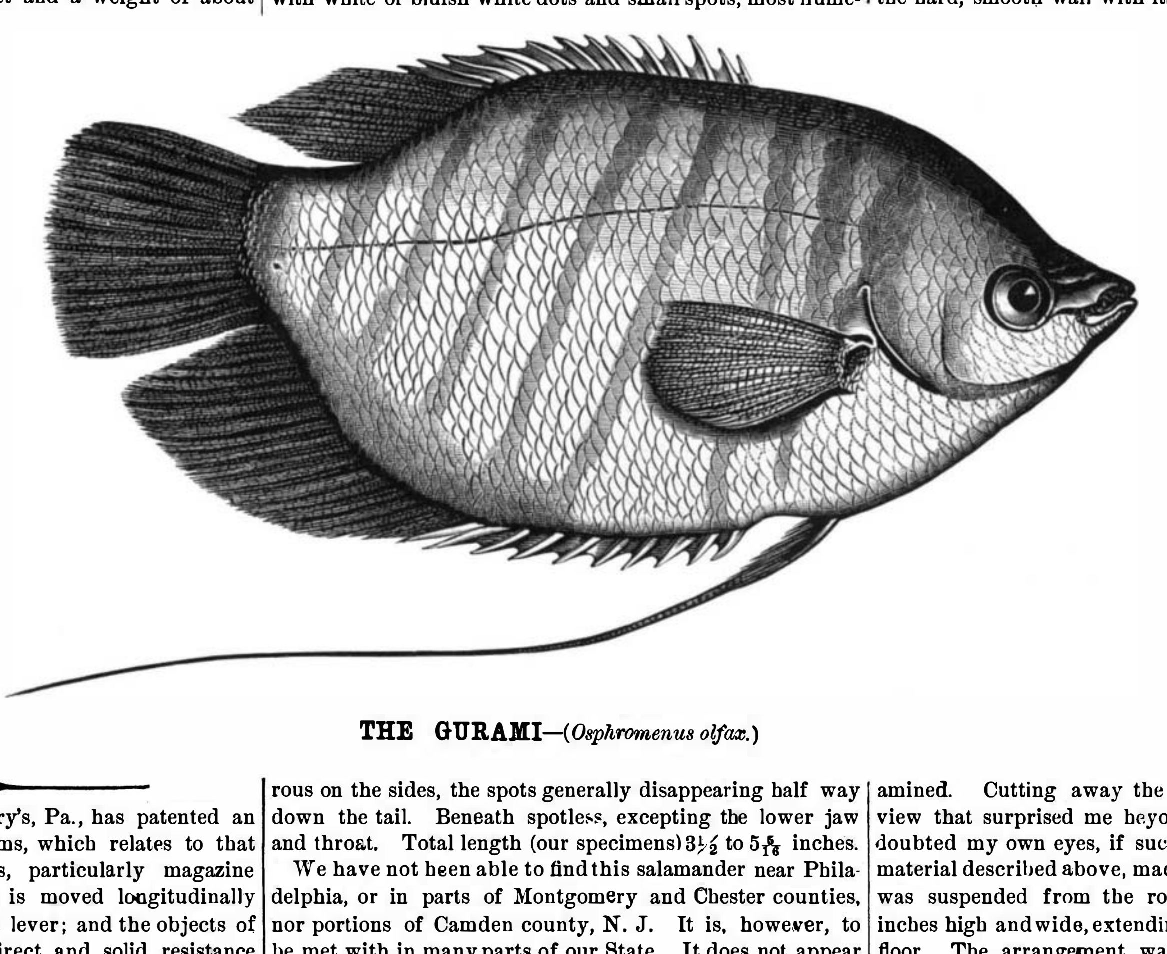
THE GURAMI.

The gurami (*Osphromenus olfax* or *Trichopodus mentum*) attains a length of from 6 to 7 feet and a weight of about 25 lb. The back is brownish-red in color, and the abdomen of a silver color, with brown spots, and dark brown-red stripes pass from the back to the abdomen of the fish.

