BOURRY'S DYNAMOMETRIC GOVERNOR.

The great increase in the adoption of electrical illumination opens up a new field for this governor, which is claimed to be the only one, really practical, that permits of employing the electric light in many works where there is not always an excess of power available. By its aid the power not utilized during certain portions of the day may be automatically distributed among two or more electric generators, which will thus serve as accumulators of electricity, their stored up energy being rendered available for the requirements of illumination. The extreme sensitiveness of this governor also renders it especially useful in rolling mills, saw mills, and other cases where the resistance varies almost constantly, as well as in connection with marine engines. Instead of depending upon variations from the normal speed, the inventor, M. A. Bourry, of Saint-Gall, Switzerland, turns to account the dynamic effect produced by the torsile strain exerted on the shaft, and also the fact that this shaft is subjected to a rotatory force at one end and to a resistance at the other. As a rule, this torsile strain, being neither visible nor palpable, is not immediately utilizable; but, in order to make it serve for the desired purpose, it must be increased artificially, by concentrating it on a single point by means of springs judiciously applied, in the action of which is reflected, as it were, the resistance opposed to the motor. The arrangement adopted by M. Bourry consists in converting all circular strain into rectilineal pressure, which permits of applying the greatest number of the best springs known. These are placed round and near to the shaft, a practice that offers great advantages as regards distribution of the strain, facility of installation, and the replacing of parts. In this way, the inventor obtains a constant, durable, and compact dynamometer, together with a perfect governor, which may be applied to small powers as well as the largest engines, such as those of screw steamers, because it contains no part, without even excepting the springs, that cannot be made as strong as may be required.

The engravings show two types of this governor, applicable to all cases which may possibly occur. In the first arrangement, shown in side elevation at Fig. 1, and in plan at Fig. 2, the appliance is mounted on a special frame, which may be affixed to the floor, to a wall, or to the ceiling. An intermediate shaft is interposed between the motor and the driven shaft, and carries two pulleys, one of which, narrow and loose, receives the belt from the engine, while the other, double the width, for allowing of the manipulation of its belt, transmits the power to wherever it may be required. This second pulley receives its motion from the first by means of a jointed coupling; and, in certain cases, the two pulleys may be replaced by geared wheels.

