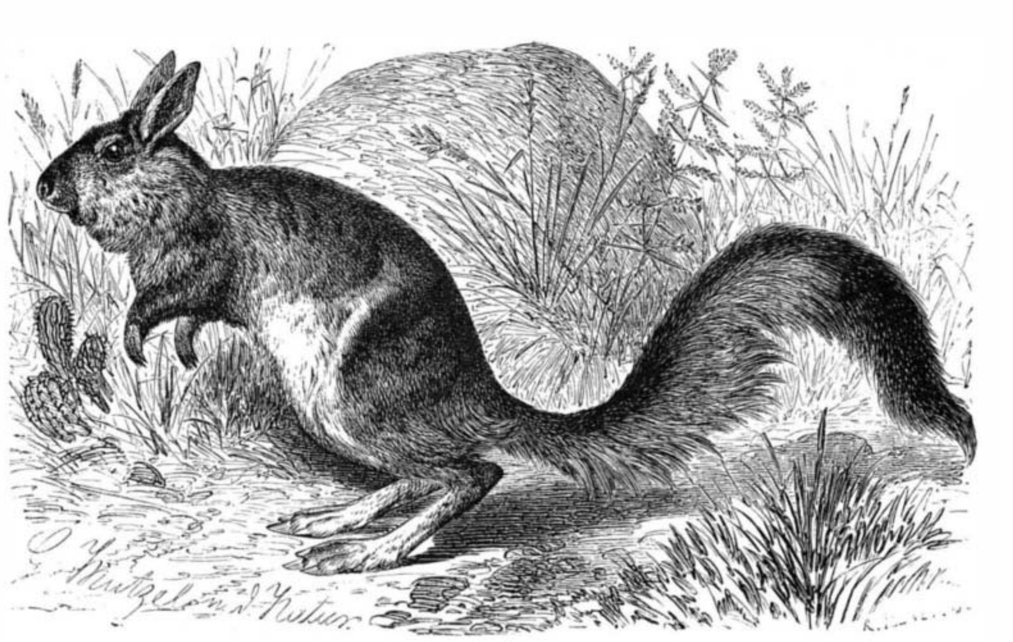
THE SPRING HAAS.

One of the most familiar of leaping rodents is the spring haas, of Cape Gerboa, sometimes called, from its hare-like aspect, the Cape leaping hare. It is a native of Southern Africa, and is found in considerable numbers upon the sides of mountains, where it inhabits certain burrows which it tunnels for itself in the ground. It prefers sandy ground for the locality of its habitation, and associates together in great profusion in favorable spots, so that the earth is completely honeycombed with its burrows. Being a nocturnal animal, it is rarely seen by daylight, seldom leaving its stronghold as long as the sun is above the horizon. The natives, who set some value on its flesh, take advantage of this habit, and being sure of finding the spring haas at home during the daytime, take their measures accordingly. Placing a sentinel at the mouth of the burrow, they force the inmate to evacuate the premises by pouring a deluge of water into the hole, and as it rushes into the open air it is seized or struck down by the ready hand of the sentinel.

Like the kangaroos, the spring haas prefers rough and rocky ground to a smooth soil, and displays such wonderful agility as it leaps from spot to spot, that it can baffle almost any foe by its mere power of jumping. At a single leap this creature will compass a space of twenty or thirty feet, and is able to continue these extraordinary bounds for a great distance. It is rather a mischievous animal, as, like the common hare, it is in the habit of making nocturnal raids upon the corn fields and gardens, and escaping safely to its subterranean burrow before the sunrise.

With the exception of shorter ears and the elongated hinder limbs, the spring haas is not unlike our common hare. The fur is of a dark fawn, or reddish-brown, perceptibly tinged with yellow on the upper parts, and fading into grayish white beneath. In texture it is very similar to that of the hare. The tail is about as long as the body, and is heavily covered with rather stiff hairs, which, at the extremity, are of a deep black hue. Upon the fore legs there are five toes, which are armed with powerful claws, by means of which the animal digs its burrows, while the hinder feet are only furnished with four toes, each of which is tipped with a long and rather sharply pointed claw.



SPRING HAAS.—*Helamys Capensis.*

CHINESE VASE.

Our engraving represents an example of opaque *cloisonné* enameling on metal for which the Chinese have a world-wide reputation. Some of the finer pieces of the ware are valued at several thousand dollars. One of the most elegant of these vases is shown in our illustration.

This vase measures some five feet in height by three feet in breadth. Its prevailing color is sea green, but other colors, such as blue, yellow, and red, appear upon its surface, and the birds, which are marvels of workmanship, have the color of their plumage copied after nature.

The engraving excellently illustrates the exceeding delicacy of the ornamentation, but it is necessary to understand something of the laborious processes by which this effect was produced in order to appreciate its great value.

Enameling, in its broadest sense, is the act of fixing a vitreous substance on any surface by fusion; usually that surface is a metal. Enamels are either transparent or opaque, and are colored by metallic oxides. The processes by which it is embedded upon or in the metal give the names *cloisonné* and *champlevé*.

There are other processes of enameling, but it is needless to speak of them in this connection. In *cloisonné* enameling the pattern is formed by slender strips of metal being bent into required shape, and fixed to the plate. Into the *cells* (whence the name) thus formed, the workman pours his enamel paste, and the piece is placed in the furnace for fusion. When the process is completed, the article is taken out, cooled, and the surface rubbed down and polished.

In the *champlevé* process, the spaces for the enamel are dug out with a tool, the raised line of the design thus being a part of the plate itself. The vitreous matter is then introduced into these cavities, the other process being similar to those pursued in preparing the *cloisonné* enamels.

CHINESE VASE.—*Cloisonné Enamel.*

The Frog Poison of Colombia.

M. André, who was sent to South America on a scientific mission by the French government in 1875, communicates an article to *La Nature* on the subject of a poisonous frog met with in Colombia, and from this we copy the following notes:

This batrachian—called by the Indians of the Choco, "Neaara"—although harmless in appearance, carries one of the most terrible poisons known. It is used for poisoning arrows and serves the Choco Indians as a substitute for the famous *curari* employed by the savages of the Orinoco and Brazil. The three principal tribes which inhabit the immense forests of the Choco are the Cunas, the Noanamas, and the Chocoes.