The fish originally was an inhabitant of Chinese waters, but was taken to Java, Sunda Islands, etc., on account of the good quality of its flesh. It lives on potatoes, salad, bread, rice, beans, worms, raw and cooked meat, small fishes, and frogs, and in fact will devour almost anything.

The male fish builds a nest among the plants of the pond, in about five to six days, and the female lays in it from 800 to 1,000 eggs.

As the gurami is very easily acclimatized it might with advantage be introduced into our rivers, it being very hardy and easily fed, and its flesh is of a very good quality.



THE GURAMI—(*Osphromenus olfax.*)

Mr. John H. Salter, of St. Mary's, Pa., has patented an improvement in magazine firearms, which relates to that class of breech-loading firearms, particularly magazine arms, wherein the breech-block is moved longitudinally back and forward by means of a lever; and the objects of the invention are to obtain a direct and solid resistance against the breech-block when closed and to permit rapid loading and firing with the gun at the shoulder.

THE GLUTINOUS SALAMANDER.

BY C. FEW SEISS.

This batrachian (*Plethodon glutinosus* (Green), Baird), which is known by some authors as the viscid salamander, can be distinguished from our other salamanders by the following characteristics: Head oblong, not as broad, short, and rounded in front as in the amblystomas; form rather robust for the genus (the amblystomas are generally much stouter); tail cylindrical; limbs short and rather stout, with the inner toes small, but distinct. There are 14 folds in the

THE GLUTINOUS SALAMANDER.—(*Plethodon glutinosus*, Baird.)

skin (*costal plicæ*) on the sides of the body between the shoulder and the groin, while the red-backed species (*P. erythronotus*) has 16 to 19. The general color is black, sometimes with a violaceous tinge; the throat and abdomen are generally paler in color, with a whitish band across the throat fold. The head, body, and legs above are sprinkled with white or bluish white dots and small spots, most numerous on the sides, the spots generally disappearing half way down the tail. Beneath spotless, excepting the lower jaw and throat. Total length (our specimens) $3\frac{1}{2}$ to $5\frac{5}{16}$ inches.

We have not been able to find this salamander near Philadelphia, or in parts of Montgomery and Chester counties, nor portions of Camden county, N. J. It is, however, to be met with in many parts of our State. It does not appear in Prof. Verrill's catalogue of the batrachia of Maine, and Prof. Allen says it is not common in Massachusetts. Dr. De Kay calls it the "blue-spotted salamander," and includes it in the fauna of New York State.

Ralph W. Seiss furnishes me with the following remarks: The *glutinosus* is rightly named, for unlike other urodelans of my acquaintance, it is covered with a glutinous slime, which, when brought in contact with the hand in capturing the animal, leaves an adhesive, albuminous substance upon the fingers, which is somewhat difficult to wash off. While in Hunterdon county, N. J., this summer, I collected six individuals. They were all, with one exception, captured under rotten logs, one being found in the center of a log which was sufficiently decayed to be readily broken to pieces. These specimens were very lethargic and inactive, much more so than even the red-backed salamander, allowing themselves to be captured without making any effort to escape or to bite. When placed in the water, this species, like the *P. erythronotus* (red-backed), becomes very lively, doing his best to escape from the seemingly unwelcome element. I, however, obtained two of my specimens within a yard of the water. I captured several of this species, the red-backed and the gray variety of the red-backed (*P. cinereus*), in the immediate neighborhood of each other. In one instance, I found a glutinous and red-backed salamander under the same log. I know nothing in regard to its breeding habits. Prof. Cope, however, says it probably never enters the water, but its eggs are hatched in damp places on land.

I have placed beside the salamander a cloak-bearing longicorn beetle (*Desmocerus cyaneus*, Fabr.). It is a handsome species, being of a deep blue color, with purple reflections, and the anterior portion of the wing covers (*elytra*) orange-yellow. It is found in June and July upon the common elder (*Sambucus canadensis*, Lin.), and its young bore into and feed upon the stems. I have never known it to be injurious to other plants.