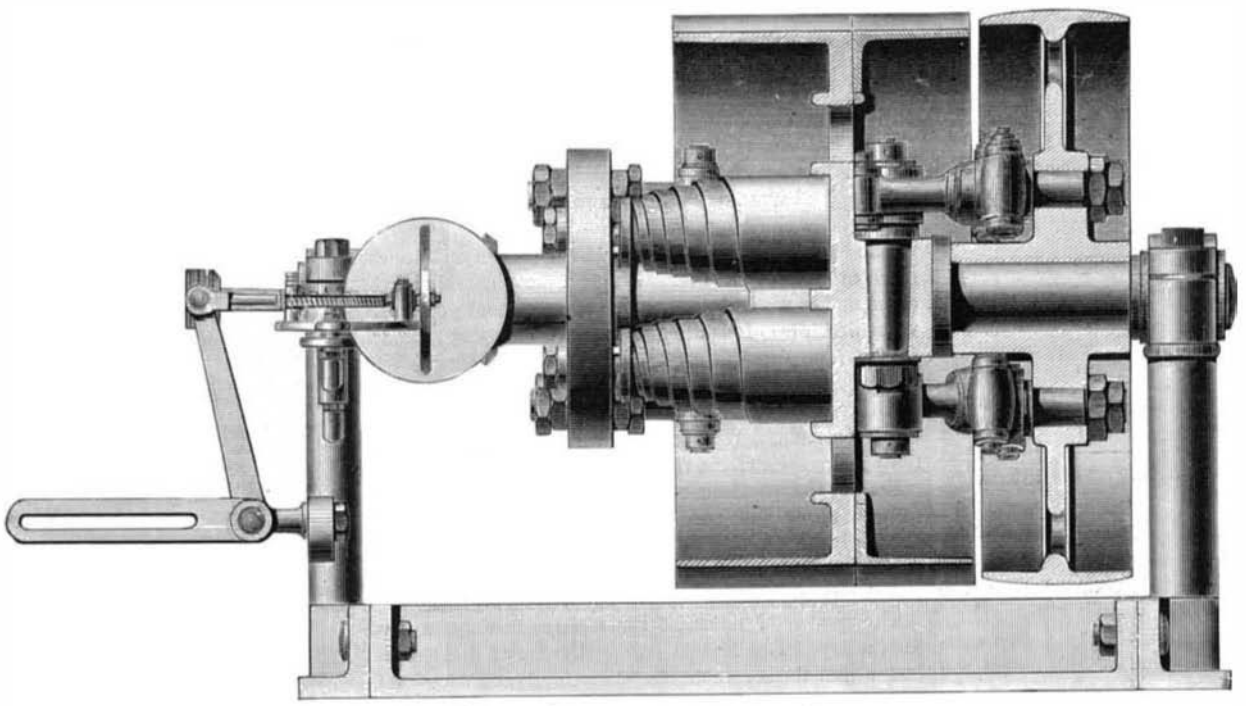


Fig. 1.—BOURRY'S DYNAMOMETRIC GOVERNOR.

