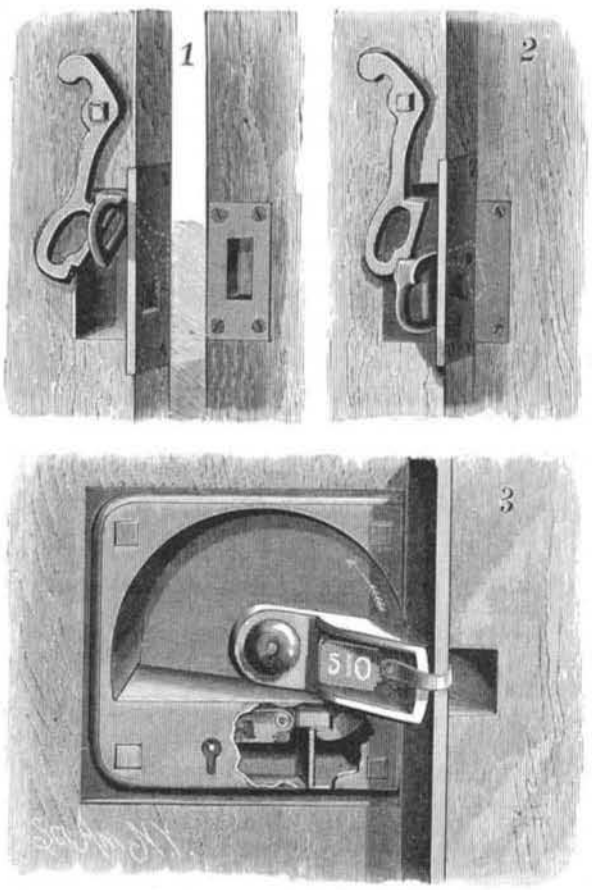
FREIGHT CAR DOOR LOCKS.

The accompanying engravings represent two simple, strong, and durable locks for fastening doors of freight cars. The upper figures show a device for securing the end doors so that they cannot be opened from the outside—Fig. 1 showing the lock open and Fig. 2 showing it closed. To lock the door it is simply necessary to push the toggle to one side, when the weighted end swings the bolt down so that its other end enters the recess in the door; at the same time the toggle swings forward, and its lower end rests upon the bolt, which is held firmly in place. To unlock the door the toggle is pushed one side, and the bolt raised until it is supported upon the upper catch of the toggle. The dotted lines show the small end of the bolt in the two positions. The seal holding tag can be passed through an opening in the side plate and through the end of the bolt. The lock is reversible, and will fit on either door post.

In the lock shown in Fig. 3 the bed plate is made with an inclined bottom, in the center of which is pivoted a button which, when in the position shown in the cut, most effectually prevents the door from sliding. When the button is moved to the inside of the inclined bottom, the door is free to move by. From one side of the button projects a hook, in which a strong three tumbler lock bolts and secures the button in its outward position. The tumblers and lock bolt are made of brass, the latter being so placed that rough usage will not affect it; the locks are of malleable iron. Cinders, snow, etc., are prevented from entering the lock by an inside escutcheon for the keyhole. Openings are made in the button and side plate large enough for the seal and for the U. S. lock for bonded goods.

These locks are manufactured by Mr. J. Hyde Fisher, of 50 State Street, Chicago, Ill.



FISHER'S FREIGHT CAR DOOR LOCK.

PETROLEUM INDUSTRY OF BAKU.

It is singular that although the oil wells of Baku have been known for over fifty years, it is only within two or three years that they have been worked to any extent, and only within a few months that the public generally have had the fact of their existence thrust upon their attention. This condition of affairs is due to several reasons, the principal of which is that Baku is located upon a remote frontier of the Russian Empire, being separated from commercial Russia by the exalted range of the Caucasus, and having no railroad communication with the interior. Its former obscurity is due, however, more to the lack of enterprise on the part of those who undertook to work the wells than to its geographical situation; for although its location is remote as regards the market, it is situated on the shore of a great inland sea, the Caspian, and in this respect has a great advantage over our own oil producing district. The cause of Baku having been brought so unexpectedly and suddenly before the public notice is due perhaps to the fact that the wells have been brought under the control of a new management, who have spared no means or expense to bring the wells into the most perfect working condition, and who have had the keenness to perceive that it was not the expense in procuring and storing the oil which rendered the petroleum high priced by the time it reached the market, but the awkward facilities of transportation at that time afforded; and it has been to this that the energies of the new company have been principally directed, and in this their efforts have been rewarded with success, for Baku has been connected with the Black Sea by a partially unfinished railroad since 1881, which road was monopolized during that period by a single company. The road has recently been thrown open to the public, however, and the petroleum is now introduced into the European market at very much reduced rates, and has become a very formidable rival to its American cousin.

