

REMARKABLE PHOSPHORESCENT ANIMALS.

BY CHARLES FREDERICK HOLDER.

For some reason the Pacific coast of the United States, particularly California, has always been famous for its displays of phosphorescence—that strange phenomenon over which many men have spent years of study, and which, to a large extent, is still mysterious and unexplainable, though it should be said there are not theories and pseudo-explanations lacking.

The islands of Southern California from the Coronados to the Santa Catalina group of four, opposite Los Angeles County, to the Santa Barbara group of four in the channel of that name, are the points most available for observation, due to the peculiarities of the coast. The Coronados, Santa Catalina, San Clemente, Anacapa, Santa Cruz, Santa Rosa, and San Miguel all lie more or less parallel to the coast, affording that necessary feature for extended investigations—a perfect lee; the water often being so smooth that it is difficult to believe one's self at sea.

As these islands all rise out of the blue depths of the ocean, and are washed by offshore currents, they afford a remarkable field for the zoologist, and it can be said that there is hardly an animal obtainable from the Naples aquarium that cannot be found, or its prototype, along these shores from Point Conception above Santa Barbara to San Diego. The observer is particularly impressed with the richness of the invertebrates found here, ranging from giant jelly fishes twenty feet in length, which in all sizes often appear to fill the sea, to the graceful Porpita, Velella, and Physalia, and during the late winter months the delicate paper nautilus is sometimes found, and has been kept alive and watched.

Students of animal phosphorescence have read of the Pyrosoma, one of the Ascidians whose wonders of light have made it famous. One of these beautiful animals was caught off Avalon Bay some time ago, and in all probability the first photograph of the animal ever taken is shown in the accompanying illustration. It was first seen as a blaze of light as large as a bucket, ten or more feet below the surface, and supposed to be a large jelly fish; but as it was watched through the window of a glass-bottom boat, it was seen to rise and to be long and cylindrical. The finder called it a "fire barrel," not an exaggeration, as when the strange object reached the surface it was seen to be barrel shaped, about a foot in length, open at one end and emitting a faint light; but the moment it was touched as the finder placed his hands beneath it, it blazed out in a vivid glare of green silvery light. The discoverers were not naturalists, but they saw that the animal was alive, and that a stream of water was pouring from the open end, forcing the strange object along. It was caught in a pail and successfully placed in a tank, and doubtless the first large Pyrosoma seen alive in America was closely observed. It would be difficult to exaggerate the beauties of this animal. In a specimen the writer kept in a dark room in the Gulf of Mexico, by stirring it with a stick, light was produced sufficient to read medium-size print, and the sight was a ghostly one, the large type standing out with marvelous distinctness.

At certain times the Pyrosoma is fairly common in the San Clemente channel, but specimens larger than a foot or so have never been seen. It is in the tropics that the animal is at its best. Moseley describes one as follows: "The most beautiful kind of phosphorescence is, however, that of the Ascidian colony of Pyrosoma. This, when stimulated by a touch, a shake, or a swirl of the water, gives out a bright globe of bluish light which lasts for several seconds . . . and then goes out suddenly. A giant Pyrosoma was caught by us in the deep-sea trawl. It was like a great sac, with its walls of jelly about an inch in thickness. It was four feet long and ten inches in diameter. When a Pyrosoma is stimulated by having its surface touched, the phosphorescent light breaks out just at the spot stimulated and then spreads over the surface of the colony to the surrounding animals. I wrote my name with my finger on the surface of the giant Pyrosoma as it lay on deck, and my name came out in a few seconds in letters of fire."

The Pyrosoma, as soft, jellylike, and insignificant as it appears, stands high among the great branches of animal life, being a tunicate in the order Chordata, leading up to the fishes, the larvæ of some forms showing a notocord believed to be a primitive vertebra or backbone.