A New Leaf-Cutting Ant.

BY REV. G. K. MORRIS, VINELAND, N. J.

At Island Heights, a new summer resort on Barnegat Bay, N. J., I have found a new leaf-cutting ant. That it belongs to the *Attidæ* is the opinion of both Dr. McCook and Mrs. Treat. It has the rugosity on the head which characterizes Dr. McCook's Texas cutting-ant, and resembles it in so many other particulars as to leave no doubt of their relationship generically. This, however, is much smaller, being not much more than an eighth of an inch in length. Like other leaf-cutters it carries its burden on the top of its head and along the back. A row of them marching in single file, each carrying a piece of the fine needle-like leaf of tender pine seedlings, suggests a file of soldiers armed with rifles. It is an amusing sight, and provokes a smile. Sometimes the leaf carried is twice as long as the ant. I have seen them gathering only one other leaf besides the young pine leaf, namely, from cow wheat (*Melampyrum americanum*). Of this plant they gather also the petals. They make relatively very large cells, of the general shape of a coffee cup, and from two to four inches in diameter. The nests examined were in fine white sand, but the cell walls were made very firm and smooth. In several instances the walls were lined with what may be called a curtain of sand, of different color, the particles of which are held together mysteriously, and the whole suspended against the walls of the cell. This curtain is readily removed, leaving the hard, smooth wall with its original finish, showing clearly that after the formation of the chamber and the completion of the walls, the yellow sand had been brought up from a lower stratum, from two to three feet down, and worked into a loose drapery of hitherto unheard of texture. Dr. McCook assures me that after the pupa state, ants cannot make web. It may be in a sense true, but certainly these ants use a fine white filament, for which I know no other name than web.

The leaf cuttings are manufactured into a porous, spongy material, which becomes crisp when exposed to the air, and in which the young ants are reared. I have usually found this material either on the bottom of the cell or chamber, or else filling the same loosely from top to bottom. I was not prepared, therefore, for what met my eyes in the last chamber examined. Cutting away the side cautiously, I gained a view that surprised me beyond expression. I could have doubted my own eyes, if such a thing were possible. The material described above, made of leaves and other matter, was suspended from the roof of a cell three and a half inches high and wide, extending nearly to the pebble-covered floor. The arrangement was like that of the comb in a beehive. There were three combs, or layers, each shorter than that by its side. These were full of small, irregular pockets, so made as to take advantage of all the material used, but not evenly arranged side by side. Each pocket had been completed by itself and without reference to those about it. They were designed for the young ants, but in this case were empty. I am persuaded that this comb, if I may so call it, is made of the partially masticated cuttings bound together with web-like filaments. Washing a little of it in alcohol and placing it under the glass, I distinctly saw white web completely covering some of the particles.—*American Entomologist.*

New Phototype Process.

At the last meeting in Paris of the Society for the Encouragement of National Industry, a communication was received of a process discovered by M. Lenoir, for producing engraved plates from negatives photographed from nature.

The inventor illustrated his process before the council, preparing plates serving to show different styles of engraving, which were distributed among the audience.

M. Lenoir himself describes his process as follows:

"Until now, in order to obtain these negatives, a print was made in fatty inks by Poitevin's system. An impression was taken upon a sheet of transfer paper, which was placed upon a metal plate; after submitting it to the action of acid, it was inked several times under water. All this was difficult as well as uncertain. I have sought a means of operating directly upon the plate, without inking, and in this manner I set to work:

"I lightly coat a metal plate with albumen mixed with bichromate and carmine; this last is used not only as a dye, but it assists in the lifting of the film, on account of its solubility in ammonia. Gamboge and various resins answer the same purpose almost as well.

"The use of carmine is in the stripping off of the mass, because, the exposure taking place upon the upper surface, the carmine draws the albumen with it, more or less, according to exposure.

