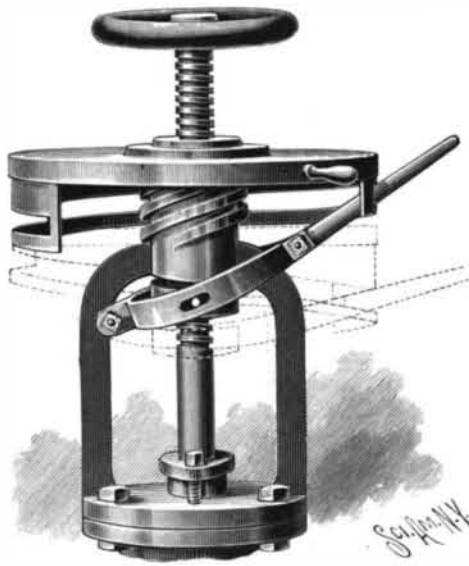


**AN IMPROVED VALVE.**

The illustration represents a valve which can be readily and quickly moved toward or from the valve seat, a cam wheel being arranged to move in the direction of the axis of the valve stem, and a lever controlled by the cam wheel being connected with the nut of the valve stem. The improvement has been patented by Sidney W. Sampson, of Hudson, Mass. A threaded portion of the valve stem screws in a nut fitted to slide in a bearing on a yoke attached to the casing, and the nut is engaged by a lever fulcrumed on the yoke, the lever moving the nut in its bearing in the direction of the axis of the valve stem. The free end of the lever is engaged by a groove of the cam wheel, whose hub has a nut screwing on external screw threads on the bear-



SAMPSON'S VALVE.

ing. When the cam wheel is turned it imparts a swing motion to the lever, and the latter shifts the nut to move the valve toward or from the valve seat, as indicated by the dotted and full lines in the engraving. The stem may be turned in the usual manner, by means of the hand wheel at the top, to adjust the valve relative to its seat, but to quickly open or close the valve the operator makes use of the cam wheel.

**In the Ocean's Depths.**

The temperature at the bottom of the ocean is nearly down to freezing point, and sometimes actually below it, says the Nineteenth Century. There is a total absence of light, as far as sunlight is concerned, and there is an enormous pressure, reckoned at about one ton to the square inch in every 1,000 fathoms, which is 160 times greater than that of the atmosphere we live in. At 2,500 fathoms the pressure is thirty times more powerful than the steam pressure of a locomotive when drawing a train. As late as 1880 a leading zoologist explained the existence of deep sea animals at such depths by assuming that their bodies were composed of solids and liquids of great density, and contained no air. This, however, is not the case with deep sea fish, which are provided with air-inflated swimming bladders. If one of these fish, in full chase after its prey, happens to ascend beyond a certain level, its bladder becomes distended with the decreased pressure, and carries it, in spite of all its efforts, still higher in its course. In fact, members of this unfortunate class are liable to become victims to the unusual accident of falling upward, and no doubt meet with a violent death soon after leaving their accustomed level, and long before their bodies reach the surface in a distorted and unnatural state. Even ground sharks, brought up from a depth of no more than 500 fathoms, expire before they gain the surface.

The fauna of the deep sea—with a few exceptions hitherto only known as fossils—are new, and specially modified forms of families and genera inhabiting shallow waters in modern times, and have been driven down to the depths of the ocean by their more powerful rivals in the battle of life, much as the ancient Britons were compelled to withdraw to the barren and inaccessible fastnesses of Wales. Some of their organs have undergone considerable modification in correspondence to the changed conditions of their new habitats. Thus down to 900 fathoms their eyes have generally become enlarged, to make the best of the faint light which may possibly penetrate there. After 1,000 fathoms these organs are either still further enlarged or so greatly reduced that in some species they disappear altogether and are replaced by enormously long feelers. The only light at great depths which would enable large eyes to be of any service is the phosphorescence of deep sea animals.