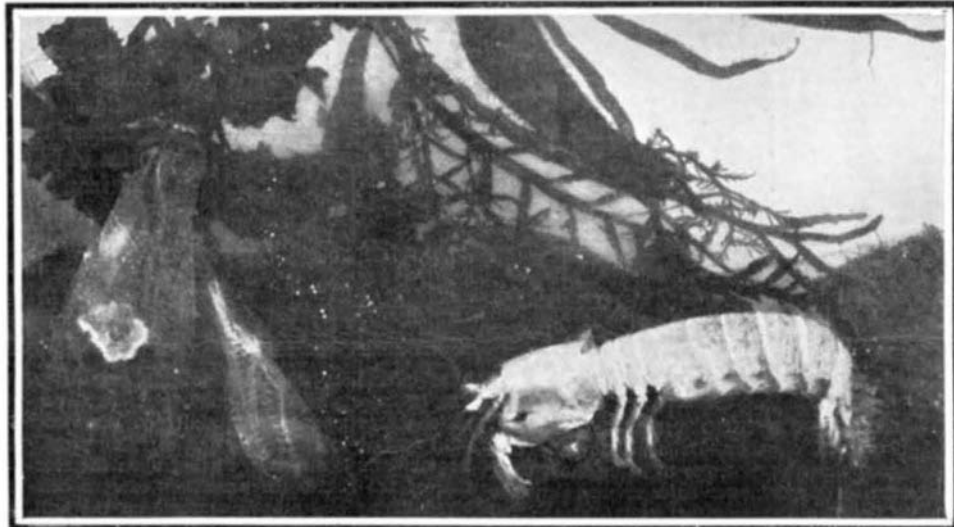
Humboldt has described the radiant beauties of these fire bodies as he saw them like stars in the bed of the ocean; and so brilliant was their light, that he could distinguish fishes by their radiance. The Pyrosoma or fire body has on many occasions astonished observ-

ers by its splendid light that varies in tint and color. Thus those observed by Bennett, the English naturalist, gave out a splendid pale greenish light, while M. Peron, the French zoologist, met a school of them near the Isles of France, and describes them as resembling



Luminous Living Heteropod from Avalon Bay, California.

"red-hot balls of iron." In all probability, Bibra, the Brazilian naturalist, was the first to utilize their light when he placed six small specimens in a swinging glass in his cabin, and used their brilliant light as a lamp, by which he wrote a description of the animals and their beauties. Sir Wyville Thompson, referring



Salpa (*Cyclosalpa affinis*).

Squilla.

Photographs of Two Living Luminous Animals.

to the blaze of phosphorescence and train of intense brightness that followed the ship, while he did not use them in his cabin as lamps, says: "It was an easy matter to read the smallest print sitting at the after port in my cabin; and the bows shed on either side rapidly widening spaces of radiance so vivid as to



The "Firebarrel" or Pyrosoma. Photograph from Life.

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throw the sails and rigging into lights and shadows." The animal resembles faceted jelly, and is really a colony made up of innumerable pseudo-individuals bound together by insoluble ties. Each individual in feeding draws water from the outside and ejects it on the inner side; and as countless jets are being forced out, a stream is formed which forces the entire colony along in the direction it happens to be headed. The light of the Atlantic forms is an intense green, but in very large individuals it is blue. When handled, a peculiar albuminous substance is exuded that is also phosphorescent. The impression is conveyed that the entire animal is luminous, but this is not so. In the illustration little tubercle-like objects are seen covering the animal. Each indicates a zooid, and each of the latter has two luminous spots, according to Panceri, "situated over the position of the ganglia of the nervous system." At times the Pyrosoma does not show a light, but if it is disturbed or injured, the light will start at the point of impact, and spread with wonderful rapidity from point to point until the entire mass is ablaze with light.

It is well known that some of the most remarkable light-givers are crabs, and of all the crustaceans the one shown in the accompanying photograph is perhaps among the most interesting. The writer kept several from the Atlantic and the Gulf of Mexico, and had never noticed their phosphorescence. A large and beautiful specimen was dredged off Avalon Bay, California, and placed in a tank, that its beauties of color—red, blue, purple, and green—might be observed. It happened that in looking at the tank one night the squilla was seen to be surrounded by a peculiar light, which examination showed came from the ventral fillets, or some part of them, sufficient to make the strange crustacean stand out in lines of gold. The animal, at least in the Pacific waters, is a deep-water form, and one of the most attractive of all marine animals in its marvelous coloring. It is very active, having a wonderful swimming apparatus, darting about with great velocity.

