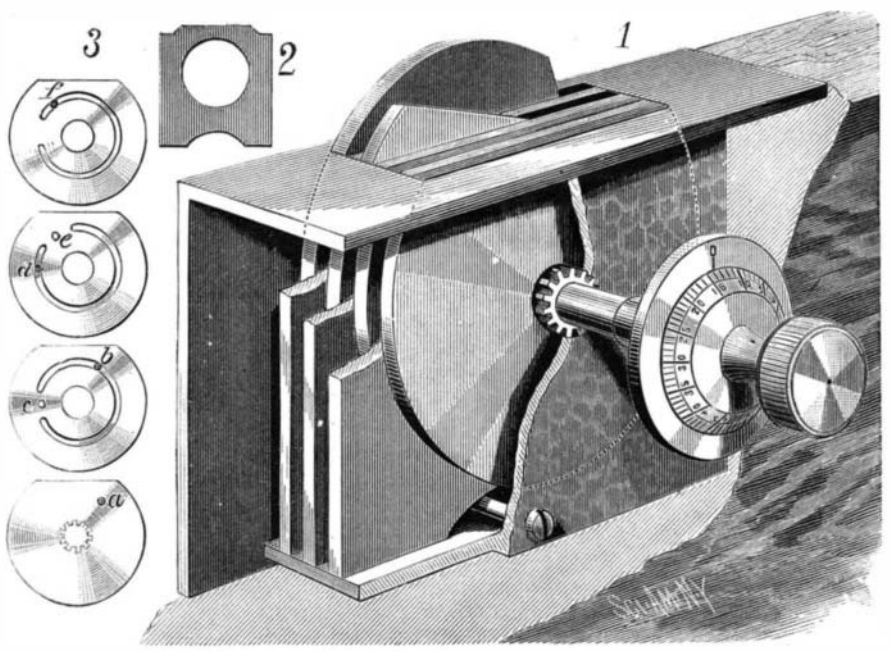
NEW COMBINATION LOCK.

This is a combination lock in which a series of disks are substituted for the bolt, the disks being mounted on a knob spindle, to be turned by it to lock and unlock, the locking being effected by shifting the disks, so that any portion of of the disks will project through the lock case, and the unlocking by shifting them to a position in which the line of a segment cut off will coincide with the plane of the lock case. One of the series of disks is positively connected to the spindle and turns with it, and, after making nearly a whole revolution, communicates motion to the next. The rest are operated successively in like manner, so that in the operation of unlocking the knob is shifted alternately to right and left a certain number of turns or parts of turns for each disk known to the operator.

As shown in Fig. 3, the disks are alike in size, thickness, and material, and all have a similar segment cut away on one edge, and the first disk is connected to the knob spindle positively by means of the notches in the eye of the disk and the teeth on the knob spindle.

This disk has a stud pin, *a*, which projects through a central hole in the partition plate (Fig. 2) placed between this disk and the next, and into the curved slot, *b*, in the latter, which extends nearly but not quite around the circle. The second disk has a pin, *c*, extending into a curved slot, *d*, in the third disk, and the latter has a pin, *e*, extending into a similar slot, *f*, in the fourth disk. This latter, being the terminal disk of the series, has no pin.

To unlock the lock the spindle must be turned four times to the right and stopped at the number on the indicator known to coincide with the zero mark when the disk coincides with the face plate of the lock. This simple arrangement of tumblers renders it impossible for one not knowing the combination to open the lock.



ALLEN'S COMBINATION LOCK.

The combination is capable of being readily changed so as to render the lock as good as new should the combination become known to unauthorized persons.

The simple construction of this lock admits of cheap manufacture, and at the same time insures great durability.

This invention has been patented by Mr. James W. Allen, 102½ North Fifth Street, St. Louis, Mo.

The Orfe.

The fine specimens of the orfe presented by the Duke of Bedford to the International Fisheries Exhibition, and exhibited in one of the tanks of the Aquarium, fully deserves, says *Nature*, the notice of all interested in the culture of our fresh water fishes. They are some of a number which Lord Arthur Russell succeeded in importing from Wiesbaden in March, 1874, and which were placed in a pond at Woburn Abbey in Bedfordshire. Owing to the succession of cold summers these orfes did not breed until last year, and we may hope that this season will also prove favorable. This species may now be considered as acclimated, and will become a permanent acquisition to our ornamental waters.