Great rivers, such as the Atrato and San Juan, water these vast solitudes where the jaguar, the tapir, immense boas, and the caymans make their quarters, disturbed only now and then by the Indians who come to hunt them. For many ages this hunting has been done by means of a weapon called the "sarbacane" or "bodoquera"—a tube about 10 feet long made of the two halves of a palm stalk, which is split, scooped out, and put together again, and then wound with fibers and covered with a black, hard-drying gum. The arrows are made of small bamboo rods, which are very slender and about the length of a knitting needle. They are sharpened at one end, wound around with wild cotton at the other so as to make them just fit the diameter of the tube, and are shot out of the blow-gun with great force by the breath of the hunter. The point of these arrows is dipped in a subtile poison which is nothing else than the venom of the frog just mentioned. To obtain the poison for their weapons the Indians go in search of the little batrachian to the district of Rio Tatama, an affluent of the San Juan. The agility of the animals renders them difficult of capture, and as this has to be effected by hand, the latter is always covered with large leaves to prevent its coming in contact with the poison. Once taken, the frog is inclosed in a piece of bamboo and carried to the camp, where a long pointed stick is thrust down through its mouth and out through the extremity of its body. A fire having been lighted the spitted animal is turned round over the glowing embers until at length its skin begins to swell, and a yellowish acrid juice exudes, and into this are dipped the arrows to be poisoned. Sometimes the poison is obtained on a larger scale by scraping the juice from the body into an earthen pot by means of a knife, and this is afterwards fastened to the hunter's girdle along side of his quiver and used as wanted. The venom, which is only used before its solidification, keeps for some time, but at length acquires the consistency of curari. The physiological effects of this poison are quite similar to those produced by curari. Introduced into the stomach the substance has no effect, but once introduced into the circulation it causes a momentary paralysis, but one which lasts long enough to kill the animal wounded by a poisoned arrow. A single arrow shot into a roebuck thoroughly disables it in ten minutes, and it takes only double that length of time to kill a full grown jaguar. No antidote is known for the poison, and the Indians are so thoroughly aware of this fact that when one has the misfortune to wound himself with an arrow he lies down quietly to await death without making any efforts to cure himself. The Choco frog belongs to the genus *Phyllobates* erected by Bibron and Dumeril. It is probably only a variety of *P. bicolor Bibr.*, which is an inhabitant of trees in Cuba, while the Choco variety is terrestrial. It would be interesting to make experiments on other species of allied batrachians found in the warmer regions of the globe; for, just as the venom of serpents differs considerably according to the species, so the cutaneous secretion derived from batrachians by artificial means may vary in its composition and in the toxic effects which result from its introduction into the circulation.

Carrier Pigeons at Great Altitudes.

Experiments were recently made in Switzerland to ascertain whether carrier pigeons would start at great altitudes, and would find their way from summits covered with snow as well as from less heights. Two pigeons were set at liberty on the Bergli, at a height of 8,600 feet. After perching for a few minutes on a neighboring rock, they took flight in the direction of the Eiger; but soon after they returned to the hut whence they had been liberated. They did not start again for some time, when they took the route for their cot, although, surrounded by mountains, they had not seen the country. Of these two, one did not reach its destination till seven days after; the other failed to appear. Neither (it should be said) had been accustomed to be set at liberty at a great distance from its cot. Another experiment consisted in letting off two pigeons (one of which had not been trained for great distances) about 9:30 A.M., at a point 50 feet under the highest point of the Jungfrau, or 13,750 feet above the sea level. They immediately rose, described several large circles, and took their flight down the valley of Lauterbrunnen, in the direction of Schilthorn and Schwalveren. One of these pigeons reached its cot at Thun at three o'clock next day (eight hours after starting). The other did not turn up. The result of these observations is the more interesting, because in several instances pigeons let off from balloons high up in the air have seemed incapable of sustaining themselves, and have fallen to earth like an inert mass.

Extinct American Rhinoceroses.

According to an article by Prof. Cope, in the *American Naturalist*, twelve species of mammals which may be called rhinoceroses, have been described from materials obtained from the Tertiary formations of North America, and five other species have been distinguished which may be regarded as more or less allied to that family. This family of mammals still exists in Asia and Africa, but in Europe it disappeared during the glacial epoch. In North America it became extinct at a still earlier period, no remains of rhinoceroses having been found in beds of later age than the Loup Fork, or Upper Miocene period. In both Europe and America the forms included in the family first appear in the Lowest Miocene or Oligocene epochs; that is, in North America, in the White River formation. The family of *Rhinoceridæ* is divided into eight genera, embracing some twenty-eight species, six of which are living, and the remainder fossil species. No extinct species of the true genus of *Rhinocerus* has yet been found in North America or Europe, and no extinct rhinoceros of North America which is known, possessed the median dermal horn that we are familiar with in the living animal. The succession of development in the line of *Rhinoceridæ* is not now difficult to trace; it is probable that the family had its origin from tapiroid animals. The earliest known genus is *Aceratherium*, which is characteristic of the Miocene or Middle Tertiary formations of Europe, and is the primitive form of the true rhinoceroses. The first appearance of dermal horns was apparently in a pair placed transversely on the nasal bones in species of the Eocene tapiroid genus, *Colonoceras*. The same character has been observed in species of the Lower Miocene belonging to the true *Rhinoceridæ*, and which Marsh has called *Diceratherium*. The latter genus appears to have terminated the line exhibiting this structure, and the family in North America remained without a horn. The genus *Aphelops*, consisting of five species, occupies a position intermediate between *Aceratherium* and *Rhinocerus*, and is distinguished from the latter in the number of premolar teeth, and the absenceof horns. The largest known species, *A. crassus*, was found by Dr. Hayden on the Niobrara River, Nebraska.

The other species are more restricted geographically. The types possessing the median horn arose in Europe in the genus *Ceratorhinus* of the Middle Eocene, and still survives. This genus occupies a position intermediate between the last named and *Rhinocerus*. It is evident that the descent diverged here at a comparatively late period of geological time into two lines, which are represented at the present day by the African and Indian species respectively. The earliest species of the toothless or African series is the *Atelodus pachygnathus*. The most specialized type of rhinoceros, the genus *Cœlodenta*, of the same line, has become entirely distinct. Its three species yet known were confined to Europe and Northern Asia, and the most formidable of them extended its range with the hairy mammoth within the Arctic Circle. The woolly rhinoceros (*C. antiquitatis*) was evidently the most effectively armed of the family, as it possessed two horns, which, judging of the character of the surface of the skull to which they were attached, must have been of unusual size. Prof. Cope observes that a successive increase of size in the species of this line has taken place in North America with the advance of geologic time. Thus their probable ancestors of the genus *Hyrachyus* were the least of all. The *Aceratheria* of the White River formation were larger—the oldest, *A. mite*, being the smallest. The *Diceratheria* of Oregon were larger still; and the species of the Loup River or Upper Miocene formation were larger, and nearly equal to the large existing species.