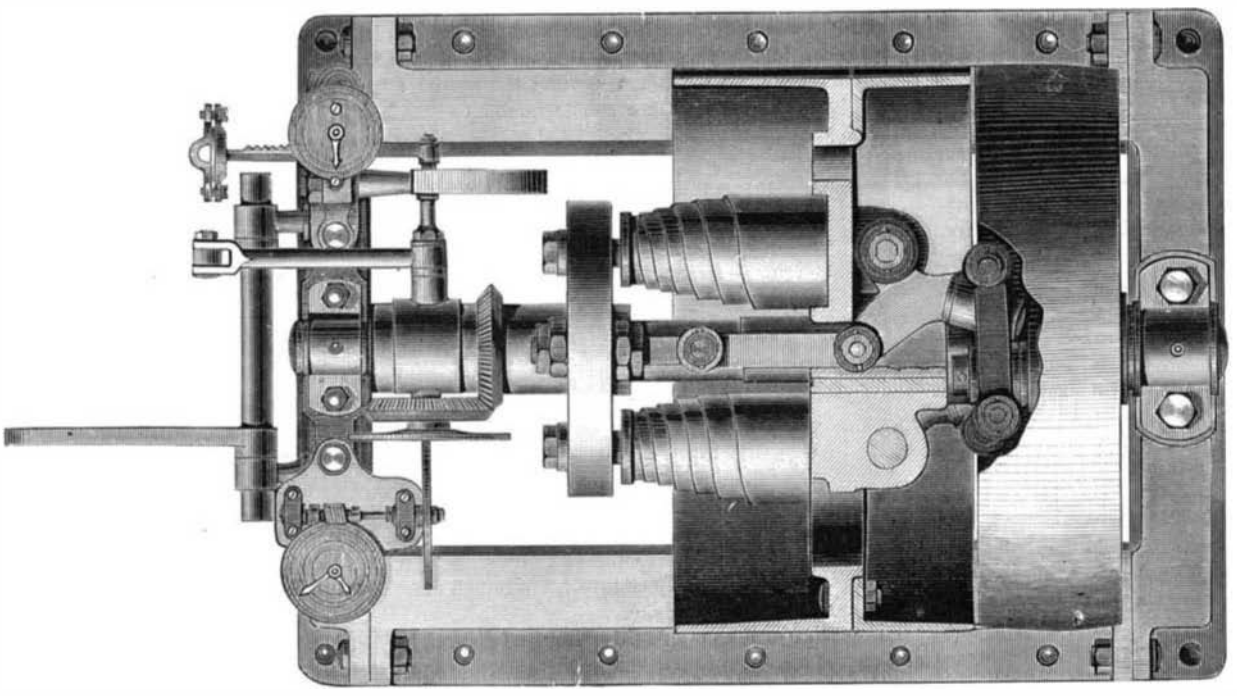
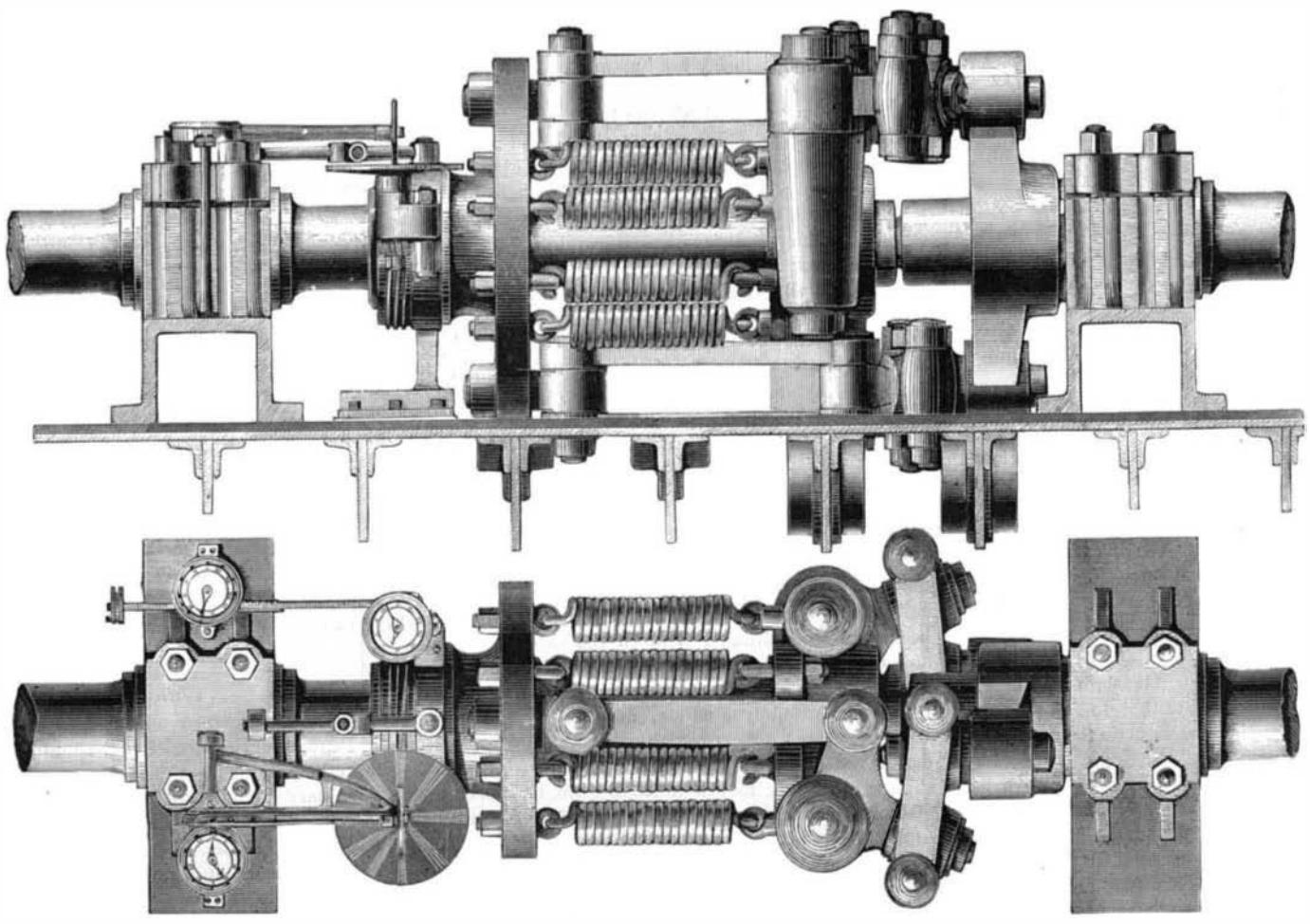


Fig. 2.—PLAN VIEW OF BOURRY'S DYNAMOMETRIC GOVERNOR.



Figs. 3 and 4.—BOURRY'S DYNAMOMETRIC GOVERNOR BETWEEN DRIVING AND DRIVEN SHAFT.