In the waters, twenty miles off San Pedro, may be seen the Salpa, a wonderful light-giver. Chains of them ten or even twenty feet long have been placed in tanks, and their light witnessed at night. Of all the luminous animals, these are among the most wonderful. In the illustration the claspers are seen on the upper end. The light is confined to the so-called nucleus of the animal, and bodies of water twenty miles square have been seen glowing with light and color from them. In some, the light is silvery, in others red or blue, while some refuse to respond. The writer has seen the Santa Catalina channel, which is from eighteen to twenty miles wide and practically forty-five miles long, off Los Angeles County, so filled with these radiant creatures that as far as the eye could see they were the fraction of an inch above the surface and gleaming like gems in the sunlight. They constitute the food of the whalebone whales, and many of the large animals were seen at this time reveling every day in the delicacy.

Interesting light-givers are the low Heteropods—the dazzling white, seemingly shapeless forms shown in the accompanying photographs. They float slowly in the water, and are common in Avalon Bay in summer, and often seen floating in the clear blue water. It is difficult to locate the seat of the light in them. Those observed by the writer, when irritated, gave out a light seemingly over the entire surface, but Giglioli refers to one in which the light was red and confined to the axis of the body. They are lowly but interesting creatures, with transparent bodies, a sucker-like organ by which they can cling to the weed, and a long powerful tail or swimming organ. Some of these forms have minute shells; others are shell-less. The Phyllirhœ, a free-swimming, sluglike mollusk, common here, is a brilliant light-giver; a dangerous possession, it would seem, as it is a signal that cannot fail to attract the attention of marauding fishes. The sight of these waters at night is at times awe-inspiring. One glances down into the depths, and sees myriads of forms passing and repassing, all blazing with this mysterious light.

The production of aluminium in the United States has increased nearly ten-fold in as many years, according to the annual report of the United States Geological Survey for 1904, which has just been completed. The output of 1904 was 8,600,000 pounds, as compared with 7,500,000 pounds in 1903, and 7,300,000 pounds in 1902. When it is remembered that the industry dates its beginning from 1883, in which year the production was 83 pounds, its rapid development will be appreciated.

Action of Mineral Substances on Milk.

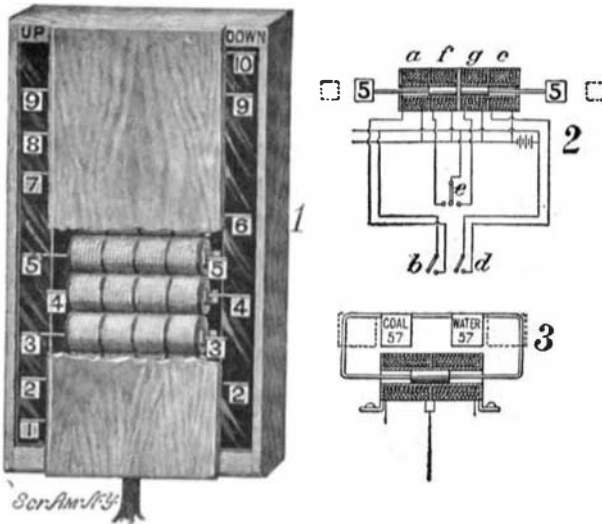
Experiments have been made as follows: (1) On lime in the form of milk of lime; (2) on chlorine, in the form of sea-salt; (3) on phosphoric acid (phosphate of lime); (4) on iron (neutral acetate of iron). The animals received as nourishment green herbage, *ad libitum*, and a daily ration of half a kilogramme of linseed oilcake and half a kilogramme of malt grains.