"When the film is stripped off, an image remains formed of albumen, in itself unable to resist the action of acids. It must, therefore, be rendered insoluble. There are two ways by which this may be effected; one is to cause the albumen to absorb a solution of gum lac, dissolved in hot water with borax; the other, and that which I prefer, is to plunge the plate, once stripped, in a solution of bichromate of potash, then drying at the heat of about 120°. The albumen has by this means acquired the required resistance to the action of acids. The plate has now to be engraved to give it a grain according to the amount of ink it should take up. Upon the unabsorbent and stripped plate a film is spread, consisting of a solution of bitumen of Judea and turpentine mixed with carbonate of lime. When plunged in acid, carbonic acid is liberated; it forms tiny canals through which the acid attacks the metal more or less quickly, by reason of the thickness of the albumen.

"But if strong acid be employed, the minute canals would be soon destroyed; I therefore use acid liquid composed of water acidulated with nitric and oxalic acids and alum. An oxalate of the metal is then formed on the sides of the canals, and causes them to adhere to the plate. The texture of the etching is more or less fine according to the length of time the albumen is allowed to absorb the acid. Minute hillocks remain in form of microscopical obelisks.

"In this state the plate is finished; it requires only to be dried, and is ready to be printed from immediately. No preliminary preparation is necessary, as the whole operation may be conducted in three hours."

A Railway in the Rocky Mountains.

A correspondent of the Denver *Times*, describing the extension of the Denver and Rio Grande Railway from Conejos westward toward the San Juan country, gives these picturesque bits. He says:

For miles the railway curved among the hills, keeping sight of the plains and catching frequent glimpses of the village. Its innumerable windings along the brows of the hills seemed, in mere wantonness, as loth to abandon so beautiful a region. Almost imperceptibly the foothills changed into mountains and the valleys deepened into cañons, and winding around the point of one of the mountains it found itself overlooking the picturesque valley or cañon of Los Pinos creek. Eastward was the rounded summit of the great mountain of San Antonio; over the nearest height could be seen the top of Sierra Blanca, canopied with perpetual clouds; in front were castellated crags, art-like monuments, and stupendous precipices. Having allured the railway into their awful fastnesses, the mountains seemed determined to baffle its further progress. But it was a strong hearted railway, and, although a little giddy 1,000 feet above the stream, it cuts its way through the crags and among the monuments and bears onward for miles up the valley. A projecting point, too high for a cut and too abrupt for a curve, was overcome by a tunnel. The track layers are now busy at work laying down the steel rail at a point a few miles beyond this tunnel. The grade is nearly completed for many miles further. From the present end of the track for the next four or five miles along the grade, the scenery is unsurpassed by any railroad scenery in North America. Engineers who have traversed every mile of mountain railroad in the Union, assert that it is the finest they have seen. Perched on the dizzy mountain side, at an altitude of 9,5.0 feet above the sea—greater than that of Veta pass—1,000 feet above the valley, with battlemented crags rising 500 or 600 feet above, the beholder is enraptured with the view. At one point the cañon narrows into an awful gorge, apparently but a few yards wide and nearly 1,000 feet in depth, between almost perpendicular walls of granite. Here a high point of granite has to be tunneled, and in this tunnel the rock men are at work drilling and blasting to complete the passage, which is now open to pedestrians. The frequent explosions of the blasts echo and re-echo among the mountains until they die away in the distance. Looking down the valley from the tunnel, the scene is one never to be forgotten. The lofty precipices, the distant heights, the fantastic monuments, the contrast of the rugged crags and the graceful curves of the silvery stream beneath them, the dark green pines interspersed with poplar groves, bright yellow in their autumn foliage, that crown the neighboring summits—height, depth, distance, and color—combine to constitute a landscape that is destined to be painted by thousands of artists, reproduced again and again by photographers, and to adorn the walls of innumerable parlors and galleries of art. Beyond the tunnel for a mile or more the scene is even more picturesque, though of less extent. The traveler looks down into the gorge and sees the stream plunging in a succession of snow-white cascades through narrow cuts between the perpendicular rocks.

