PETROLEUM AS AN ILLUMINANT FOR BUOYS.

We have frequently advocated in the columns of the SCIENTIFIC AMERICAN the more general utilization of petroleum, both as an illuminant and a fuel, mainly because of its cheapness, abundant supply, and efficiency. One of the latest applications of this oil is that for the illumination of buoys, and it is the invention of Mr. James Richardson Wigham, the well-known lighthouse engineer of Dublin, Ireland.

Although the adequate illumination of rocks and shoals by buoys is indispensable for the safe navigation of rivers, estuaries and harbors, it is not imperative that the light cast from the buoys should be of very powerful illuminating intensity. Indeed, it is very seldom that the visibility of their rays is desired from a range exceeding five or six miles. But, on the other hand, occasionally buoys have to be placed in isolated positions, where it is impossible to erect lighthouses, and, owing to the difficulty of access thereto, it is essential that they should continue to burn brilliantly, without any attention, for several weeks or even months. Compressed oil gas is the illuminant generally employed for this purpose, since, although it is more expensive than oil, it possesses none of the drawbacks inherent to the latter. The principle expense incurred by the utilization of oil gas is the installation of the special gas-making establishment on shore. By the use of petroleum, however, all such expense is averted, because it is only necessary to convey the oil to the buoy to replenish the lamp reservoir.

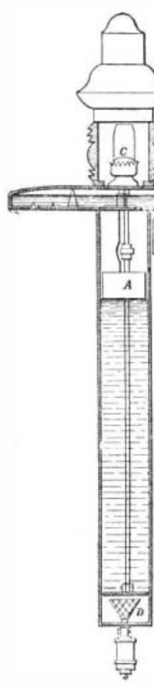


Fig. 2.

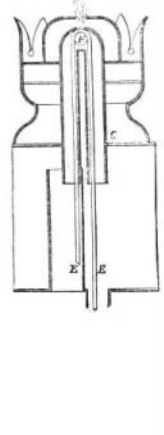
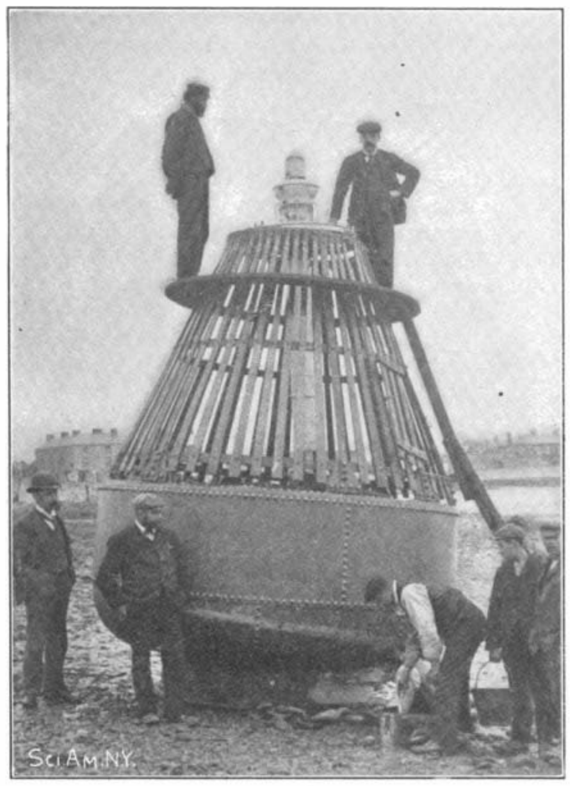


Fig. 3.

SECTIONAL ELEVATIONS OF LAMP AND BURNER.



PETROLEUM BUOY.

The great disadvantage which has always militated against the satisfactory application of oil is the manipulation of the wick. In a short time after the ignition of the lamp the wick becomes so charred that the capillary attraction which brings the oil to the point of combustion is obstructed, and the light goes out. An attempt was made to overcome this drawback by the construction of a carbonized wick, but, although it lasted longer than the ordinary wick, in a few days the deposit from the oil was sufficient to extinguish the light.