The results of the tests may be summed up as follows: (1) The mineral substances, lime, chlorine, iron, and phosphoric acid, in combination with the nourishment of the cows, do not sensibly modify the quantity of the milk produced, or its proportion of fatty matters. (2) The total percentage of ash in the milk of the cow is very constant; it is scarcely influenced by the absorption in noticeable quantities of mineral substances. (3) Among the mineral substances experimented on in analysis, lime is that which is found in the most variable proportions in the ash, proportions which may be somewhat influenced by the alimentation. (4) The percentage of lime in the ash may be raised by several centesimal units (3 to 6 per cent) from the fact of the absorption by the animals of important quantities of lime. (5) This absorption may augment, not only the percentage of lime in the ash, but also that of a given quantity of milk. (6) The increase of the percentage of lime in the ash or the milk takes place, not only with the absorption of caustic lime, but also with that of lime phosphate. (7) Nevertheless, the increase in the percentage of lime in the milk consequent upon the alimentation is so slight that it is of no importance in regard to the properties of the milk; besides, it is restricted to narrow limits of the percentage of lime in the produce of different cows. (8) The absorption of sea-salt by the animals does not increase the percentage of chlorine. Even for portions higher than the animals can support, the increase in the percentage is scarcely perceptible. (9) The percentage of chlorine in the milk increases very considerably with the progress of the period of lactation, independently of saline alimentation. (10) The percentage of phosphoric acid, as well of the milk as of its ash, is not at all affected by considerable quantities of this substance, at least in the form of lime phosphate. The question whether the increase of the proportion of phosphoric acid in the milk only fails when this already contains a high proportion of it, has not yet been settled; it is

not impossible that in the case of a milk otherwise poor in phosphoric acid, this proportion may increase as a consequence of a phosphate alimentation. (11) The percentage of iron in the milk is not sensibly affected by alimentation.—Condensed from the French of M. Schulte. Communication to the Fédération Internationale de Laiterie.

AN IMPROVED ANNUNCIATOR.

A recent invention provides an annunciator in which there are no mechanical devices of any kind for moving the signals into view. Instead, a series of solenoids is used and the signals are attached to the floating cores of these solenoids. Each solenoid comprises two coils, one of which is energized to move the signal into view, while the other is used to withdraw the signal. The core is either square or oval in cross section and fits into a bore of similar outline. This holds the signal in an upright position, preventing it from falling over. In Fig. 1 we show the annunciator as applied to an elevator car and a diagram of the electrical connections is shown in Fig. 2. It will be observed that the solenoids are arranged in pairs, those on one side for operating the "up" signals, and those on the opposite side for operating the "down" signals. The outer coils, *a*, of the "up" solenoids are respectively connected to the switches or

**AN IMPROVED ANNUNCIATOR.**

buttons, *b*, on the different floors, and the coils, *c*, of the "down" solenoids are connected to the buttons, *d*. The operator can thus signal his desire to ride up or down from any floor, in the usual manner. The inner coils of the solenoids are all operated by a common switch, *e*. The switch may be thrown to one side to energize the coils, *f*, and thus withdraw all the "up" signals, or to the other side to energize the coils, *g*, and thus withdraw the "down" signals. The absence of any levers or other mechanical devices for moving the signals renders the apparatus very compact. The annunciator illustrated measures but 5 inches by 8½ and is only 1¼ inches thick. It can be used either on a main or a battery current and can be wired to withdraw any single signal on either the "up" or the "down" side or to withdraw all the "up" and "down" signals at a single touch of the push button. In Fig. 3, a modification is shown which may be used in hotels. The solenoids comprise two coils as in the construction just described, but each solenoid is arranged to exhibit either of two signals. When one coil is energized one of the signals is brought into view and when the other is energized the other signal is exhibited. The signals are withdrawn by energizing both coils at once, when the core is moved to the neutral position, as shown in the drawing. Messrs. James and William Patten, 2535 Eighth Avenue, New York city, N. Y., have recently procured a patent on this improved annunciator.

Aeronautical Note.

In addition to the \$10,000 prize already offered by M. Deutsch for first covering a certain specified course in the air above Paris with a flying machine of the "heavier than air" type, this gentleman has recently given a \$2,000 challenge cup which is to be competed for by all kinds of aeronautical apparatus and which will be held permanently by the club which wins it three years in succession. The airship or flying machine that goes 100 kilometers (62 miles) to a specified point and returns to the starting place in the quickest time will be declared the winner. A cash prize of \$4,000 will be given in 1906, 1907, and 1908 to the man who pilots the winning machine. Capt. Ferber, of the French army, is having built by the Buchet Company a light-weight motor for a motor-driven aeroplane with which he expects to compete for the Deutsch prizes.

RECENTLY PATENTED INVENTIONS.**Electrical Devices.**

ELECTRIC SWITCH FOR STREET ARC-LAMPS, ETC.—P. H. F. SPIES, New York, N. Y. The object of the inventor is to provide a switch more especially designed for street arc-lamps, chandeliers, and the like and arranged to keep the main-line circuit completely uninterrupted whenever the lamp is cut or lowered for the insertion of new carbons or for repairs or other purposes, the lamp on being returned to its normal position being immediately and automatically cut in without interruption of the main-line circuit.