The orfe, whose bright yellow or golden colors resemble those of the goldfish or golden tench, is, like these two latter fish, a permanent variety of a wild and much less brightly colored race, belonging to the same genus as, but specifically distinct from, the chub, with which it was confounded by some writers. Its systematic name is *Leuciscus idus;* of vernacular names those of "Aland" and "Nerfling" are those most generally used in Germany, while the Swedes know it by the name of "Id." The name "orfe" refers to the golden colored variety only, which has been cultivated for centuries in inclosed waters in Bavaria. Willughby knew it well; he says in his "Historia Piscium" (Oxon, fol., 1686), p. 253: "At Augsburg we saw a most beautiful fish, which they call the 'Root oerve,' from its vermilion color, like that of a pippin apple, with which the whole body is covered, except the lower side, which is white."

As in the golden tench, individuals of pure golden-yellow tints are scarce, the majority retaining marks of their origin from a plain colored ancestry in brownish spots or blotches on some part of their body. The ordinary size of this species is ten or twelve inches (and this is about the size of those at the Exhibition); but it is known to have attained to double that size and to a weight of six pounds.

The orfe will thrive in all inclosed waters suitable to roach and goldfish; as an ornamental fish it is preferable to the latter on account of its larger size, livelier habits, and rapid reproduction; it takes the bait, and is eaten in Bavaria. As an ornamental domestic fish the goldfish will always hold its own, but for waters of any extent and free from pike and perch we know of no more ornamental fish than the orfe, a worthy rival of the golden tench.

Fish as Food.

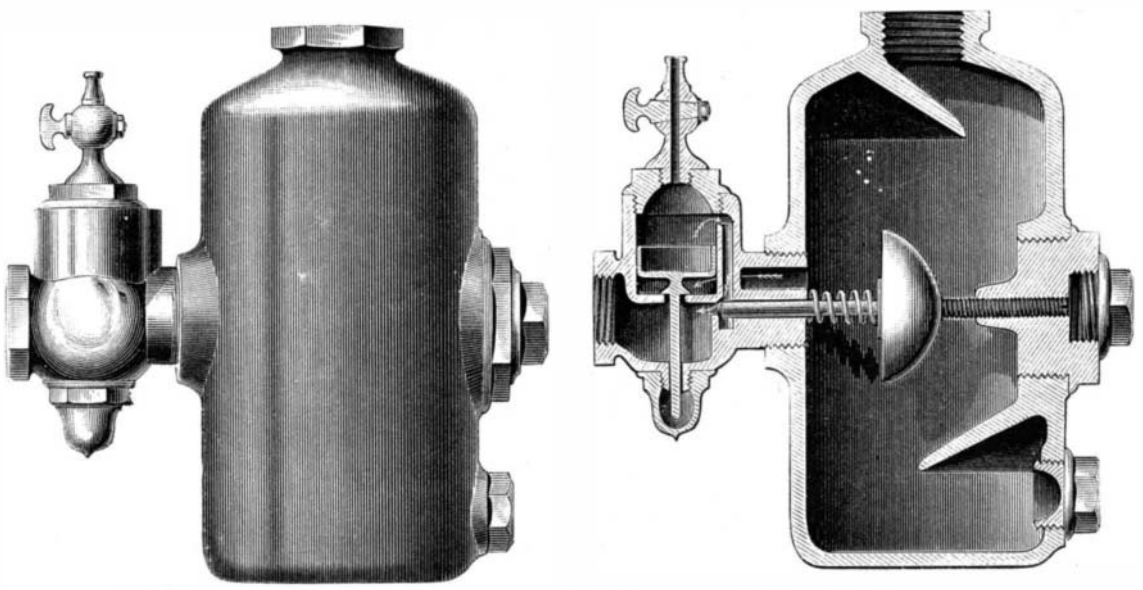
Sir Henry Thompson recently delivered a lecture on "Fish as Food." It was an able summary of the known facts about fish, but Sir Henry went too far in his denunciation of the notion that fish eating increases brain power as a "complete fallacy." It has long been perfectly well known to physiologists that the phosphorus theory must be discarded, but it is a fact beyond dispute that fish is a form of food which is easily digested, and proves specially nutritive to the bodies of brain workers. Sir Henry Thompson thinks that the only way it acts is by putting a man's body into proper relation with the work he has to do. This may be quite true, and doubtless is so, but the brain is an integral part of the body. Moreover, it comprehends a considerable number of the most important centers of the nervous system, whence the body as a whole derives its power. Therefore, in putting a man's body in proper relation with his work, fish may chiefly act by supplying his nervous system with specially available nutriment.—*Lancet.*