This, by the way, is about as close a relation as it holds to our Pennsylvania petroleum, for the latter for illuminating purposes is a far superior product, while as a lubricator it is said not to equal the Russian oils. According to Professor Mendelyeff's analysis, the Baku petroleum contains 20 to 40 per cent. of lubricating matter, while the American contains but 7 per cent. of this substance.

The wells are by no means as deep as our wells on this side the water, and some of their best producing drives are not more than 500 feet deep, while the deepest well of Nobel Bros., who are the largest owners in this region, is but 735 feet in depth, and the yield from this drive is perfectly enormous.

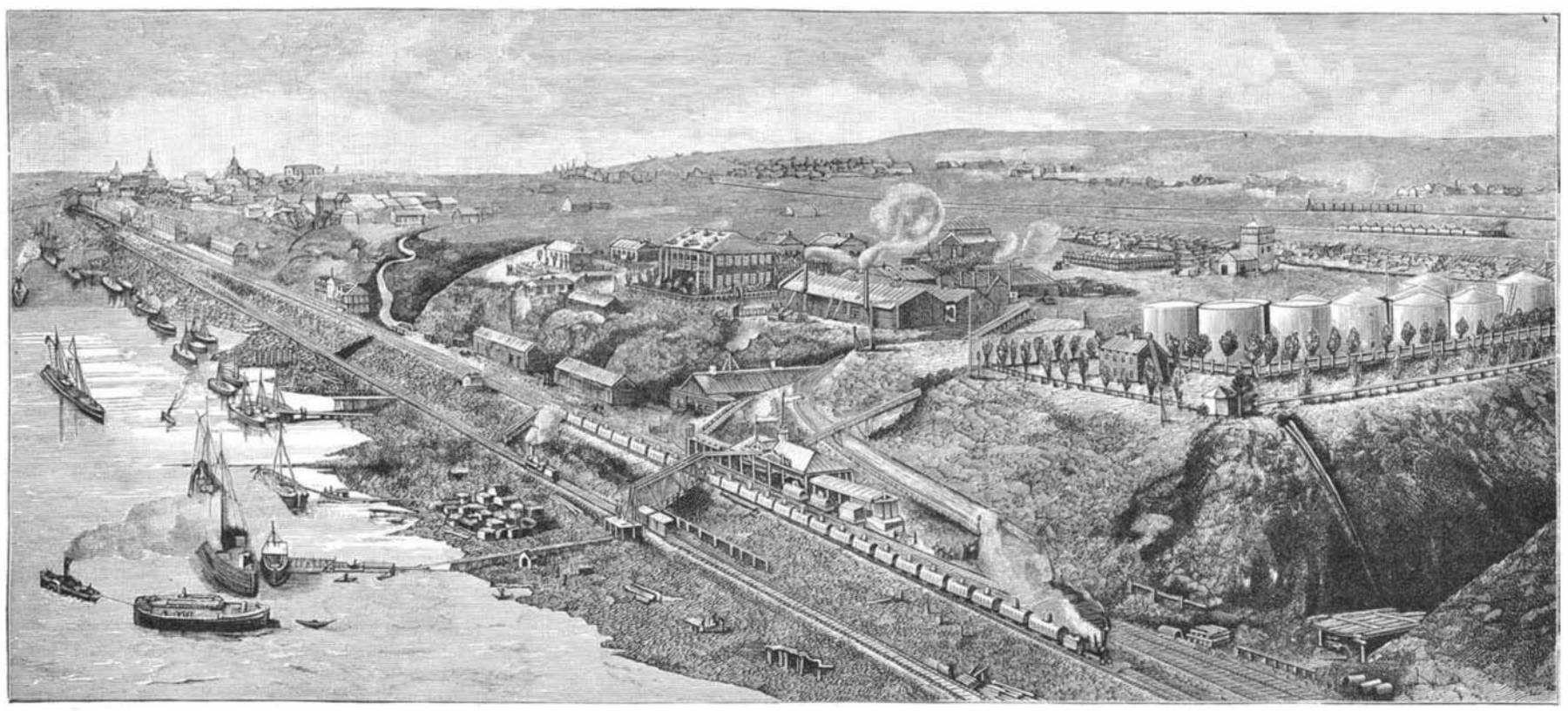
It will be seen from this, says *Engineering*, to which we are indebted for our cut and the following details, that the Baku people have not exploited to any very serious extent their petroleum deposits. Years must elapse before 1,000 feet, a common depth in America, will be attained; and at least two or three decades before they touch the cells 2,000 feet below the surface, as has been already done in many cases in Virginia. The present supply of oil is so enormous at the feeble depth of from 100 feet to 600 feet below the surface, that no inducement to deep sinking exists. Wells are only being bored in the hope that the impending opening up of the European market will cause a rapid and unprecedented demand for crude oil; or, as in the case of Nobel Brothers, who have a dozen good spouting wells plugged up, simply to keep the staff employed. The gravity of the crude oil ranges from 0·780 to 0·890, and no deterioration has been observed in quality in that obtained from the lower depths.