Of Interest to Farmers.

SICKLE.—P. E. FLETCHER, Ridge, Ore. This sickle mechanism is designed to be used in connection with a harvester, reaper, or binder, the object being to provide a mechanism that will be of comparatively light draft, thus requiring but little power to run it, and further, to employ a very thin sickle-blade that may be readily sharpened with an emery-wheel without removing the blade from the machine.

COMBINED SEEDING AND MANURE-SPREADING MACHINE.—D. TOSCANI, Rocca Imperiale, Italy. The object of the invention is a machine which opens furrows in the ground to receive the grains or seeds, spreads in said furrows the seeds at equidistant intervals, together with the manure necessary for their successive development, and then covers the seeds and the manure spread in the bottoms of the furrows.

MOTOR-PLOW.—H. J. KYLE, Tipton, Ind. The improvement pertains to plows such as used upon farms for tilling the soil. The object of the invention is to produce a plow which will be advanced by a motor carried on the framework thereof. Special objects are to provide operating mechanism which is of simple construction and which enables the operation of the plow to be easily controlled by a person not skilled in mechanical arts.

BINDER ATTACHMENT.—A. WILLIAMS, Joliet, Mont. In the present patent the invention is an improvement in self-binding harvesters, and it has for an object the provision of a novel construction by which to collect and save the grain and grass-seed which are ordinarily wasted off the deck of the binder.

PLOW.—S. S. WEAVER, Carrollton, Mo. The invention relates particularly to a plow intended for preparing the soil for seed, in which plow means are provided for acting on the subsoil at the bottom of the furrow. The object is to provide a device which may be readily attached to existing plows of this class and by means of which the subsoil may

be effectively cultivated and furrows prepared for the reception of the seed.

BALE BINDER AND TIER.—W. C. MORGANS and T. GILLOON, Dubuque, Iowa. It is intended that the device is to be mounted upon the frame of any power baler or one that has a self-feeding arrangement, and it is so arranged that the power may be taken from any shaft of the baler, according to the style and construction thereof. The invention saves time, increases the capacity of the baler, saves the service of tying, saves in the length of wire and therefore its cost.

DEVICE FOR LOADING SUGAR-CANE.—G. D. LUCE, New Orleans, La. A loading attachment to carts and other vehicles for loading sugar-cane or like material is provided by this invention. The device includes a permanently-attached standard adapted to receive removable cranes, which cranes are provided with grapples and with means for raising and lowering the grapples and operating their trips, together with means for swinging the cranes on their supports, the cranes being independent in their action.

Of General Interest.

STEAM-TRAP.—W. BLETSO, Youngstown, Ohio. This improvement relates to a trap of that class in which the steam and water of condensation are entered into a chamber the outlet of which is sealed by a valve and in which when the water attains a certain height in the chamber the valve is opened and the steam-pressure is permitted to discharge the liquid contents of the chamber. Primarily the object is to improve the general design of the trap and provide means for effectually and rapidly operating the discharge-trap.

EXTENSIBLE HANDLE.—D. LAWSON, New York, N. Y. In the present patent the invention has reference to extensible handles—such, for instance, as are used upon shovels and analogous implements for handling coal, and also admitting of general use in instances where longitudinal cylindrical handles are employed. The length of the handles can be changed by the operator at comparatively short intervals.

SELF-FASTENING COTTON-MARKER.—G. W. LONG, Lindsay, Ind. Ter. This invention pertains to improvements in cotton markers, its object being to provide a device which will be self-fastening and one which is simple, cheap, and efficient, one which will remain in place when once attached to a bale of cotton, etc.

MARINE VESSEL.—J. E. JOHNSON, Ishpeming, Mich. The object of this invention is to provide means for propelling marine vessels which will at the same time decrease the resist-

ance offered by the hull to this propulsion. The inventor provides peculiarly-arranged propeller-shafts mounted diagonally on the vessel with respect to water-line and carrying propellers at their lower ends, so that upon the rotation of the shafts the propellers exert a combined lifting and propelling force on the hull, causing it to displace less water, and enabling it to be driven with less resistance.