Correspondence.

The Expansion of Steam.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN for November 20, 1880, there appears an article referring to my paper in the June number of the *Journal of the Franklin Institute*, in which Prof. R. H. Thurston quotes from a letter from an unnamed correspondent, who asks, "What *is* really the proper point of cut-off in steam engines to give maximum economy in dollars and cents?"

Prof. Thurston himself says, "No *theoretical* determination of the proper point of cut-off has ever been made that is of any service to the engineer."

After first giving the rule for the point of cut-off as $E = \frac{1}{2}\sqrt{P}$, Prof. Thurston quickly invalidates his rule by saying, "Sometimes an engine is found to give maximum economy when expanding fifty per cent more; that is, $E = \frac{3}{4}\sqrt{P}$."

Am I not right in saying that Prof. Thurston is trying to give a definite answer to an indefinite question, and doing some pretty wild guessing in the effort?

"Economy in dollars and cents" covers both economy in the cost of *making* and *running* the engine and *economy of steam*. The article in the *Journal of the Franklin Institute* referred only to *economy of steam*.

It is, I think, acknowledged by all that steam should be used dry or superheated; if steam is not given to the engine in such form proper means should be adopted to make it so. Any attempt to deal with or answer questions referring to ill-devised or imperfect apparatus can only result in failure. It is possible to obtain either dry or superheated steam, and I think I was fully justified in so assuming.

The remaining assumption made was that the curve of expansion of steam is *approximately an equilateral hyperbola*. It was not pretended that it was accurately such a curve.

The precedents both among writers on and practitioners of steam engineering warranting such assumption are too numerous to mention.

The work done by the steam can be divided into two parts: first, that necessary to keep the engine running: and, second, the useful work delivered outside of the engine. These two quantities may bear any ratio to each other, and do vary greatly, "even in two engines built from the same drawings and made from the same patterns."

The user of the steam engine naturally regards the useful work only, but *economy of steam*, considered in itself, does not require a consideration of these two forms of work apart from each other.

If, now, my assumptions that steam can be delivered in a dry or superheated form, and that in being expanded its curve of pressure is *approximately* (that is, with sufficient exactitude for practical purposes) an equilateral hyperbola, then is my result and rule—*that the most economical point of cut off for a steam engine is that fraction of the stroke determined by dividing the absolute back pressure by the absolute initial pressure*—an unavoidable deduction, and it only remains for the engine builders and experimenters to realize the conditions placed as nearly as possible in order to obtain the greatest possible *economy of steam*. I *do not* say in the cost of building the engine or of keeping it in repair.

I *do not* say that the greatest useful work can be obtained from the engine, but that the total work done by the steam in driving the engine and doing work outside of the engine, will be done with close approximation to the greatest possible economy of steam.

Are the assumptions which I have made so impossible of realization that my "theoretical determination of the proper point of cut off" will never be "of any service to the engineer"?

It was not many years ago that a distinguished engineer announced that no engine would cut-off economically earlier than one-half the stroke.

Our small high-speeded engines have since demonstrated his error, and also shown that the ratio of the power required to drive the engine to the useful work can be greatly reduced.

While no one is more willing than myself to acknowledge the fact that many results of theoretical investigation cannot at once be realized, I still believe that much room for improvement in the construction of the steam engine remains, and that the road which we must follow will be marked out by theory.

I would ask those who have read my article in the June number, to do me the favor to also read a paper entitled "The Limitations of the Steam Engine," in the August number of the *Journal of the Franklin Institute*, in which will be found a continuation of the discussion.

Regretting that so famous a theorist on the steam engine should have entirely rejected all theory, and requesting as a special favor that you will permit me to be heard in defense of my theories, I am, very respectfully,

WM. D. MARKS, Ph.B., C.E.
Whitney Prof. Dyn. Eng., University of Pennsylvania.