The Instincts and Emotions of Fishes.

At the opening meeting of the session of the Linnæan Society of London, held on the 6th of November, Dr. Francis Day read a paper on the "Instincts and Emotions of Fishes." The study of the subject had, he said, received but very little attention in late years, most naturalists apparently accepting Cuvier's view, that the existence of fishes is a silent, monotonous, and joyless one. This is, however, by no means the case, though we cannot, of course, expect to find special expressions so well marked as in higher animals, because fishes have immovable eyelids, have their cheeks covered with scales, and have no external ears, whose motions in some animals are so expressive. The most numerous recorded observations are those which refer to the regard for the young. Some fishes are polygamous, but among the monogamous there is seen a watchfulness over the young, in which the male often plays as important a part as the female. With several species it is the duty of the male to prepare the nest, as well as to take care of the young. In some classes, which are not nest builders, the eggs are carried about in the cheek hollows of the male. In the case of the stickle-back (*Gasterosteus*), the nest, besides being guarded by the male, is gradually opened more and more to the action of the water, and a current is directed over it by a motion of the body. That fishes may be trained to come when called is well known, though as this is generally associated with feeding, it may not be taken to mean much. Cases have been noticed of male fishes remaining at the same spot in a river from which the female has been removed; and, in one case, where a pair were separated for three weeks, they became miserable and seemed near death, while on being reunited they again became happy. In aquaria fishes have been known to attach themselves to particular spots and battles to ensue with intruders. Such combats have been watched, and it has been noticed that while the conqueror assumes more brilliant hues, the conquered sneaks off with his gay colors faded. In their artfulness in obtaining food, fishes show much intelligence, which is more marked with those that eat smaller species, which they entice within their reach. That some classes are capable of an organization for acting together for common good is shown by the way they unite to attack a common enemy. The subject is one that deserves much more attention than it has hitherto received.

Dyes from Mollusks.

In former times some valuable dyes were obtained from shell fish, and of which sepia and the ancient Tyrian purple dye are examples. The abundance of mineral, insect, and vegetable coloring matters which are now available renders these at present quite valueless for industrial purposes, yet some account of them is not without interest. The color known among artists as "sepia" is a liquor contained in the ink bag of *Sepia officinalis*, the cuttle fish. It is of a powerful, dusky-brown color, and works admirably in water, being used in making drawings in the manner of bistre and Indian ink, but is not applicable with oil. Sepia is sold in little bladders, which have to be freed from membranes. This is very easily effected by boiling for a moment in dilute hydrochloric acid, which destroys the envelope, and allows it to be detached by trituration with the hands in water. The bag or pouch being light, floats, and is readily separated on filtration. The black substance which remains is dried, after being washed in hot water. When pulverized finely enough this color is used for water-color drawings; but its hardness renders it necessary to mix it with some foreign color, like sienna, to facilitate the operation of pulverizing. There is great dispute as to the exact source of the once celebrated Tyrian purple, so much used for the garments worn by ancient kings and emperors. Some authorities believe it to have been the product of certain rock lichens, like the "orchella weed" of modern commerce, but the general and most probable opinion is that it was obtained from some species of *Murex* and *Purpura*, the animals of which furnish a rich color. In Britain there are several kinds of mollusks which furnish a dye of this sort; and *Helix janthina*, which is found in the Mediterranean, Atlantic, and South Seas, affords a similar fluid. If the shell of *Purpura lapillus* is broken, there is seen on the back of the animal, under the skin, and near the head, a slender longitudinal whitish vein containing a yellowish liquor. According to E. Schunck, who has investigated this coloring matter (*Chemical News*, No. 39), linen saturated with it and exposed to the sunlight passes from the original yellow through green and blue into purple and scarlet, at the same time exhaling an odor resembling that of assafœtida. This peculiar animal secretion remains undecomposed for years if kept in the dark; but as soon as it is exposed to sunlight, the changes of color make its appearance quite rapidly, without any apparent influence upon it of the presence or absence of oxygen. Chlorine and nitric acid destroy the color, but soap and other acids than nitric are without effect upon it.

By extracting 400 mollusks with alcohol Schunck obtained, in the sunlight, 7 milligrammes of purple. He names this coloring matter *punicin*, and believes it to belong to the indigo group. In ancient times, *Purpuræ* of the best description were chiefly found on the rocks of Tyre, on the coast of Asia. They were also collected at Mininge, on the Grætulan shore in Africa, and on the coast of Laconia in Europe. The colors varied according to the locality in which they were taken; those from Pontus and Galatia, in the north, produced a black dye; in the equinoctial regions a violet hue predominated; while in the south, as at Rhodes, the color was of a richer red. To make various shades of dye several varieties of shell fish were mingled; for instance, 200 *Buccina* were added to 111 *Pelagia* to make the purple color so much eulogized by Pliny, and one of the three shades of purple recorded by the ancients.

Some of the Tyrian garments had a beautiful play of colors, like the shot silks of our own time; and this, it is said, was first suggested by the similar play of colors on the neck of the pigeon. With the destruction of ancient Tyre the beautiful art of dyeing this peculiar color was lost for centuries, until it was again recovered by scientists of the present day, and the discovery would probably have been of much value to commerce had not the use of it been rendered unnecessary by the discovery of the cochineal insect. The latter, again, has been to a great extent replaced by the discoveries of chemistry in the coal-tar colors. In the reign of Augustus one pound of wool dyed with Tyrian purple sold for a sum equivalent to about $180 of our money. We need not wonder at this enormous price when we consider the tedious nature of the process, and the small quantity of dye obtained from each mollusk. For 50 pounds of wool the ancients used no less than 200 pounds of the liquor of the *Murex* and 100 pounds of that of the *Purpura*, being 6 pounds of liquor to 1 of wool; consequently the rich Tyrian purple fabrics vied in value even with gold.

How Nutmegs Grow.