GARMENT-SUPPORTER.—H. F. NILES, Chicago, Ill. In this case the invention pertains to supports for garments, and more particularly to belt-suspenders for trousers. Its principal objects are to provide a concealed support for such garments as hip-trousers which shall be effective, comfortable, and readily adjustable to the wearer and garment.

DISPLAY DEVICE FOR MILLINERY ARTICLES.—H. SILBERMAN, New York, N. Y. The invention has reference more especially to devices for displaying millinery articles, as ladies' hats and the like, in stores and show-windows and other places; and one of the principal objects thereof is to provide a device of this class which is comparatively inexpensive to manufacture, besides being thoroughly reliable for its purpose and possessing the capacity for long and continued service.

RAZOR-BLADE HOLDER.—J. H. HUNT, Massillon, Ohio. The purpose of the improvement is to provide a readily-operated holder for the blades of safety-razors when it is necessary to hone or strop the same, and, furthermore, to so construct the holder that the blade can be quickly and conveniently introduced into the holder or removed and held firmly between the jaws of the holder during the sharpening process without the use of set-screws or their equivalents.

RAZOR-STROP.—G. W. COLLINS, St. Joseph, Mo. Mr. Collins has found in his experience that many persons who use razors constantly injure them by an improper use of the ordinary swinging strop. The object of the invention is to construct a strop in such a manner that this cannot be done. He avoids the disadvantages of those stropps which have been formed of rigidly-connected straps that could not be adjusted with respect to each other or the supporting means employed.

COMBINED CIGAR CUTTER AND LIGHTER.—W. H. CRAWFORD, Cliftonforge, Va. The invention is an improvement in combined cigar cutters and lighters. The device is entirely automatic in its operation, performs its cycle of movements in proper sequence and always returns the burner into position under the extinguishing-hood, thus preventing waste of fuel from failure to extinguish the flame.

DEVICE FOR TEACHING PENMANSHIP.—R. W. MANUM, Minneapolis, Minn. An en-

velop is employed for containing used and unused practice-sheets to be used by pupils, and means for attaching to the back of envelop a plurality of copy-slips having samples to be followed in any order when practicing examples given. Back of envelop is utilized as a writing-base, upon which practice-sheets are placed. As each line of a practice-sheet is filled out the sheet may be pushed forwardly to temporarily conceal such lines and to bring next succeeding line adjacent to lower edge of the copy-sheet being followed, until all lines of the practice-sheet have been utilized, thus preventing mistakes in copying their writing instead of the exercise on the slip.

UMBRELLA ATTACHMENT.—MARGERET A. BRUNNER, New York, N. Y. In using the device the umbrella is stood near the person and a portion of his garment at a convenient point is placed between inwardly-projecting teeth, whereupon the body of a tassel is slid in the direction to lock the claw to the garment. Rising without noticing the umbrella it will tug at the garment as he moves and he will be apprised that the article is forgotten. It has substantially the appearance of an ordinary umbrella tassel.

COMPUTING DEVICE.—G. M. BROWN, Otto, N. Y. The invention refers to a device for rapidly determining the value of a certain line of goods at a given price without mathematical calculation, and has for its object to produce a device of this character which will have a very large range both in respect to the prices and quantities, which will be very compact in structure and which will be so simple as to render mistakes impossible.

PIPE-WRENCH.—L. V. REMION, San Bernardino, Cal. This wrench is designed especially for use in oil-fields, as in the putting down of pipe-lines. The invention is simple in construction yet efficient in operation, and no complicated mechanism forms part of the wrench. The handles are easily detached. Hence the wrench may be used in a limited space, and when the pipes are properly seated and started power may be used to turn it by means of a belt engaging the wheel-sections. The sections are removable.

HOSE-COUPPING.—M. L. SCANLON, J. S. SCANLON and A. A. ARNOLD, Gallon, Ohio. In this patent the invention has reference to means for rendering hose and pipe couplings water, air, and steam tight. The object had in view by the inventors is the provision of a coupling of this character which shall not only be adapted for effecting an improved coupling of the parts, but be simple of construction and easy to operate.

LINE-FASTENER.—D. W. ROBBINS, New York, N. Y. This device is an improvement for securing the ends of and taking up the slack