The second arrangement, shown in elevation and plan at Figs. 3 and 4, illustrates the appliance connecting the lay shaft with that of the engine, as in the case of screw steamers. In both arrangements the special parts perform identically the same functions. The journals of a double crank, of a wheel, or of a pulley, made fast on the driving shaft by means of an articulation, act respectively on one of the arms of two bent levers, which oscillate on strong tenons, belonging to a coupling keyed on the lay shaft. The other arm of these bent levers is connected by rods with a slider working freely on the shaft. Between the slider and the coupling are arranged a sufficient number of springs, having together the necessary resistance, and acting according to circumstances, by tension or by compression. When the engine is put in motion, the effect of the rotation first acts on one side of the bent levers, and is afterward transmitted to the slider and the springs. These latter, becoming compressed or extended at each change of resistance, give a reciprocating movement to the slider, the position of which always corresponds exactly with the load on the engine. In order to transmit this movement to the steam valves, the sleeve is provided with a collar which participates in its reciprocating, but not in its rotary movement. This governor, receiving the whole power given out by the engine, acts as a constant dynamometer, to which may be fitted the various measuring-instruments, the motions of which are derived from that of the collar on the slider.

The first of these instruments, the dynamometer proper, serves to measure the resistance opposed to the engine; it consists of a graduated dial, on which works an index, receiving its motion from a rack

actuating a small pinion. The second is a counter, revolving with greater or less speed according to the resistance to be overcome by the engine, which resistance it records in kilogrammeters or foot pounds, thus constituting a dynamometric indicator, analogous to gas and water meters. A third instrument, the "dynamograph," represents graphically, on an endless band of paper, the variations of the resistance. The first two instruments are easily distinguished in the illustrations. As regards the third, the place of the pencil only is shown at the end of the rack of the dynamometric index, the arrangement of the band of paper varying with the circumstances of each particular case. An ordinary counter is shown in the last two figures.

In order that this appliance may work with precision as governor, its action must be regulated so as to correspond exactly with that of the steam valves of the engine; that is to say, their opening must coincide with the respective positions of the slider, which may be obtained empirically, or better still, by calculation. It is not necessary that all these instruments should work constantly. Thus, in stationary engines, the dynamograph will only be used periodically in the same way as an indicator. On the other hand, for screw engines, there is every reason to cause the work of the engine and the resistance of the propellor to be traced continuously during the whole voyage, so as to retain a true record of the state of the sea. It is always useful for the dynamometric counter to work continuously, whatever be the nature of the motor to which it is applied; it will indicate the total power given out from any given instant, and will permit of comparing the effective force developed with the quantity of fuel consumed. For the determination and checking of the amount of motive power let on hire, this instrument is almost indispensable. The dynamometric index, which gives a constant indication of the resistance, and consequently the strain on the motor, is an excellent guide for the engine man and stoker, enabling them to judge of the quantity of water and fuel required. This index, indeed, records the measure of the work done in any establishment, while an exact reproduction of it in the office, by electrical or mechanical means, constitutes a valuable method of supervision which cannot fail to exert a favorable influence on the production.

New Factory of the Edison Electric Lamp Company.

The moving of the lamp factory from Menlo Park to East Newark, N. J., affords a fitting occasion for making a brief mention of the history of the Edison Lamp Company.

The manufacture of lamps was commenced at Menlo Park, in November, 1880. Prior to that date a large number of lamps had been made, but the first regular pay roll of the Lamp Company, as an organization distinct from the laboratory and experimental department of the Light Company, was November 11, 1880, which may be taken as the date of the starting of the factory. From that time until April 1, 1882, when moving to Newark was commenced, the factory was running all the time, except about six weeks. The largest number of men employed at any one time was 135, and for the last year there has not been at any time less than 100 hands employed. Up to April 1, 80,000 lamps were shipped, and at that time there were about 50,000 unsold in stock. The reason for moving the factory to East Newark is to secure larger buildings, with increased facilities, also convenient accommodation for workmen, and to be nearer the source of supply for obtaining reliable help. The manufacturing of lamps was begun in the new factory at East Newark on June 1, 1882, and 150 men are now employed. The tools and power now in the factory are adequate for making 1,200 lamps a day, but the factory has an ultimate capacity of 40,000 lamps a day, which will require from 3,000 to 4,000 hands, according to the style of lamps made. The lamp factory has always been managed with unusual skill and intelligence, and all visitors have united in praising the perfection of the system and the economy and precision of the work. The officers of the Edison Light Company are as follows, namely: Thomas A. Edison, president; Francis R. Upton, treasurer; William Holzer, superintendent; and J. J. Bradley, master mechanic.

Photography of Maps, etc.