Nutmegs grow on little trees which look like small pear trees, and are generally over 20 feet high. The flowers are very much like the lily of the valley. They are pale and very fragrant. The nutmeg is the seed of the fruit, and mace is the thin covering over this seed. The fruit is about as large as a peach. When ripe it breaks open and shows the little nut inside. The trees grow on the islands of Asia and in tropical America. They bear fruit for seventy or eighty years, having ripe fruit upon them at all seasons. A fine tree in Jamaica has over 4,000 nutmegs on it yearly. The Dutch used to have all this nutmeg trade, as they owned the Banda Islands, and conquered all the other traders and destroyed the trees. To keep the price up they once burned three piles of nutmegs, each of which was as large as a church. Nature did not sympathize with their meanness. The nutmeg pigeon, found in all the Indian islands, did for the world what the Dutch determined should not be done—carried the nuts, which are their food, into all the surrounding countries, and trees grew up again, and the world had the benefit.

The Cause of London Fogs.

Dr. Frankland has lately concluded an investigation into the cause of the persistency and irritating character of the fogs which afflict the large towns of England, a subject which is rather opportune just now. The fogs are not always a sign of dampness, as they occur in comparatively dry air. Dr. Frankland has ascertained that their persistency in a dry medium is due to a coating of coal oil, derived from coal smoke, upon the surfaces of the minute particles of water which compose fog, the oleaginous coating effectually preventing the evaporation of the water. The oleaginous liquids are discharged into the atmosphere in large quantities during the combustion of bituminous coal in fires. Dr. Frankland therefore concludes that by the substitution of smokeless coal, coke, or gas, for bituminous coal, town fogs would cease. This would be a consummation devoutly to be wished; but considering the vested interests which are concerned in the supplying and using of bituminous coals, and the national preference for blazing fires, the reformation is just as likely to come from the adoption of some of theas yet undiscovered means of heating. But much might be done if the gas companies were more enterprising. Apart from the inconvenience, it is waste of money to be using costly illuminating gas for heating when a gas equally effective for that purpose, but far cheaper, could be obtained. Nor would it be requisite to have a double set of mains, as there are several methods by which such gas could be rendered illuminating at a cheap rate.—*The Architect.*

"Ecarlate."

Among the new coloring matters derived from coal there are few which have a better claim to our attention than "ecarlate." This product has already taken the place of cochineal in a considerable number of its uses, and the moment is not far distant when it may be said that cochineal has had its day.

We shall not enlarge here upon the composition of ecarlate, nor upon the manner of its manufacture.

We have to do merely with the manner of using this new product so as to obtain upon wool a beautiful scarlet equaling grain scarlets both in fastness and brightness. For 100 lb. of wool add to the necessary quantity of water 2½ lb. of sulphuric.

Dissolve in boiling water 1½ lb. of the coloring matter.

Heat the water to about 86° Fah., enter the wool, and work it constantly while the water is raised slowly to a boil.

The dyeing is completed when the beck is exhausted, that is, when it holds no more coloring matter in solution, which is generally effected in about 25 to 30 minutes.—*Moniteur des Produits Chimiques.*

To Dye Straw.

Magenta Red.—The first operation for dyeing this or any other color on straw is to steep the latter in a bath acidulated with sulphuric acid for 12 hours. For magenta, take an acid bath of 4° to 5° Bé. The straw after washing is immersed for 12 hours in a bath kept at 30° to 40° C., containing the necessary amount of dye. Now wash well and dry. Other aniline colors do not dye straw with the same facility.

Maroon, with Logwood.—Clean the straw by boiling with a solution of carbonate of soda, then steep in a bath of logwood for two hours. To give a bluish tint, add some blue stone to the bath; if too much of the latter is used the straw will have a greenish hue. This is a loose color, only employed on account of its cheapness.

Coffee and Chocolate Stains.—If the coffee or chocolate contains milk the stains produced are more pronounced than if prepared with water only, but they are also more easily removed. To remove them, the stains are washed with a mixture of yolk of egg in tepid water. If with this treatment they still remain, add a little spirit to the mixture, and rub with a hard brush.

Blue Linings for Hats.—In producing these the cloth is not dyed, but the thickened color is applied to it in the following manner: Prepare the color with 22 gallons of water, 30 lb. starch, 2 lb. tallow, 44 lb. ultramarine blue; mix, boil, pass through sieve; print on the roller first on one side, then on the other, and dry on the cylinder.

Preparing Steel.

A novel mode of preparing steel has been suggested by Signor Guido, an Italian engineer. It consists in electrolyzing water by means of a dynamo-machine, and smelting the carboniferous ore by reducing it with the oxygen and hydrogen gas obtained, and thus producing either steel or pure malleable iron at will. To turn out two tons daily would, however, require the constant use of a 120 horse power engine.

Softening Processes for Hard Water.

So much of the best water obtained in large districts of England is rendered hard by the presence of an excess of bicarbonate of lime, that an account of the processes by which this hardness can be reduced, and the chalk or limestone waters rendered more available for washing and for some purposes of cooking, will not, says the *Journal of Gas Lighting*, be out of place at the present time. Dr Clark, of Aberdeen, long ago suggested that the addition of a certain quantity of quicklime, which should combine with the carbonic acid holding the lime in solution in the water, and cause the precipitation of an insoluble powder of carbonate of lime, including much of that which had been held in the water, could be carried on economically, and would be valuable in some cases. He considered that the fine powder would be available for certain purposes in the arts, at least to some extent, and that in this way the cost would be diminished. Dr. Clark pointed out that every pound weight (16 ounces) of chalk consists of 8·64 ounces of lime and 7·36 ounces of carbonic acid, and that the 8 64 ounces of lime (which could be separated by burning the chalk in a kiln) would be soluble in 40 gallons of water. This pound weight of chalk, however, would require 5,000 gallons of water for its solution. He explained also that by combining a pound of chalk (which, as we have seen, already contains 7 ounces of carbonic acid) with another 7 ounces of carbonic acid, the resulting substance (which is now a bicarbonate of lime) would be soluble in 400 gallons of pure water, the result being a water of the same average hardness as ordinary well water obtained from the chalk strata. If, then, 40 gallons of clear saturated lime water containing 9 ounces of lime is mixed with 400 gallons of clear chalk spring water also containing 9 ounces of lime, the ingredients combine, forming 2 pounds of chalk in a light impalpable mud, and leaving clear water above, containing about 1½ grains of carbonate of lime per gallon.