The inventor carried out numerous experiments with a view to overcome this obstacle by causing the wick to move automatically as it was consumed, so that the same part of it would not be constantly exposed to the action of the heat of the combustion, thus securing a constant brilliant light. But this was an impossible task under the existing circumstances where the wick in the lamp is placed perpendicular to the level of the oil in the oil container, since it could not be readily made to alter its position automatically as its combustion proceeded. Mr. Wigham, therefore, conceived the ingenious plan of passing the wick over a roller, thus burning it horizontally, so that the light was obtained from the side and not from the end of the wick.

The burner he has invented is surmounted by a combustion cone, and surrounded by lenticular apparatus. One end of the wick, *E* (Fig. 3), is conveyed up through an oil tight copper tube with holes in its sides, and passes over a roller, *F* (Fig. 3), at the burner, *C* (Fig. 2). The other end is brought down through a tube standing above the level of the oil in the lamp and soldered or secured at the lower end. A circular float, *A* (Fig. 2), is placed in a copper cylinder fixed to the bottom of the lamp and filled with oil. When the lamp is first lighted this float is at the top of the cylinder, and is attached by means of hooks or loops to the wick. The oil in the cylinder is caused to drop slowly out of it through a valve, *D* (Fig. 2), of peculiar construction, supplied with a cotton core, at such speed as may be necessary. The oil thus descends into the receiver, bringing with it the float and the wick which is attached to it. When, at the end of one month, or any such other period as may be desired, it is necessary to replenish the lamp with oil, the cylinder is refilled, as is also the reservoir under the lamp.

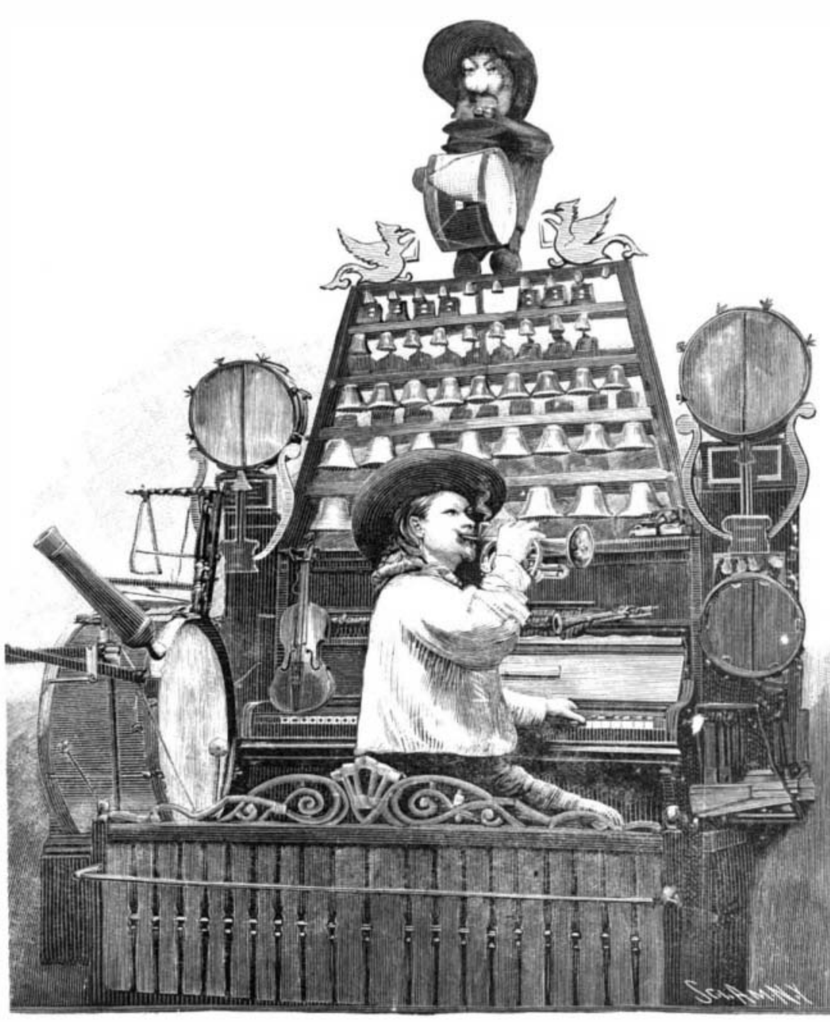
It is necessary to fix the lamp upon swivels or gimbals, so that, however great may be the motion of the sea, the lamp always maintains practically a level position. Divisions are fixed in the oil reservoir by which, should it for a moment be brought out of level by the motion of the sea, the oil is prevented from flooding the wick during the passing of the wave, after which its proper level is again maintained.