Grape Vine Oil.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN of October 16 I find an article on "A New Oil from Grape Vines," in which it is said that M. Laliman, a French savant, has discovered that there can be distilled from American vines an oil having the property of remaining fluid at 8° Fah., while other oils congeal at or above 27½°. The oil is recommended for use in watches, etc.

M. Laliman's alleged discovery has been known for more than a century. As early as 1770 oil was made from grape seeds in Italy and France. In 1800 there was a factory at Olby which had existed from time immemorial. Other factories existed in Bergamo, Italy, in 1770; in Rome and in the vicinity of Ancona before 1782; Naples, 1818; Germany, before 1787.

In the south of France, where the grape-oil industry is carried on, from ten to fifteen per cent of oil is obtained, the oil being better and sweeter than nut oil, and remaining fluid at a lower temperature. It is used in lamps, and gives a bright light, without odor or smoke.

In extracting the oil from the grape kernels, the refuse left after distilling brandy or making verdigris is dried and ground fine in an ordinary mill, the yield of oil being in direct proportion to the fineness of the grinding.

Some manufacturers first press without heat, obtaining about 5 per cent of oil; afterwards the stuff is heated and pressed with a yield of 10 or 15 per cent more oil. The oil is of a light yellow color, and in course of time obtains a density of 0·9202 at 59° Fah., and solidifies at about 3° Fah. M. Laliman errs in recommending this oil for watches, for although it does not congeal so soon as other oils it becomes viscid and rancid when exposed to air. Grape oil saponifies readily, but the soap lacks hardness and density.

Black grapes contain much more oil than white grapes. The kernels of grapes from vines in full vigor yield more oil than those from very young or very old vines. In France the vines of Roussillon, Aude, and Herault give the most oil. In general black grapes produce from 15 to 18 per cent of oil; white grapes, 10 to 14 per cent. It is probable that American vines, especially those of California, yield more oil than French vines. In the south of France 25 pounds of kernels are allowed for 25 gallons of wine. It is easy to estimate the quantity of oil that is annually lost in grape producing countries.

TH. FLEURY,
Directeur de l'Huilerie de Bacalan.
Bordeaux, France, Oct. 22, 1880.

Present Population of the Earth.

Volume VI. of Behm and Wagner's *Bevölkerung der Erde*, just issued, gives a mass of well-digested information on the area and population of the countries of the world. The areas of Europe, Africa, America, Australia, Polynesia, and the Polar regions have been carefully recomputed, and as the results differ in many instances from statements usually found in our handbooks, we give an abstract of these new figures:

	Area in sta. sq. m.	Inhabitants.
Europe (exclusive of Iceland and Novaya Zemyla)	3,749,263	315,929,000
Asia	17,209,806	834 707,000
Africa	11,548,355	205,679,000
America	14,822,471	95,495,500
Australia and Polynesia	3,457,126	4,031,000
Polar regions	1,745,373	82,000
Total	52,532,394	1,455,923,500

If these figures are correct, the ocean covers 144,364,860 square miles, or 73·31 per cent of the earth's surface. The most populous towns in the world are London (3,630,000), Paris (1,988,806), New York (with suburbs, 1,890,000), Canton (1,500,000), Berlin (1,062,008), Vienna (1,020,770).

THE letters patent for the improved nursing bottle illustrated in a recent issue of this paper describes two forms for the body of the bottle, one having an inwardly projecting ridge forming depressions on either side of the bottle, the other with an outwardly projecting ridge forming a central channel for containing the last of the milk, and for receiving the end of the movable tube. In practice the inventor prefers the latter form. The body of the bottle is made in two sections held together when in use by a hard rubber ring. All of the parts, including the nipple, are made with special reference to convenience in use and facility in cleaning. The address of Mr. E. A. Barton, the inventor, is 348 Notre Dame street, Montreal, Canada.