An improvement on this process, which has been adopted on a moderate scale in various places in the manner above described, was some years ago suggested by Mr. Porter, and his modification, called "The Porter-Clark process," was adopted at the new Middlesex County Asylum on Banstead Downs. There, in the early part of 1878, about 6,000 gallons of water per hour were purified, throwing down and separating the impalpable powder as mud with increased rapidity and efficacy, by forcing the water to pass through disks of cloth after being treated with the lime. The operation was, however, both slow and costly.

Dr Clark's process has been adopted at Caterham, Canterbury, Tring, Aylesbury, Redhill, Colne Valley, Swindon, and by the Kent Water Company. In some cases it has been retained, but we do not hear of many recent applications. The rapid accumulation of the precipitate, and the difficulty of so far drying this mud as to render it easy of transport, may be judged of when we remember that for every million gallons per day of chalk water softened, a mass of wet mud, weighing more than two tons when dry, would have to be handled. Thus, to apply the method to the quantity of water now used in the metropolis, assuming it to be all lifted from chalk wells, we should have to reduce to dryness, and afterward deal with nearly 90,000 tons of impalpable powder of chalk per annum. This, however, is not the sole, nor perhaps the most serious objection to the process. The water thus softened has been found to deposit rapidly, in the pipes that convey it to its destination, a mass of minute crystals of carbonate of lime, choking them up, and being very troublesome to remove.

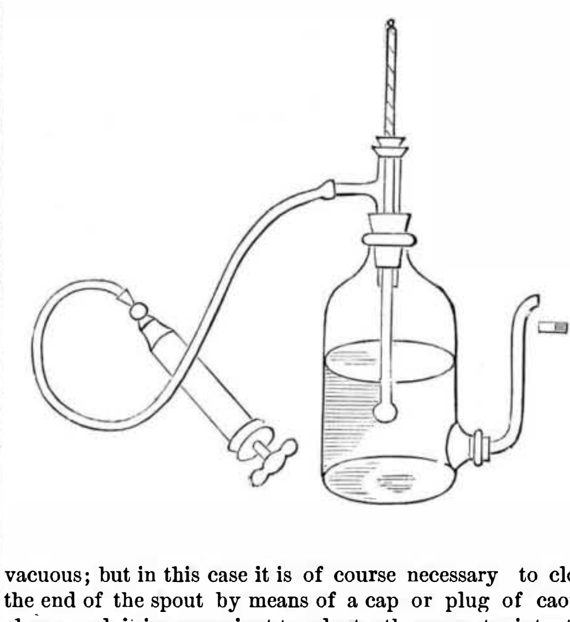
Wherever limestone water prevails, the same objection as to hardness is found to apply to the water that has long remained in contact with the rock. No doubt hardness is uneconomical with regard to the use of soap, but it is more than doubtful whether for drinking purposes it is in any way objectionable. It certainly makes better beer and other fermented liquors than soft water, it is far more pleasant for drinking, and probably more wholesome. Even for infusions such as tea it is hardly inferior, as, while boiling hard water extracts the aroma and the better flavor, it leaves behind the tannin and the coloring matter, which are not desirable or pleasant, and which give the deeper color to tea made of soft water.

The process of softening does not in any way assist in the filtration of water, nor does it remove the earthy yellow tinge of flood waters, or the disagreeable taste of vegetation sometimes observed. In none of these respects does it improve its quality. On the other hand, ordinary filtration through sand, when carefully conducted, does unmistakably improve the quality, and even diminish the hardness of hard water. For practical purposes it may be accepted that on a large scale no better filter material has been discovered than fine, clean, sharp sand. It must, however, be kept clean by frequent scraping and washing, and the washing must be thorough. Filtering sand soon becomes choked in the lower part of the bed when neglected, and the quality of the water passed through soon begins to deteriorate if great care is not adopted, and some expense incurred in reference to clearing the filter beds.

It may be well to allude very briefly to the nature of Dr. Clark's test of hardness, and the meaning of the degrees generally adopted. The test consists in ascertaining the quantity of a standard solution of soap in alcohol that is required to produce a permanent lather when mixed with a given quantity of the water under examination. The solution requires to be made with care and measurement, and the whole value depends on the uniformity of strength of the solution. Each degree of hardness in water is understood to mean a grain of chalk, or its equivalent, dissolved in the water. Thus, a water of 16° of hardness contains 16 grains of chalk per gallon, and 100 gallons of such water would require 32 ounces, or 2 pounds of soap to reduce it to the condition of distilled water. The hardness of water is inferred from the number of measures of soap solution employed, a table being used for reference.

Clarification of Gelatinous Solutions.

A bottle having two necks—one at the top and the other about an inch from the bottom—is procured, and to the lower neck there is fitted, by means of an India-rubber cork, a glass tube bent something like the neck of a coffee pot. If a gelatinous solution (not quite free from intermingled air-bells) be now put into the bottle, the necessary temperature being maintained by means of a warm water bath, the air-bells will gradually rise to the surface, after which the clear liquid may be decanted through the spout-like tube. In order to expedite the rising of the air-bubbles to the surface, the upper neck can be connected with an air pump, so that the space over the gelatinous solution may be rendered



vacuous; but in this case it is of course necessary to close the end of the spout by means of a cap or plug of caoutchouc, and it is convenient to adapt a thermometer into the neck in such a manner that the bulb of this instrument shall be immersed in the gelatinous liquid. Both these latter ends may be attained by fitting into the upper neck a glass tube a couple of inches long by half an inch in diameter, and provided with a side branch for connection with the air-pump while the thermometer passes through the upright tube, where it is fixed by an India-rubber cork. A caoutchouc tube with coiled wire inside is convenient for connecting the apparatus with the air pump, as such a tube does not collapse, in consequence of the pressure of the external air.

Here, then, is the complete apparatus ready for use, and I feel sure that any one frequently using or experimenting with gelatinous solutions will find it exceedingly convenient in actual practice. T. BOLAS, F.C.S.

Moulding Mixture for Gelatine Photo Plates.