The cost of lighting buoys by mineral oil is very trifling, the consumption being about half a gallon of oil every twenty-four hours. In connection with the buoys at present employed in Belfast Harbor, which are lighted by this means, this amounts to an expenditure of about 6 cents per twenty-four hours. This cost may be decreased if the oil, which constantly drips from the cylinder of the lamp, is collected in a portable vessel instead of falling upon the water, to 2 cents per twenty-four hours. The oil which apparently runs to waste, however, performs a valuable function, for it serves to calm the sea in the vicinity of the buoy.

This system of petroleum illumination of buoys has been used with conspicuous success in many of the harbors and estuaries of Ireland. In some cases the lamps only receive attention once in three months, which is sufficient testimony to their efficiency. The numerous advantages of the oil over the compressed gas are obvious, and the action of the lamp is so simple as to be of easy application.

THE ORCHESTRA-MAN OF THE EXPOSITION.

There was much music to be heard at the Exposition of 1900, but the most original was, without any doubt, that played by M. Malboech in the vicinity of the Gallery of Machines. This extraordinary man is capable of playing as many as thirteen instruments—the piano, cornet à piston, clarinet, violin, a chime of forty bells, the bass drum, cymbals, triangles, two kettle drums, tabor, and castanets.



MALBOECH THE ORCHESTRA-MAN.

By means of his hands he plays either the piano or the clarinet and piano at the same time, but more generally the cornet à piston and piano. The left hand, used for this latter instrument, actuates the chimes also. The secondary instruments are played through the pressure of the feet upon pedals.

These multiple occupations do not prevent the artist, while playing the cornet, from smoking his pipe. This is a fact that it is impossible to see accomplished every day. Our musician correctly executes pieces that are often difficult, and when a person closes his eyes he would be willing to affirm that he was present at a concert given by a dozen persons, so great is the volume of sound produced. The execution is sometimes fantastical, as, for example, when a gun is fired to terminate certain scores à la Berlioz or à la Wagner.

Malboech himself superintended the installation of his orchestra and arranged the different parts of it.

Although the artist, who is a native of Holland, is but forty years of age, he has traveled over nearly the entire world. He announces in his circulars that he offers $2,000 to any one who will succeed in imitating him, and styles himself "the greatest artist in the world."—La Nature.

Therapeutic Action of Light.

Dr. P. Garnault has lately read a paper before the Académie des Sciences dealing with the therapeutic action of light, and mentions a number of cases in which he has used this treatment with success. His attention was first called to the subject by M. Trouvé, who was among the first to bring out this action of light; in 1893 he observed that a workman afflicted with rheumatism was completely cured after having remained for forty-eight hours in the vicinity of a very intense arc light used for an electric fountain. Since then it has been observed that in works where electric soldering is carried on, this being accompanied by great luminous intensity, the workmen cease to be affected with gout or rheumatism. In the present experiments Dr. Garnault uses apparatus which has been specially constructed for the purpose by M. Trouvé. The experiments were confined to the effects of local action of light, and there seems to be no doubt that the results are due to the light radiations and not to other causes. A lamp of 50 candle power provided with a silvered parabolic reflector was applied in eight cases of muscular or articular rheumatism of average gravity and several years' standing, and in all these cases a very marked improvement was obtained at the end of three to twelve operations, and not followed by a relapse. Chronic catarrh of the nose may be also treated with success by the application of light accompanied by vibratory massage. The treatment was also applied in cases of deafness, accompanied or not by humming noises in the ear; the apparatus used consisted of two ten-volt lamps provided with reflectors and applied to each ear by a curved spring passing around the head; in some cases the action of heat was eliminated by placing alum screens in front of the lamps. In three such cases a marked diminution of the humming noises and an improvement of the hearing; other cases without the use of the alum screen were a so successful. The most complete observation was made upon a person thirty years of age who had undergone, the year before, an operation in which the tympanum and small bones of one ear had been removed; on the operated side the intensity of the humming noises had been greatly reduced, but on the other they were very marked; these were made to disappear by a series of applications of light. They reappeared after a severe cold contracted by the patient, but were again made to disappear by a second treatment. In twelve cases of deafness the application of light brought about good results. Dr. Garnault has also used the treatment in other cases, and is convinced that the luminous rays may be used in certain affections as a local agent to great advantage, and that the results obtained are certainly due to its specific action.