We know that at the surface this light is often very powerful, and Sir Wyville Thomson has recorded one occasion on which the sea at night was "a perfect blaze of phosphorescence, so strong that lights and shadows were thrown on the sails and it was easy to read the smallest print." It is thought possible by several naturalists that certain portions of the sea bottom

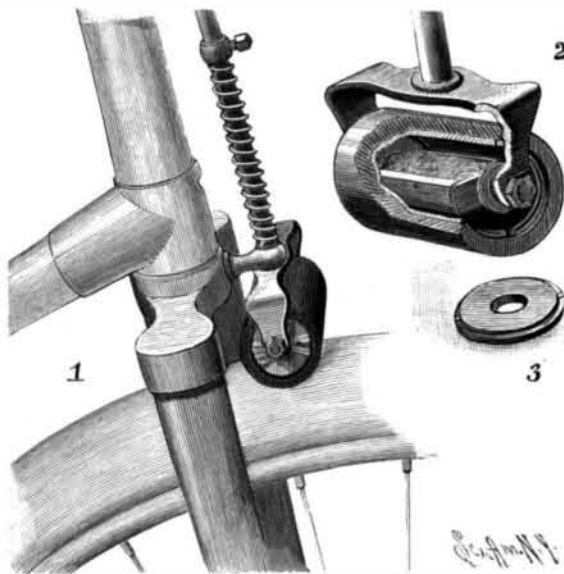
may be as brilliantly illumined by this sort of light as the streets of a European city after sunset. Some deep sea fish have two parallel rows of small circular phosphorescent organs running along the whole length of their bodies, and as they glide through the dark waters of the profound abysses they must look like model mail ships with rows of shining portholes.

**Jumping Beans.**

Mr. Yeatman Woolf, writing to the Pall Mall Gazette, says he has had experiments in hand with the so-called "jumping beans" for the last two years, and he finds that the apparent leaps are an illusion due to the eccentric shape of the beans, and the character of certain of the complicated movements thereby rendered possible. In support of his contention he mentions that, after carefully removing the woody fiber of some beans so as to leave intact the silken bags containing the live maggots, the beans, despite the decrease of weight, although they still continued to move, did not appear to lift themselves at all from the sheet of blackened glass upon which they lay. He claims to have been able to thoroughly clear up the cause of the motive power by keeping many maggots in artificial wax houses with windows inserted. When the grub has covered up an aperture with its silk, it afterward darkens the same with juices formed out of the excreta, until it assumes a brownish color. In one instance a bean was found to contain a parasite (ichneumon) tucked up alongside the cocoon, but dead. From the fact of the interior of the bean having a silk lining similar to all those containing maggots, and from the excreta, it is presumed that the ichneumon parasite had eaten the caterpillar.

**A NEW ROLLER BICYCLE BRAKE.**

The great danger of injuring or destroying the pneumatic tire by using a fixed brake has heretofore been the principal reason why so many wheels have been put on the market without brakes. The roller brake, which has been used to some extent, is not open to the objection made to the fixed brake, but such a brake, which depends for its action upon friction produced simply by the bearing of the revolving roller upon the tire, has been found inefficient. The illustration represents a new and improved form of roller brake, recently patented by Wm. L. Stewart, of Wilmerding, Pa., in which the wearing friction is taken off the tire and borne by inner friction bearings within the brake roller, the latter having an outer shell of vulcanized fiber, which presents a hard and entirely smooth surface, almost entirely unaffected by heat, cold or moisture. Fig. 1 represents the improved brake in place on a wheel, Fig. 2 showing the inside of the brake roller, and Fig. 3 the cap by which the interior of the roller is made dust tight. The roller shell is lined with a cylinder turned from tool steel and case hardened, and the brake shoe, also made of steel and having on its side edges a facing of thin brass or copper, has a bearing on both sides on the inner wall of the cylinder when the brake is applied, this being effected by downward pressure on the plunger rod, the trunnions of the shoe being



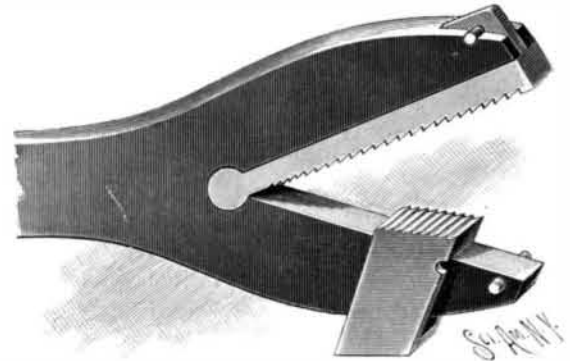
STEWART'S BICYCLE BRAKE.

journalled in the opposite members of a yoke on the lower end of the rod. The brass or copper facing of the friction edges of the shoe may be readily removed and another facing inserted when necessary, and centrally in the shoe is a space in which may be placed asbestos or other fibrous substance saturated with sufficient lubricant to serve for a long period. A bowed spring on top of the shoe (not shown in the illustration) holds the parts from rattling at all times. The brake has already been extensively tried and found to work easily and powerfully to check up or preserve uniform speed of the wheel in descending steep grades.