The difficulty of copying a map or plan by the photographer to whom such work is only brought at rare intervals, is, it is well known, very difficult, the obtaining a perfectly true rectangular image on the ground glass being most wearisome without the aid of special appliances. One plan recommended for the purpose is to suspend a block that is perfectly square by a piece of string against the center of the picture, any departure of the axis of the lens from a true perpendicular to the plan being shown by one or other side of the square coming into view. We recently saw an improvement upon this method, says the *British Journal of Photography*. A pill box with red lining was suspended, by the aid of a piece of cotton, just over the center of the plan, and the slightest deviation was indicated by the red lining forming a sort of ribbon on the ground glass, which showed the exact direction the plan required to be moved to bring it into proper position.

Coal Jigging in the Schuylkill Region.

The *Coal Trade Journal* says that the Mahanoy jig house has proved such a success that another near Heckscherville will go up this summer. They will have a capacity of 200 cars per day of pea, buckwheat, and dust coal. In these houses the coal is agitated in water. Slate being the heaviest part drops to the bottom, and the coal is brought out cleaned of this objectionable part. To pick such small sizes of coal would be a tedious and unprofitable job. Under the new process pea coal will receive better treatment than by screening, and its market value will be enhanced. The company propose to treat the coal dirt at the collieries in this way, relieving it of about 18 per cent. of slate. The coal will be used in those engines of the company which are specially adapted to such fuel. The amount of dirt prepared in this way last year at a cost of 5 cents per ton, and in which there remained only 4 per cent of slate, was 60 000 tons, thus saving to the company over $120.000. When the new buildings and machinery made for treating the dirt are completed all stationary engines at the collieries and in the shops and foundries of the company will be supplied with it, and the marketable sizes of coal now used by the company will be sold to the trade.

PHOTO BASS-RELIEFS.

BASS-RELIEFS BY PHOTOGRAPHY.

Among the interesting industries to which electricity may be applied, is the metallic reproduction of photographs in relief. Some curious specimens were exhibited at the Paris Exposition of Electricity, and our engraving represents six small bass-reliefs in metal obtained from simple photographs.

The process employed by the inventor is one of great simplicity, and differs only from those already known by employing gelatine in liquid form, instead of dry or in paste. An ordinary photographic negative is taken and placed in a printing frame. A rubber tube is put behind the negative, and bent around the edge, and over this a second glass is placed; the frame is then closed as in ordinary printing. The space between the two glasses is rendered tight by the rubber tube, and in this space, opened only on one side, a solution of bichromated gelatine is poured; then the apparatus thus prepared is exposed to an electric light of sufficient intensity. That which was employed at the Exposition was supplied by a small Siemens machine, consuming about three-horse power. A reflector conveniently arranged would certainly have given more complete and rapid results by concentrating a greater number of luminous rays upon the subject experimented upon. When the light has worked upon it sufficiently, the gelatine coagulates in layers or coatings of variable thickness, proportionate to the quantity of light which passes through the negative. The thickness is but little more than two millimeters, and thus a hollow reproduction of the photographic design is made. This hollow gelatine mould having been hardened in a suitable bath, an impression is taken by electrotypy, which will be in bass-relief.

These reliefs may be made much more pronounced by giving to the gelatine mould a slight curvature.