SILK MANUFACTURE.

Although silk is a substance that is produced by several varieties of insects, it has come to be almost exclusively associated in the public mind with the product of a particular variety of caterpillar, which is popularly known as the silkworm, and by the entomologists as the larva of *Bombyx mori*, or the mulberry-feeding moth. The eggs of the silkworm are hatched by artificial means, and are exceedingly small, weighing about a hundred to the grain. It is customary to place pieces of finely punctured paper above the trays in which the eggs are being hatched. As soon as the worms break through the shell they creep through the holes in the paper in their endeavor to get to the light, and in doing so scrape off the pieces of shell which may adhere to their bodies. They are reared in rooms where particular care is taken that an abundance of fresh air and light are present, and where the temperature may be kept at an even point. The worms are voracious feeders and begin to increase rapidly in size from the day they are hatched. As a rule the silkworm moults four times during its life; usually about the sixth, tenth, fifteenth, and twenty-third days after being hatched. As soon as the caterpillars have reached their full growth they climb the twigs and small branches which have been prepared for them, and begin the spinning of their cocoons. The silk glands of the worm consist of two sacks running along the sides of the body, with a common opening on the under lip of the worm. In the process of spinning its cocoon the silkworm ejects from both glands a line of extremely fine thread. The two filaments from each gland are laid side by side and are held together by an adhesive secretion from the worm. The cocoons are either deep yellow, white, or light green in color, and oviform in shape. Their average length is from an inch to an inch and a half, and they are from half an inch to an inch in diameter. The cocoon consists of an exterior made up of broken and straggling filaments, while the interior layers are densely glued together into a mass which is not unlike parchment, and which is impossible to unwind except by moistening.

The manufacture of silk may be broadley divided under the heads of reel silk manufacture and the manufacture of spun or waste silk. The first method has to do with continuous fibers thousands of yards in length. In the spun silk industry the raw materials are worked up by methods similar to those used in the case of cotton and other fibrous materials.

The first operation is to produce the "raw silk" of commerce. The cocoons are placed in warm water for the purpose of softening the natural gum with which the filaments of the cocoon were fastened at the time it was spun. From six to ten of the cocoons are put in a bath, and as soon as they are properly softened the threads of each are caught up by an attendant on a fine brush, and passed through an eyelet to a reel, upon which they are wound. The reel consists of a light, wooden, revolving frame, which winds the silk into what are known as skeins, and it is in this form that the silk is usually received at the silk mills.

The first thing to be done with the skeins after they are taken from the bales is to soak them thoroughly in cold water. The raw silk is too fine and delicate for textile manipulation, and has to be doubled and twisted to give it the necessary body and strength. To this end the skeins of raw silk are placed on light wheels, known as "shifts," from which the silk is wound onto spools; then two spools of silk are run together and doubled and afterward twisted, some of the twisting machines, however, performing the doubling and twisting in one operation. The twisted silk is then wound onto rectangular frames, known as creels or reels, and at the same time is measured off into lengths of from 10,000 to 15,000 yards, the silk now being once more in the form of skeins. It is then taken from the creels and rolled up into hanks, ready for dyeing.