NEW EXPANSION TRAP.

We illustrate the Curtis expansion trap, in which, in very compact form and with simple and durable mechanism, the objections to former traps have been overcome. With this trap steam users can utilize the enormous amount of heat which is contained in water at a temperature above 212° as compared with steam (volume for volume), and which is lost when the water is discharged above 212°, as it is by the use of a float trap which must discharge it as soon as it becomes water, regardless of its temperature; while with the Curtis trap the water may be discharged at 210° or any less degree of temperature. The operation of this trap is as follows:

The sectional view shows a main valve, lifted by a very loose fitting piston; a passage connecting the top of the piston with the outlet; a very small valve controlling that passage (by means of an expansion vessel and a stiff spring); and a mud drum, which can be cleaned by taking off the lower cap.

The principle upon which it works is the change of pressure on the top of the piston, the pressure underneath remaining constant (being the same as the pressure in the trap).



CURTIS EXPANSION TRAP.—EXTERNAL AND SECTIONAL VIEWS.

The operation is as follows: The trap is cold, and the flexible surface of the expansion vessel is pushed back by the stiff spring, thus opening the small valve. The opening of this valve connects the top of the piston with the outlet (under the seat of the main valve), and, relieving the pressure on top of the piston, permits the pressure underneath to raise the outlet valve for a free discharge.

Steam being let on, all the air and water in the pipes flow out freely, until the temperature of the water reaches the point at which the trap is set to close. At this point the expansion in the vessel is sufficient to force the secondary valve toward its seat. This restrains the movement of water through the connecting passage, thereby increasing pressure on top of the piston; which pressure forces the outlet valve toward its seat, and diminishes the flow of the water, delivering it only at the temperature at which the trap is set to deliver. The cap at the back can be taken off while pressure is on, and the degree of temperature raised by turning back, with a screw driver, and lowered by turning forward. It is claimed that this trap will fully control the outlet valve on a change of temperature of 5°.

The following are some of the advantages of these traps, which will commend them to those who have had large experience in the use of traps: The outlet valve, having an exceptionally large area (nearly four times as large as other traps with same sized connections), rapidly delivers great quantities of water, if present in the trap. The outlet valve, being located outside the body of the trap, can be cleaned and put in order by removing a simple cap.

The trap closing only by temperature, it follows that the air in the connecting pipes will pass out as fast as steam will displace it, the valve closing only when steam reaches it. This trap has no glands or friction, and no joints to leak. Any trap will work equally well under high or low pressure.

It is small and perfectly supported on the connecting pipes, saving expense in location and transportation. It has a mud drum to catch sediment, and an opening to remove it, and is handsomely finished, so that it may be located anywhere in sight and be accessible.

This trap is manufactured by the Curtis Regulator Company, 59 Beverly Street, Boston, Mass., having general agencies at 109 Liberty St., New York; 86 and 88 Market St., Chicago; 925 Market St., Philadelphia; and corner Holliday and Saratoga Sts., Baltimore.

Gold Reactions.