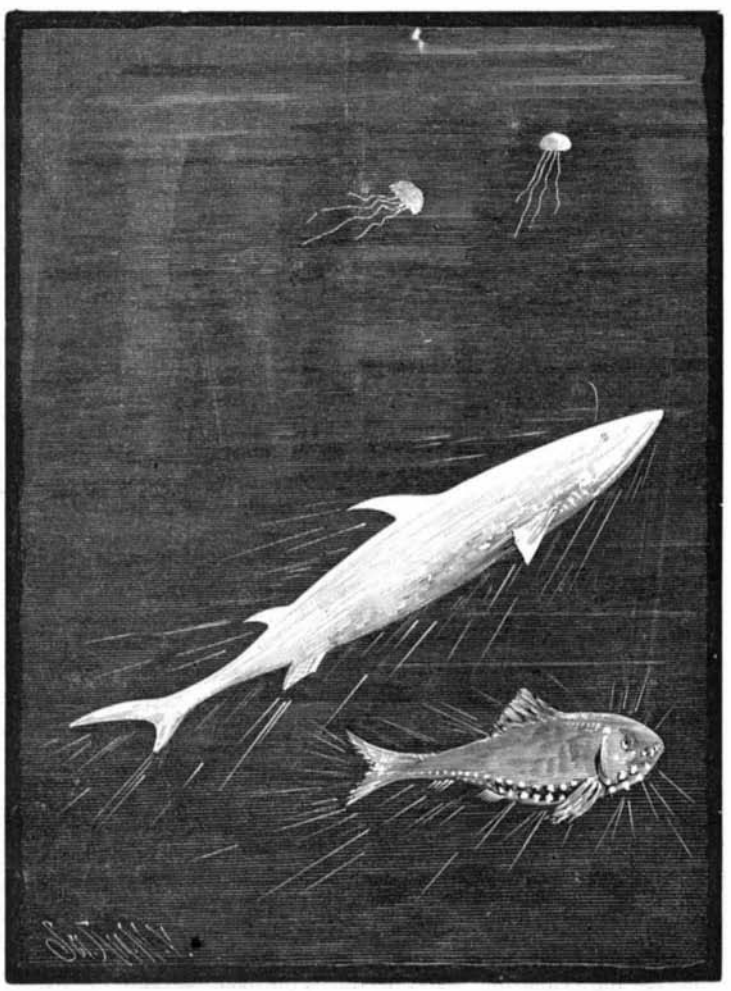
Artistic productions may be obtained by this process at very low prices.—*La Lumière Electrique.*

A LUMINOUS SHARK.

BY C. F. HOLDER.

Among the later outgrowths of scientific investigation we find the theory of abyssal light, intended to explain the presence of eyes in many of the deep sea forms, their existence supposed to be conditional upon the presence of light in the greater depths of the ocean. The Ascidians and Alcyonarians are well known as wondrous light givers. The form of the former we are most familiar with is the oval ball that seems growing upon a stem, and waves to and fro with the tide like a veritable plant; it is, however, a highly organized animal. Some of the Ascidians are free swimmers, and live in colonies; such is the Pyrosoma, one of the most remarkable of all phosphorescent creatures, as well as one of the largest. In appearance they resemble an elongated empty barrel, about five feet long as a maximum, with one end closed, the other open, a provision that insures movement in a given direction. The means of propulsion seems incomprehensible, but it is easily explained, however, upon an examination of the animal. Each individual in the colony draws in water from the outside and ejects it into the interior, where it finds a common outlet at the open end, the current rushing out forcing the aggregation of Ascidians along in the direction it happens to take. The surface is completely covered with curious filaments that appear to wave to and fro. Such is the general appearance of the creature in the day time, but in the night or abyssmal depths of the ocean it presents an entirely different sight, gleaming and glowing with a wondrous golden light, that penetrates the water for twenty or thirty feet around it, and resembling more than anything else a cylinder at white heat, vibrating waves seeming to pass over it in quick succession, producing many different tints of yellow and gold. As may be surmised, at a distance of one hundred feet or more they resemble worms three or four feet in diameter, of wavy, nebulous matter, the center burning brightly. The appearance of numbers of these wondrous creatures in the water is an extraordinary sight, and looking down into the depths we seem to be looking into space. Every break of the water is the signal for myriads of beautiful creatures to spring into life, as it were, the sea fairly igniting, the minute granules in the depths below sparkling and scintillating in the reflection. Great constellations seem revolving in erratic courses, now rising and falling, meeting each other, the lights intermingling, while smaller phosphorescent jelly fishes, like stars of lesser magnitude, revolve about them, completing the curious scene. The light given out by the Pyrosoma is not confined to the water, but is reflected above it, covering everything with a pale, ghostly light. The sails of vessels are lighted up by it, and cast dark shadows about, while within four or five feet of the animal a newspaper can be read with perfect ease.

But the most curious light-giving forms discovered are the fishes. Among the bony fishes of great depths, the families Scopelids, Sternoptychids, and Stomiatids, have long attracted attention, on account of the rows of bright spots that occur upon their sides, now found to be luminous.



LUMINOUS SHARK (*Squalus fulgens*).—FISH WITH PHOSPHORESCENT SPOTS (*Ichthyococcus ornatus*).