A BICYCLE stable is a recent contrivance. It consists of a case into which the wheel fits snugly, and when covered up resembles a desk.

**AN ADJUSTABLE PIPE WRENCH.**

A wrench of the alligator style, especially adapted for gripping pipes, rods, etc., is shown in the accompanying illustration, and has been patented by John H. Jenner, of Leavenworth, Ind. Its stock is formed with forked members, in the upper one of which is a removable toothed jaw, at whose inner end is a circular offset fitting into a correspondingly shaped recess in the stock, while at its outer end is an upwardly extending lug which enters a slot in the outer end of the upper member of the stock, where it is held in place by a pin. By removing the pin the jaw may be swung inward and readily disengaged from the stock, to be replaced by a new one when desired. The lower jaw is preferably made in the shape of a casing adapted to slide on the



JENNER'S WRENCH.

lower forked member of the stock, and is prevented from dropping off the member by a pin, on removing which the jaw may be removed and replaced. As the lower jaw may be readily slipped or shifted along the member, according to the size of the article to be gripped, the wrench may be quickly adjusted for a wide variety of work.

**The Antiquity of Chess.**

The latest excavations on the pyramid field of Sakkara have led to an extraordinary discovery as to the origin of chess, says the New York Evening Post. Hitherto it was assumed that the ancient Indians had invented the game, that it was introduced from India to Persia in the sixth century, and that by the Arabs, and in consequence of the crusades it spread from East to West. This theory was substantiated by the fact that an Indian, Persian, and Arabic influence is traceable in the character of the figures at present used and in some of the words connected with the game, such as "shah" (check) and "matt" (mate). Now, north of the pyramid of King Tetu or Teti, two grave chambers have been discovered which were erected for two high officials of that ruler. Their names were Kabin and Mernker, called Mera. The grave chamber ("mastaba") of the former consisted of five rooms, built up with limestone. Its walls are covered with exceedingly well preserved bass reliefs and pictures representing various scenes. The other grave chamber, that of Mera, is the most valuable. Up to now no fewer than twenty-seven halls and corridors have been uncovered. There are beautiful grave columns, in the chief room there is a niche a tinted statue of the departed, about seven feet high, with a sacrificial table of alabaster before it. Among the many wall paintings in this and other rooms, hunting and fishing scenes, a group of female mourners, the three seasons, Mera and his sons, holding each other by the hand, and Mera playing chess, are to be seen. King Tetu belonged to the sixth dynasty, and his reign was assigned by Prof. Lepsius to about the year 2700 B. C. Prof. Brugsch, correcting this chronology, puts it back to still greater antiquity, namely, to the year 3300 B. C., so that chess would have been known in the once mysterious land of Mizraim something like 5,200 years ago.

**Cause of Landslides.**

Because of the many landslides that have occurred on the line of the Canadian Pacific Railway in British Columbia, Col. Robert B. Stanton, M. Am. Soc. C.E., and Mr. James D. Schuyler, M. Am. Soc. C.E., were lately appointed a board of experts to examine into the matter for the railway company. As a result of this investigation, an action has been brought by the Canadian Pacific Railway Company to secure an injunction against the farmers on the Thompson River to prevent them from further irrigating land contiguous to the railways, this irrigation having already caused landslides which have swept down upon the tracks of the company. Along this river the land rises in benches extending from 50 to 500 feet above the river. The soil is gravelly, with a clay subsoil. The farmers irrigate their lands by water from creeks back in the mountains, and the land is sliding downward apparently on the slippery clay subsoil. In one place 66 acres have slid down in a mass, and the experts estimate the volume of one of these slides at 32,000,000 tons. At times, says the Railway Review, the railway track has been shoved five feet out of line in one night, causing great outlay in reconstruction. The jury has found in favor of the railway company, ascribing the slides to the irrigation.