If we pour into a small phial a few drops of a dilute solution of gold chloride, some drops of arsenic acid, two or three drops of ferric chloride and the same quantity of hydrochloric acid, and about 10 c. c. of water, and introduce a fragment of zinc, the liquid soon takes a purple color in the neighborhood of the zinc, and on shaking takes throughout a fine rose or purple color. The experiment thus conducted may last for half an hour, but it is completed in a few moments if we use some centigrammes of zinc powder and shake the phial. The rosé coloration is also immediate if we pour into the solution of the salt of gold, prepared in the same manner, some drops of the liquid obtained by attacking metallic iron with dilute hydrochloric acid, or, better, by heating with a mixture of hydrochloric acid and arsenic acid. It is diluted with water, and left in contact with an excess of metal. This reaction is extremely sensitive. If one-millionth part of gold is present the change of color is very visible, and it may be distinguished even with a proportion of gold one-half less. The author purposes showing at an early opportunity how the same reaction may be applied in quantitative determinations. If phosphoric is used in place of arsenic acid, the coloration is blue or violet. Hydrochloric acid alone gives a rose coloration, but less bright than with the addition of arsenic acid.—*Ad. Carnot.*

THE disposal of town's refuse by sending it in a special sewage steamer eight or nine miles to sea and then dropping it into not less than 16 or 17 fathoms of water, is a method adopted by the Corporation of Liverpool. Messrs. W. Simons & Co., of Renfrew, have just constructed a second steamer to carry 800 tons of sewage—that is, twice the size of the first one, which has now been in use for some time by the corporation with good results. The same method has been practiced at New York for several years.

The First Electric Telegraph.

The idea of the practical application of the electric telegraph to the transmission of messages was first suggested by an anonymous correspondent of the *Scots Magazine* in a letter dated Renfrew, February 1, 1753, signed C. M., and entitled "An Expeditious Method of Conveying Intelligence." After very considerable trouble Sir David Brewster identified the writer as Charles Morrison, a native of Greenock, who was bred a surgeon, and experimented so largely in science that he was regarded in Renfrew as a wizard, and eventually found it convenient to leave that town and settle in Virginia, where he died. Mr. Morrison sent an account of his experiments to Sir Hans Sloane, the President of the Royal Society, in addition to publishing them anonymously, as stated above. The letter set forth a scheme by which a number of wires, equal to the letters of the alphabet, should be extended horizontally, parallel to one another, and about 1 inch apart, between two places. At every twenty yards they were to be carried on glass supports, and at each end they were to project 6 inches beyond the last support, and have sufficient strength and elasticity to recover their situation after having been brought into contact with an electric gun barrel placed at right angles to their length about an inch below them. Close by the last supporting glass a ball was to be suspended from each wire, and at about a sixth or an eighth of an inch below the balls the letters of the alphabet were to be placed on bits of paper, or any substance light enough to rise to the electrified ball, and so contrived that each might reassume its proper place when dropped. With an apparatus thus constructed the conversation with the distant end of the wires was carried on by depressing successively the ends of the wires corresponding to the letters of the words, until they made contact with the electric gun barrel, when immediately the same characters would rise to the electrified balls at the far station. Another method consisted in the substitution of bells in place of the letters; these were sounded by the electric spark breaking against them. According to another plan, the wires could be kept constantly charged, and the signal sent by discharging them. Mr. Morrison's experiments did not extend over circuits longer than forty yards, but he had every confidence that the range of action could be greatly lengthened if due care were given to the insulation of the wires.

A JARDINIERE, BIRD CAGE, AND AQUARIUM COMBINED.

A correspondent of *La Nature* communicates to that journal a description of a cheap and easily constructed ornamental object that possesses the novelty of being an aquarium, a bird cage, and a jardiniere all in one.

It consists of a large bell glass mounted upon a wooden or iron base, and into the interior of which is introduced a cylindrical glass vessel that has first been loaded with bits of lead or cast iron painted green and other colors, so as to imitate the bed of a spring or clear brook. Upon the bottom of this inner vessel rests a movable perch made of iron rods of small diameter and provided with a foot. The orifice of the cylindrical vessel, as well as that of the bell glass, is covered with wire work having meshes sufficiently wide to admit plenty of air to the birds, while preventing their escape, and sufficiently strong to bear the weight of a row of flower pots.

After the apparatus has thus been constructed birds are introduced into the cylindrical vessel, and gold fish into the water surrounding the latter, while pots of flowers are placed upon the wire work that covers the orifice of the bell glass.