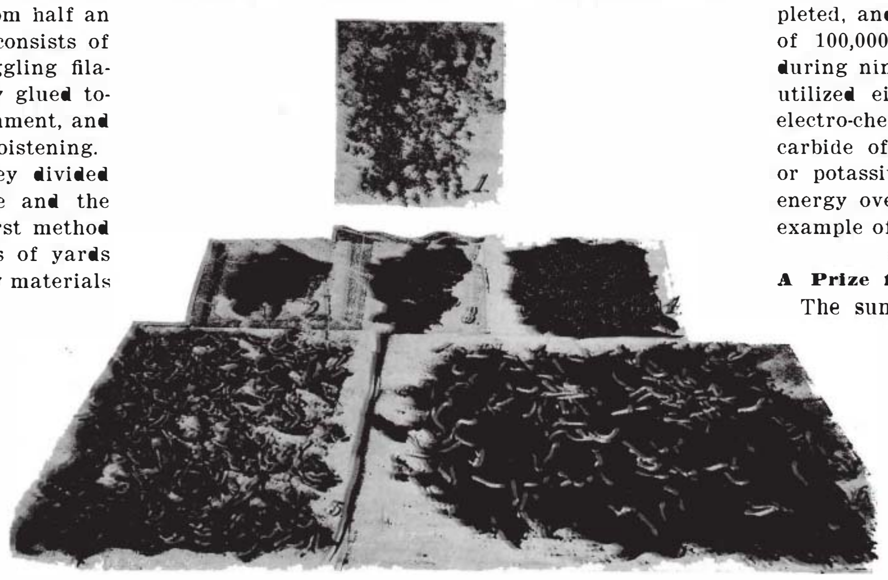
After the silk has been dyed it is returned in skeins, which are slipped on over a set of what are known as "soft silk" winders, from which it is wound onto spools once more. It is then taken to the warping department, where the spools are placed upon tables which may carry from 110 up to as many as 600 pegs. In the hand-warping machines there will be from 100 to 120 spools on a table, while the power-warping machines will carry from 300 to 600 spools. The operator gathers up the ends of silk on each spool and runs the threads onto the frames in the mill, the threads in this case being wound parallel. From 100 to 4,000 threads are run off on warping spools, which are technically known as "beams"—round cylinders of wood or iron which are 6 or 7 inches in diameter, and of a width which varies from 4 inches to 36 inches, according to the character of the fabric of which the thread is to form the warp.

The beams are then carried to the looms, where the threads are first led through a "harness," and then passed through a steel "reed" or comb, there being from two to fourteen threads in one "dent," according to the quality of the goods. The harness consists of a series of top and bottom slats known as "shafts," each pair of which is connected by a number of parallel vertical threads at the center of each of which is a small brass eyelet through which the silk threads are passed. Several of these sets are arranged vertically behind each other in the loom, and each harness with its set of threads is raised in turn between each passage of the shuttle through the warp. Each harness thus serves to lift a different set of threads for the passage of the shuttle; and it is by the proper adjustment of the vertical motions of the harness to the strokes of the shuttle that the nature of the weave of the goods is determined. The woven fabric is then taken to the packing room, where all knots, dirt, and stains are removed.

The goods are now taken to the finishing department, where it is put through a variety of operations which would necessitate another article to adequately describe them. Among other operations is that of singeing, to take off any rough nap that may be left on the goods, and sprinkling or sponging with a preparation of wax and gelatine, a process which is not unlike that of starching in laundry work. The final gloss or finish is secured by calendering, in which the fabric is run between a series of superimposed steel rolls, where it is ironed out and the fine glossy finish is secured. The goods are then either folded or wrapped on blocks ready for the market.

Projects for Utilizing the Hydraulic Power of the Rhone.

A number of projects are under consideration for



THE SILKWORM, FROM EGG TO FULL-GROWN LARVA.

1. Eggs on paper. 2. Newly-hatched worms feeding on mulberry leaves. 3. Silkworms at first moult. 4. Second moult. 5. Third moult. 6. Full-grown, ready to spin.