For moulding the gelatine relief Leipold's mixture may be employed, and by the exercise of care very perfect results may be obtained. The following receipt for Leipold's mixture is taken from Husnik's *Heliographie:* Seventy parts of bitumen are melted at a moderate heat, and to the melted bitumen there are added the following, each being melted previously: 425 of spermaceti, 200 of stearine, and 170 of white wax. All these being well incorporated, 70 parts of finely ground blacklead are stirred in. The plate to be moulded being thoroughly swelled, is removed from the water, dried with a cloth, and gradually raised to as high a temperature as it will bear without injury to any details of the device, this being generally about 35° C. A metal border being now fixed round the edges, the above composition, which ought not to be at a higher temperature than 40° C., is poured on, the composition being allowed to flow over the plate in one continuous wave. The thickness of the layer of composition may vary from half an inch to one inch in thickness, according to the size of the plate, and no attempt should be made to remove the cast until the next day, when it will generally separate with great ease. The mould is next made conducting with bronze powder, and electrotyped. The first electrotype cast obtained should be very slightly oiled, and a second cast made in it will be the required printing plate.

Euphorbium Varnish.

There seems a fair amount of promise in the experiments made with euphorbium varnish as a protective coating for iron. Some years ago the workmen at Natal found that when they cut certain plants of the family Euphorbiaceæ with an iron or steel instrument, a layer of very adherent gum was left upon the blade. The metal so coated appeared entirely protected from rust. Consequently further attempts were made to see if gum euphorbium could not be practically utilized for the preservation of metals. Sheets of iron coated with the gum were plunged into sea water at South Africa, where the well known rapidity of the growth of vegetation exercises a most deleterious action upon iron-coated vessels. As euphorbium can be obtained at Natal close along the sea coast, great facility was offered for putting its anti-corrosive capabilities to the test. The experiments are said to have been completely successful; and with a view of confirming these results, a tincture was made of gum euphorbium dissolved in spirit. This solution was readily applied to the bottom of ships' keels, and to other metallic surfaces. On evaporation of the spirit, the gum was left permanently adherent. Trials of this same preparation made during the past two years at Chatham have shown that iron so varnished remained uninjured after considerable exposure to the corrosive action of the water of the docks. In Africa the gum varnish has proved successful against the ravages of white ants, probably owing to its extreme bitterness.

The New German "Cure" for Phthisis.

For some few weeks past the German medical press has been discussing a new "cure" for phthisis, and accounts, more or less accurate, of the method and its benefits have found their way into the daily and weekly papers, both on the Continent and in this country, and have excited a considerable amount of attention. It is thus described in a letter from Dr. Kroczak, the assistant to Professor Rokitansky, of Innsbrück, who has been treating the consumptive patients in his wards by the new method, and, it is said, with results that have far surpassed his expectations; but as yet no definite statistics of the cases and their course have been published:

"Natrium benzoicum—one pro mille of the bodily weight, diluted to a solution of 5 per cent—is inhaled twice a day, in the morning and evening, by means of a well-acting 'Siegle's pulverizator,' without interruption during seven weeks. Besides, the appetite, which will show itself soon, is to be fully satisfied by a meat diet, and fresh air and prevention of all enervating influences are to be insured."

The remedy, therefore, is simple enough. A 5 per cent solution of benzoate of soda is to be inhaled twice daily for seven weeks by means of a Siegle's atomizing inhaler, in the proportion of 1 part of the salt to a 1,000th of the body weight. The quantity necessary for a patient 140 pounds in weight would, therefore, be about 2¼ ounces at each inhalation; and the inhaler must be carefully adjusted for such a large amount to be taken into the air passages. A certain proportion will always escape into and permeate the air of the room, and the patient should remain therein for an hour after each inhalation.

We can easily understand that inhalations of benzoate of soda may be of some benefit in checking the formation of mucus or pus in bronchiectatic and even in phthisical cavities; in fact, the old Friar's balsam has long been, and is still, frequently employed with advantage for this purpose. This, however, is not the result that is to be secured by the new "cure." The benzoate of soda is supposed to destroy the specific bacteria to which the tuberculizing process is due, and then the common inflammatory changes lose their destructive characters and slowly heal. The facts on which such a theory can be based are almost entirely wanting, and few pathologists, in this country at all events, will be found to give in their adhesion thereto, whatever may be the results of the treatment. We should, however, say that the theory has the support of so distinguished a scientist as Professor Klebs, of Prague, and that Dr. Max Schneller, a "privat-docent" in the University of Greifswald, is stated to have failed in inducing tuberculosis in rabbits that were kept for several hours daily in a box which had been filled with these benzoic vapors, although these animals are, as is well known, very readily infected with this disease.

We hope that this treatment may be employed in some selected cases of phthisis, in different stages, so that we may have some trustworthy data on which to found definite conclusions as to its real value. Meanwhile we can only say that *a priori* it seems to us more likely to benefit chronic cases of phthisis with profuse expectoration than those in which true tuberculosis is taking place. It is necessary to add that benzoic fumes are extremely irritating, so that they would be contra-indicated in all cases where there were any signs of irritation in the throat, larynx, and larger bronchi, and that when the vapors are being inhaled, even in the most chronic cases, or in healthy subjects, very distressing cough is likely to come on; and we doubt if many patients will be able to breathe such a large quantity as we have mentioned. Moreover, at present, sodium benzoate is very expensive.—*London Lancet.*

Surgery by the Electric Light.

The London *Lancet* states that Dr. Berkeley Hill recently operated for vesico-vaginal fistula in University College Hospital, while the vagina was lighted up by Mr. Coxeter's application of the glowing platinum wire. The apparatus consisted of a fine wire twisted into a small knot. Through this knot was sent a continuous galvanic current, strong enough to maintain the wire at a white heat. The wire was inclosed in a glass chamber, which was itself also inclosed in another glass cover. Through the space between the glasses, a current of water was allowed to flow in order to preserve a low temperature round the light. The afternoon, which was dark and foggy, afforded a good opportunity of testing this plan of lighting up deep interiors, and the illumination was completely successful. A strong light was maintained for more than an hour, close to the margins of the fissure, without impeding the manipulations of the operator.

The Therapeutical Action of Cold.

BY W. H. THOMSON, M.D., PROFESSOR OF THERAPEUTICS AND MATERIA MEDICA IN THE MEDICAL DEPARTMENT OF THE UNIVERSITY OF THE CITY OF NEW YORK.

Remedial agents are of two kinds: First, drugs; and second, other therapeutic measures, such as temperature, electricity, etc. For the sake of convenience, we will here consider those remedial agents which are not drugs, and first, among them, we will study one of the physical forces or imponderables—cold.

Physically, cold is the absence of heat. Therapeutically, it is a positive agent, and has five actions:

1. Tonic.
2. Styptic.
3. Antiphlogistic.
4. Anæsthetic.
5. Antipyretic.

In the first three cold acts only upon the vaso-motor system as a pure irritant neurotic. In the last two it acts simply on physical principles.

