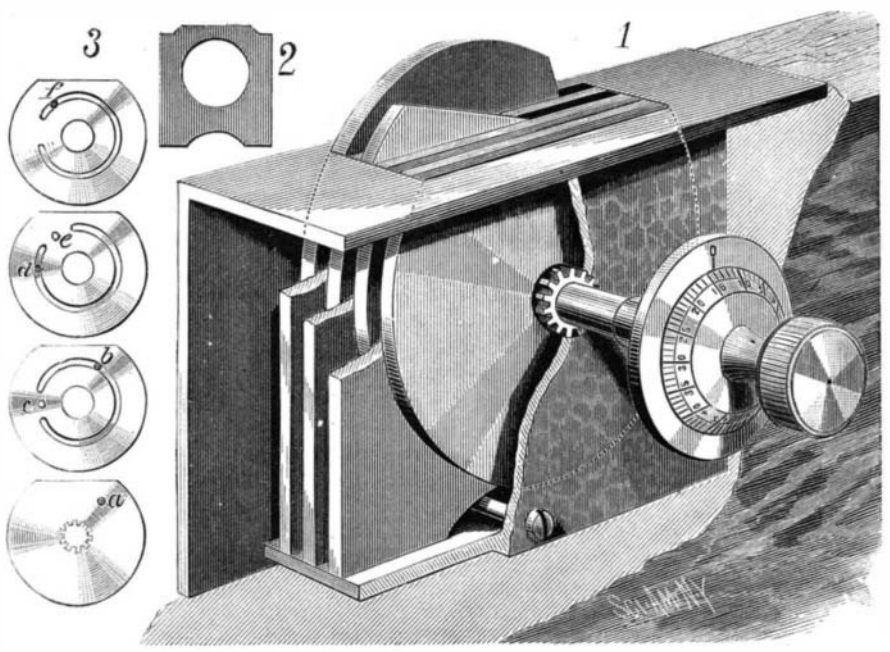
NEW COMBINATION LOCK.

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.

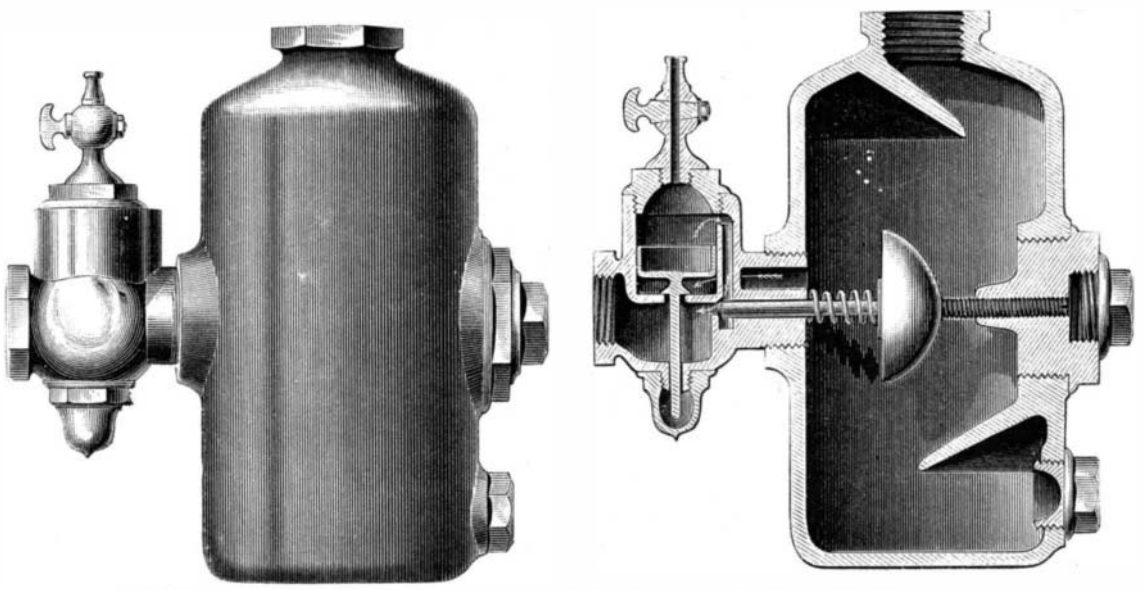
Sir Henry Thompson recently delivered a lecture on "Fish as Food." It was an able summary of the known facts about fish, but Sir Henry went too far in his denunciation of the notion that fish eating increases brain power as a "complete fallacy." It has long been perfectly well known to physiologists 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.