The effect produced upon the spectator by this arrangement is said to be very curious, as the birds seem to be living in the water along with the fish.

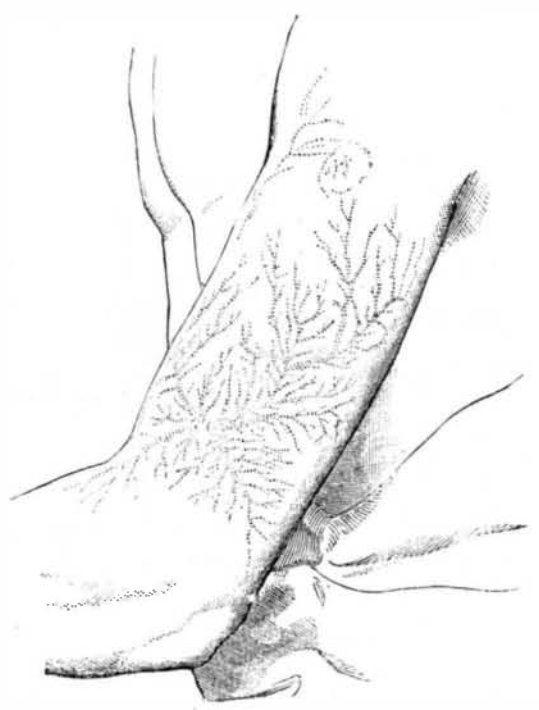
Imported Cattle Disease.

A report of the U. S. Treasury Cattle Commission, under date of August 4, 1883, says that the charges recently made in the British Parliament that American cattle were being received in British ports which were infected with the foot and mouth disease are not true; that the first invasion of the disease into this country was from two English cows brought by way of Montreal, and that "two years ago the steamship France, of the National Line, landed in New York a herd of Channel Island cattle suffering from foot and mouth disease. These were quarantined by the State authorities, and the infection stamped out. The France, however, after an attempted disinfection, shipped a cargo of American beeves for the return voyage, and these, on arrival in England, were condemned as being infected with foot and mouth disease. This was undoubtedly contracted on board ship. The second case is that of the steamship Nessmore, which, in March, 1883, landed in Baltimore a herd of Channel Island cattle suffering from foot and mouth disease. These again were secluded, as soon as detected, by the Pennsylvania authorities, and no evil consequences to our home herds can be traced. But the steamship Nessmore, after an attempted disinfection by the agents, shipped a cargo of American fat cattle, and these, on arrival in England, were found to be suffering from foot and mouth disease. This infection, unquestionably contracted on board ship, appears to have been the main if not the sole occasion of the recent questions and resolution in the British Parliament."

IN Virginia they are making flour of peanuts. In Georgia the nuts are pounded for a pastry.

LIGHTNING PRINTS ON THE HUMAN BODY.

A photograph by Mr. G. Boner, of Duns, N. B., the first of the kind with which we are acquainted, has been shown to us, in which the impression found on the arm of a boy who was recently struck by lightning is most vividly reproduced. An interesting note on the subject will be found in the *Photographic News* of the 6th July. The objections to the popular idea that the delicately traced figures, so very



LIGHTNING PRINTS ON THE HUMAN BODY.

like fern fronds or branches of trees, are caused by the imprint of a near object on the surface of the body are very well put forward. The writer arrives at the conclusion that the markings are caused by the direct action of the electric fluid in paralyzing the nervous system, by causing congestion and redness in the capillary vessels, and the experimental explanation of the tree-like form is clear and satisfactory.—*Lancet.*

[The discharge of static electricity over a very poor conductor, or over a non-conductor when the latter is covered with a film of moisture or dust, assumes an arborescent form, generally spreading in all directions. Discharges of this character from a large inductorium or Holtz machine over a slightly conductive surface are readily produced, and without doubt the lightning picture shown on the arm in the engraving could be readily duplicated by artificial means could a subject be found who would be willing to become a martyr—to that extent—to the cause of science.—ED. S. A.]

BIRDS IN AN AQUARIUM.

Synthesis of Salicine.