COLD AS A TONIC.

We have said that cold, when it acts as a tonic, is an irritant. Every irritant produces a shock and causes an expenditure of the energy of the part irritated. The energy of the part irritated, therefore, becomes depressed; but this depression differs from that produced by a simple sedative, in that it is followed—provided the shock is not so great as to cause exhaustion—by a *reaction* to or beyond the condition in which the part was prior to the irritation. Thus, cold, as an irritant, affects the vaso-motor system and produces a shock which is followed by a reaction. In other words, this system is exercised, and all moderate exercise tends to strengthen the organ called into action, and permanently to improve its nutrition. Cold, then, is a vascular tonic, and may be used generally or locally. When the circulation is feeble and there is loss of muscular power, the general use of cold will arouse the heart, restore arterial tone, and thereby improve the nutrition of the whole body. For this purpose either the dip, shower, or sponge bath may be used, according to the strength of the patient, taking care never to cause exhaustion by its too frequent or too protracted use. A thorough reaction, as indicated by a glow of the skin, should always follow the bath, and never a sensation of lassitude or fatigue. When the irritant effect produced by the cold water alone is not sufficient, salt or some mild rubefacient may be added. If the patient is too feeble to bear even the sponge bath, simple exposure of the surface of the body to cold air will often prove beneficial. In all cases reaction may be assisted by friction with a rough towel.

A cold douche to the nape of the neck is indicated in the following conditions:

1. When, after sunstroke, the arteries of the head remain dilated, and there is headache and dizziness on exertion or exposure to the sun

2. In all cases in which headache is confined to one side, and is attended by dilatation of one temporal artery and suffusion of one eye.

3. In false croup, or the crowing respiration of children.

4. In tinnitus aurium, when the throbbing is synchronous with the beating of the heart, and the tympanic arteries are distended, the cold douche to the nape of the neck, aided by the internal use of hydrobromic acid, may afford relief.

Sponging the chest of a phthisical patient with cold water lessens the susceptibility to cold.

Local applications of cold water are useful in promoting absorption of inflammatory effusions and exudations in the subacute and chronic stages; also in restoring the balance of the circulation in the liver and spleen when enlarged in malarial poisoning.

The hip or sitz bath is useful in hemorrhoids, prolapse of the rectum, and congestion of the pelvic viscera.

COLD AS A STYPTIC.

As a styptic cold acts by constringing the arteries through its influence on the vaso-motor nerves. It is preferable to astringent drugs or other hæmostatics, because it obviates the necessity of applying irritant substances to the bleeding part. Nor need the cold always be applied directly to the seat of the hemorrhage; for it will also affect distant parts in accordance with the laws of the vaso motor system, the most important of which are the following:

First.—An impression on the afferent nerves of a given part will cause a variation in the caliber of the arteries of that part.

Second.—An impression on the afferent nerves of a given part will cause a variation in the arteries of all organs situated directly beneath that part.

Third.—In the case of organs which are in pairs and perfectly symmetrical, as the eyes, ears, hands, and feet (the lungs, kidneys, and testicles are not), variations in the caliber of the arteries of one will cause a similar variation in the other.

Fourth.—Variations in the caliber of the arteries of certain parts are accompanied by corresponding changes in the arteries of certain other parts, and these particular associations are to be determined by experiment; for example, the relation between the circulation of the feet and that of the pelvic viscera and the pharynx, and the relation of the circulation at the nape of the neck to that of the head and face.

The following instances will suffice to illustrate the application of these laws in the use of cold:

1. Cold water applied directly to a bleeding surface.
2. Ice-bags to the epigastrium to check hæmatemesis.
3. Holding any cold body in one hand to arrest hemorrhage in the other.
4. Cold foot baths to arrest metrorrhagia.

In post-partum hemorrhage the best means of applying cold is by ether spray, for the sudden and intense impression produced causes effectual contraction of the uterus without chilling the patient. If ether spray is not available, cold water should be poured upon the abdomen from a height of two or three feet, the shock of the falling water materially assisting the action of the cold. Either of the above measures may be used for hæmoptysis.

COLD AS AN ANTIPHLOGISTIC.

As an antiphlogistic, cold may be used to arrest an acute inflammation, unless suppuration has occurred, or to prevent inflammation when threatened. This it does by causing a protracted constriction of the arteries, thereby preventing the active congestion essential to all acute inflammation. It should be invariably applied as dry cold, directly to the part affected, in sufficient intensity to relieve pain, and continued so long as the exciting cause exists. If, before the tendency to inflammation has entirely disappeared, a neuralgic pain occurs, it is a sign that the vaso-motor nerves have become exhausted, and the use of cold must at once be discontinued, or gangrene will result; moreover, the patient will feel more comfortable without than with the cold applications. This neuralgic pain is continuous, and, if the injured part be one of the extremities, it extends from the part injured toward the trunk. Inflammatory pain, on the other hand, is local throbbing, accompanied by local heat, and is relieved by more thorough application of cold.

In fractures, or other severe injuries near joints, the injured parts should be surrounded with pounded ice placed in pigs' bladders or rubber bags, two or three layers of perfectly dry muslin being placed between the skin and bags, lest the parts should be chilled too suddenly A bottle filled with ice water makes a good antiphlogistic splint for injuries of the hand. Inflammation of the eyes may be controlled, and its spread from one eye to the other prevented, by means of cold applications. Ice bags should be applied to the head and spine in epidemic cerebro-spinal meningitis. Cold applications will control the spread of erysipelas, and are the best means for relieving febrile headache. Headache from uterine trouble is best relieved by moist warmth. Cold should not be used antiphlogistically in any acute inflammation of internal organs, except peritonitis with vomiting, and meningitis.

COLD AS AN ANÆSTHETIC.

The use of cold as an anæsthetic depends upon its physical property of freezing tissue and deadening sensation without injuring vitality It is most useful in operation where no great thickness of tissue is involved, as in opening abscesses, amputation of fingers, Cæsarean section, and ovariotomy. In all cases the action of the cold should be secured as rapidly as possible. Apply ether spray to the part alone which is to be operated upon. Anæsthesia is complete as soon as the skin becomes white and glistening.

COLD AS AN ANTIPYRETIC.