utilizing the hydraulic power of the Rhone, and there is no doubt that before long a number of plants will be established at different points, and it is expected that more than 200,000 horse power at a maximum, or 100,000 at a minimum, will be obtained. Three important projects have been planned, each by a syndicate of manufacturers; these plants will all be installed upon that portion of the Rhone which lies between Pyrimont and Fort de l'Ecluse, near the Swiss frontier. In this region the river has many rapids and falls; for instance, over a distance of only 12 miles the difference of level is about 200 feet. On the other hand, since the city of Geneva, using Lake Leman as a reservoir, has regularized the supply at periods of low water, as much as 160 cubic yards per second may be counted upon, below the junction of the Rhone and the Arve; from this it follows that over this stretch of 12 miles about 100,000 horse power may be obtained at low water. During 9 or 10 months, the maximum period, as much as 200,000 horse power is obtained. A hydraulic plant has already been installed in this region by an Anglo-Swiss company, who use about 10,000 horse power. The three projects in consideration have been made by syndicates of French manufacturers, who are only waiting until the formalities have been completed before commencing work. The plans have all been drawn up for some time past, and the land has been purchased. The first of these projects is that of Malpertuis. At 2½ miles below Bellegarde the river falls at a height of 30 to 35 feet at the "Passe de Malpertuis." The river here flows between two perpendicular banks only 160 feet apart. According to this project, a dam will be constructed at a point above the fall, and a part of the water, 160 cubic yards per second, will be taken off by a tunnel of 60 square yards section and 1.2 miles long; a total fall of 51 to 55 feet will thus be utilized, from which a force of 25,000 horse power will be obtained at low water. The second project is that of the "Boucle de Rhone." A dam will be placed at Les Andelieres, near Bellegarde; here the banks are somewhat wider, and the dam will cover 100 feet and have 20 to 22 feet height. A tunnel just above the dam will take off 160 cubic yards per second (80 to 90 at low water). The tunnel will be somewhat shorter than the preceding, and will end at Essertoux. A total fall of 80 to 85 feet will thus be obtained, giving 24,000 to 25,000 horse power, besides 5,000 to 6,000 horse power taken directly by a small hydraulic plant installed beside the dam on the right bank; this gives a total of 30,000 horse power. The third project is that of the Pont de Gresin. At this point, about 8 miles from the Swiss frontier, the river flows in a narrow gorge only 80 feet wide, and is here 25 feet deep, on an average. This point is near the railroad from Lyons to Geneva, and is thus a good locality for establishing industries; a branch line of 2 miles would connect it to the railroad. The fall of water obtained by a dam at this point will be 65 feet, with an output of 150 cubic yards per second during low water, and double this amount for the rest of the year. A minimum of 30,000 horse power may thus be counted on. The plant will include a dam with movable gates, a hydraulic plant with turbines and dynamos, and a system of canals for the discharge of water. The dam will form a vast lake, or water reservoir, and the water will be taken directly into the station by conduits passing through the walls; after passing the turbines it will be discharged into the river below the dam. The generating plant will contain fifteen turbine-dynamo groups of 2,000 horse power each; the turbines with horizontal shaft will be coupled directly to polyphase alternators; a set of smaller turbines will drive the exciting dynamos, and the station will have the necessary switchboards and appliances. It is probable that within three years these projects will have been completed, and the Bellegarde region will possess a total of 100,000 horse power at low water, and 200,000 during nine or ten months of the year. This will be utilized either on the spot for the manufacture of electro-chemical or metallurgical products—such as carbide of calcium, vanadium, carbonates of sodium or potassium, aluminium, etc.—or for the supply of energy over a radius of 80 to 90 miles, following the example of the Niagara plant.

A Prize for Communication With Other Planets.

The sum of 100,000 francs was bequeathed to the French Academy of Sciences in 1891 to be awarded to the first person who would be successful in communicating with another world. The Academy at first did not care to accept such a curious bequest, but finally it did so in the following words: "Madame Veuve Guzmann, a friend of astronomy and a believer in the plurality of inhabited worlds, has left to the Academy the sum of 100,000 francs to be given as a prize to the person who shall first enter into communication of an astre other than the planet Mars." The will wisely further stipulates that each time the prize has not been awarded for a period of five years, the accumulated interest shall be devoted to a work which will help the progress of astronomy. The intentions of the founder will be scrupulously followed. Astronomers naturally wonder why Mars was debarred.

A Funeral Trolley Car.

Baltimore has a number of fine suburban cemeteries, all of which are reached by some division of the street railway lines, and the company found by putting in a few crossovers they could take a car from any part of the city to any one of the burying grounds. It was, therefore, decided to offer cars for the transportation of funeral parties, says The Street Railway Review. The company built a special car well adapted for the purpose. The car is divided into two compartments, the smaller of which has running its full length another compartment or vault in which the casket is carried. A heavy plate glass door hinged to swing downward gives access to the vault from the outside. When a casket is to be placed in the car, the shelf is drawn out, the casket lifted upon it, and the shelf is then pushed back in place. The larger compartment has twelve cross seats in the center aisle, giving a seating capacity of twenty-four; the smaller compartment has four seats. Heavy black curtains divide this section into two private compartments for the immediate family of the deceased. Floral contributions are piled upon the top of the vault, and can be seen from the street. The car is finished inside and out with black enamel with nickel plated fixtures. The car has been named "Dolores," meaning sorrow, and it is rented at from $20 to $25 for each interment.