Natural salicine occurs in the bark of the willow tree, and is called a *glucoside* because it is easily broken up by the action of dilute acids into glucose (dextrose) and a resinous substance. There are a large number of natural glucosides, but this is the first one that has been produced artificially by synthetical methods. Although, as in all such cases, some of the preliminary steps had been taken by different chemists, the final successful synthesis was accomplished by Prof. Arthur Michael, of Tufts College, Mass.

The substances employed were not those in common use, and we beg our readers not to be frightened by their names, for the substances themselves are perfectly innocent. Helicine, which had previously been prepared by the author from acetchlorhydrose and sodium salicylaldehyde, was dissolved in water and reduced with sodium amalgam. After filtering from mercury the solution was neutralized with carbonic acid and evaporated to dryness, and the residue extracted with alcohol. After several crystallizations the product was found to possess the chemical composition and other properties of natural salicine.

CINNAMIC ACID.

Prof. Michael has also recently produced cinnamic acid by a new synthesis, viz., by heating benzoic aldehyde and malonic acid for several hours in a closed tube at 130°.

Luminosity of Flames.

Sir W. Siemens, in the *Ann. Phys. Chim.*, says that the luminosity of burning gases is a secondary phenomenon dependent on the separation and incandescence of solid particles suspended in the flame. Gases from which no such particles are separated, burn with a feebly luminous flame, and this luminosity is assigned to the incandescence of the gases themselves. No experiments have hitherto been made to ascertain whether pure gases heated to a high temperature really emit light. In order to examine this point the author's brother made a series of observations with a Siemens regenerative oven of the form used in the hard glass manufacture, whereby a temperature of the melting point of steel, 1,500° to 2,000° C., could easily be attained. By a suitable contrivance the interior of the oven could be examined, and it was found that, provided the experimental room was kept perfectly still, the heated air in the oven emitted no light. The introduction of a luminous flame into the oven caused its interior to be only feebly illuminated. As a result of the experiments, it follows that the supposition that the luminosity of the flame is due to the incandescence of the gas is incorrect.

In order to determine the temperature at which luminous waves become non-luminous, the author suggests a repetition of the above experiments with a more refined apparatus. The author further demonstrates that the heat rays emitted from hot gases are very small in number as compared with those emitted from equally hot solid bodies. Observations on the behavior of flames themselves prove equally that the luminosity of flames is not due to the incandescence of the products of combustion. If the gases to be burnt are more quickly mixed the flame becomes shorter, since the process of combustion is accelerated and hotter, since less cold air is mixed with the burning gas. The same phenomenon occurs if the gases are strongly heated before they are burnt; but since the ascending products of combustion are maintained for a short time only at the temperature of the flame, the above phenomenon would be reversed were the gas self-luminous. The luminous part of the flame is separated by a line of demarkation for the products of combustion, and is coincident with the termination of chemical action, which is probably the cause of the emitted light.

If it be assumed that the gas molecules are surrounded with an envelope of ether, then a chemical combination between two or more of the molecules will cause a vibration of the ether particles, which becomes the starting point of the light and heat waves. The luminosity of gases when an electric current is passed through them can be explained in a similar manner, and the author has already observed that all gases are conductors of electricity when their point of so-called polarization maximum has been reached.

New York Stock Quotations Received via Boston.

Much inconvenience was experienced by business men in New York city and in other portions of the country, August 14, by the cutting of the wires that connect the Stock and Gold Exchanges with the offices of business men. But the value of private wires, which were uninjured by the vandals who tried to disable those of the Western Union, was shown by the fact that the private wires of a firm in New York reaching to Boston were the principal means of communication between the two cities for commercial business. The *Sun* says: The firm of H. L. Horton & Co. obtained their quotations very promptly by way of Boston. The gold and stock wires to that city were not cut, and as fast as the figures came out in the Boston branch office of the house they were telegraphed back to the New York offices over the firm's private wire.

THE statistics of Paris lately published establish the claim of the city to be the most cosmopolitan in Europe. Whether it be a thing to be proud of or not, Paris is chiefly inhabited by a population who are not Parisians. Out of 100 residents only 30 are born within the limits of the city; the remaining 70 are provincials and foreigners.