When the abnormal elevation of the bodily temperature is due to insufficient radiation of heat, as in some nervous disorders, it is not generally in itself dangerous; for it has been known to reach 123° Fah., and remain there for several weeks. But if, as in fevers, the rise of temperature depends upon excessive chemical changes, then the heat itself is injurious, causing arrest of gland secretion, as well as extensive destruction of tissue In every fever there is a certain point beyond which, if the temperature rises, certain structural changes will take place. The glands become affected with cloudy swelling, and fatty degeneration ensues, and the muscles affected in the same manner become remarkably brittle.

The point at which these changes occur differs in each fever In scarlet fever it is 105° Fah ; in typhoid fever, 106° Fah.; in relapsing fever, from 107° to 108° Fah.; and in erysipelas still higher. Beyond this dangerous point in each fever the temperature should not be allowed to rise, but must be lowered by the use of cold, the result of which is simply the abstraction of heat. This may be effected by immersion in a cold bath or by the cold pack. Place the patient in a bath of 75° Fah., and gradually cool the water down to 65° or 60° Fah —never lower, and at the same time use cold affusions to the head continuously. At first the temperature will rise slightly, owing to the blood being driven from the surface of the body into the viscera, which are always a little warmer than the skin; but the bath should be continued until the temperature is reduced to 100° Fah., provided the fall is gradual—that is, one degree in six, five, four, or three minutes If it falls one degree in two and a half minutes stop the bath when the temperature has reached 101° Fah.; for in most cases a further reduction of one degree will occur after the bath is discontinued. If the fall in temperature during the bath be one degree in *two* minutes, the patient should be taken out at once, whatever the actual temperature may be, for in such cases there is danger of the subsequent fall becoming uncontrollable, reaching perhaps 97° Fah., and the patient passing into collapse. Should this at any time occur, wrap the patient in hot blankets, apply hot saucers to the epigastrium, and give brandy or other stimulants.

When, for any reason, the bath is impracticable, the cold pack may be used, always, however, with the same precautions as in the use of the cold bath. First wrap the patient in a sheet wrung out of water at an ordinary temperature, say 70° Fah., and then lay on other sheets wrung out of ice water. The cold bath or pack should be repeated often enough to keep the temperature below the point of danger for that particular disease. If necessary, use one every hour. If, however, two or three a day are sufficient, one should be so timed as to be given just before the highest rise of the fever heat—that is, usually between two and three o'clock in the afternoon.

The contra-indications to the antipyretic use of cold are hemorrhage from the bowels and notable variations of temperature from the regular course. Bronchitis and pneumonia are not necessarily contra-indications.

The Physical Cause of Intermittent Fever.

The July number of the *Zeitschrift*, edited by Professor Klebs, contains some particulars of an investigation into the physical cause or poison to which marsh or intermittent fever is due. The inquiry was conducted by Professor Klebs, of Prague, in conjunction with Signor Tommasi, Professor of Pathological Anatomy at Rome. The two investigators spent several weeks during the spring season in Agro Romano, which is notorious for the prevalence of this particular kind of fever. They examined minutely the lower strata of the atmosphere of the district in question, as well as its soil and stagnant waters, and in the two former they discovered a microscopic fungus, consisting of numerous movable shining spores of a longish oval shape. This fungus was found to be artificially generated in various kinds of soil. The fluid matter obtained was filtrated and repeatedly washed, and the residuum left after filtration was introduced under the skin of healthy dogs. The animals experimented on all had the fever with the regular typical course. After explaining minutely the results of their various investigations and experiments, these gentlemen are of opinion that they have discovered the real cause of the disease in question. As the fungus grows into the shape of small rods, Tommasi and Klebs have given it the name of *Bacillus malariæ*.—*Medical Times and Gazette.*

Reappearance of Small-pox in the United States.

The attention of health officers and sanitarians is called to the appearance in the United States of small-pox, and an evident tendency toward its out-cropping in other cities than those in which it has already been noted.

Since the 15th of November deaths from this disease have been reported in the cities of New York, Philadelphia, Washington, and San Antonio. In Philadelphia, with its long immunity from this affection, extending over several years, and in the District of Columbia, there is enough of evidence to show the tendency to spread, previously mentioned, from centers so far removed from each other as to preclude the idea of transmission by actual contact, as a search into the definite origin of the earliest reported cases has as yet failed to reveal any facts concerning either the mode of origin or transmission. The history of the earliest cases thus far reported in Washington are detailed in this number of the *Bulletin.* It is worthy of note here that this disease has existed along our borders for some time—for example, at Montreal, St. Johns, N. B., Havana, and Matamoros—and also that all of the principal cities of Europe have furnished cases—more especially Paris, which has reported 214 deaths since August 21.

A communication from Dr T. C. Minor, health officer of Cincinnati, Ohio, to the National Board of Health, invites the attention of those interested in the prevention of the spread of small-pox and other diseases to the importation as well as the inter-state shipment of rags as a carrier of this and other diseases. Dr. Minor states that rags gathered during the summer from yellow fever infected localities and from infected persons are being forwarded to Eastern points, and also that rags, bedding, and second-hand clothing from cities and persons affected with smallpox may become the carriers of variola from foreign as well as domestic ports to the United States. It it well known that in 1873, in Massachusetts, the origin of small-pox in eleven cities in that State was traceable directly to the importation of rags from foreign or domestic places. No further warning is deemed necessary to be given at present concerning the appearance of this eminently preventable disease.

The sanitary management of the sick with this affection is too well known to every physician to be reproduced here. In view, however, of the probable appearance of this disease in other localities, it is proper to remind every one interested in its prevention and spread that the only absolute preventive measure necessary is *compulsory and thorough vaccination and re-vaccination.*—*Health Bulletin.*

The Healthiest City in the United States.

In the annual tables of vital statistics, lately published by the Health Department of New York city, among the exhibits is the comparative death rate of various cities, American and foreign. The exhibit gives the population and death rate of over three hundred and fifty cities in different parts of the world, of which sixty are American and the remainder foreign.

It appears from these tables that the city of Burlington, Iowa, with a population in 1875 of about 20,000, enjoys the pre-eminence for health, its annual death rate being only 4·84 deaths per 1,000 souls. Stockton, Cal., stands next, 7·47; but this is 62 per cent more unhealthy than Burlington. There are probably a few, but only a few, more favored places than the latter in all the world. The death rate for New York city is 23·93 per 1,000; New Orleans, 50·71; London, 23·40; Paris, 24·71.