The mode of boring for oil is the American, modified to suit the characteristics of the Apsheron peninsula. To Messrs. Nobel Brothers belongs the credit of having introduced the composite system now in vogue, they having brought over to Baku six borers from Pennsylvania early after commencing operations in 1875.

Nobel Brothers, whose organization in almost every detail is as perfect as care can make it, lodge their employes in spacious and commodious stone barracks alongside their borings. A telephone connects their wells with the office at Baku, and again with the manager's residence in the Swedish colony that is growing up outside Baku. From Baku telegraphic communication is maintained with all parts of the world.

Boring for petroleum in the Apsheron peninsula is conducted much in the same manner as that for coal. An iron bit, gouge shaped, is fitted to a boring bar 8 feet or 10 feet in length, which is successively fitted to other lengths as the depth of the piercing increases. The strata consist of alternate sand and rock. It is in the sand that often the greatest difficulties are encountered. A loose bowlder will meet the boring tool, and, displacing itself, leave the passage free. But when the rods are withdrawn to allow the introduction of the tubes which form the lining of the well, the bowlder falls back in its place, and baffles all attempts to continue the work. This bowlder difficulty is the great terror of those commencing to bore. The diameter of the bore is invariably from 10 inches to 14 inches. The thickness of the tubes runs from one-eighth inch to three-sixteenths inch.

When the oil is touched there is usually a lengthened discharge of light carbureted hydrogen. Sometimes this pours up the pipe with terrific force, roaring so loudly that nothing can be heard alongside the well. As often as not grit is carried up with it, and finally comes the oil. Directly the gas begins to blow, all haste is made to withdraw the boring rod and fasten a *kalpak*, or iron cap, over the orifice. This is fitted with a sliding valve to regulate the passage of the gas and oil, Should the well be successfully capped over, the chief danger of an irrepressible fountain is removed, but it often happens that the oil follows too fast, and then nothing can be done to check the outburst of petroleum until its force moderates. Last year, when the engineers at Nobel Brothers' No. 25 well struck oil, the gas exploded and blew into the air 500 feet of boring rod before it could be removed. Formerly the tubes were sunk without any packing round the top. The consequence was that when they were capped the pipes burst. To obviate this it has been the custom for some years past to dig down 20 feet or 30 feet round about the mouth of the well, and fill it up with a concrete or asphalt setting. If this be well done, it will resist the strongest pressure, in spite of a filtration through it, as occurred when the Droojba fountain was stopped last December. With but a few exceptions, every care is taken by the well borers to prevent the wells becoming fountains beyond control. The Droojba catastrophe was due to an accident. The well was properly capped over, and it was while improving and strengthening the cap that the oil suddenly blew it off and spouted 300 feet high. It then became, of course, beyond control. In a few days the grit carried up with the oil ground to pieces the huge and massive beams at the top of the derrick.



NOBEL BROTHERS' PETROLEUM DEPOT AT TSARITZIN, RUSSIA.

Some weeks ago a report circulated in the English press that one of the oil fountains at Baku had spouted with such force as to fracture a 3 inch cast iron plate placed over the orifice to divert the stream. This was on the face of it erroneous, the real circumstances being these: When the oil is projected, it carries with it the grit with such force as to convert its volume into a sort of liquid grindstone. If an iron plate be placed in contact with the stream, the sand in the oil literally grinds it to pieces in a few hours. The first

caps that were used at the Balakhani wells were completely destroyed in this manner. Messrs. Nobel Brothers have one at their office at Baku preserved as a curiosity, which was worn into holes in a few hours, although 3 inches thick. It was this circumstance that led to the invention of a special kind of cap fitted with sliding valves. As might be imagined, when a fountain spouts as high as the Monument it forms round about the mouth of the well immense shoals of sand, which extend sometimes to the distance of a hundred yards from it. Houses are not infrequently completely buried in these mounds, and the mouths of neighboring wells covered for a time, involving heavy claims for compensation.

As soon as the oil ceases to spout, pumping is resorted to. The cylinders used are 10 feet long by 10 inches broad, and have at the bottom a valve which opens on touching the ground, and closes when the tube is lifted. About a couple of minutes are required to lower and lift the tube, which brings about fifty gallons of oil to the surface each stroke. When the supply begins to grow thin, boring is again resorted to. The wells are never torpedoed, because the borers are almost sure to reach a fresh supply lower down. On attaining the surface the oil runs through wooden pipes to channels outside the derrick, whence it makes its way to ponds. These, as often as not, are simply natural hollows in the ground with a rough sand embankment around them. After standing a while to rid itself of the sand, the oil is pumped into iron reservoirs, and then is piped to the refineries, eight or ten miles distant at Baku. Some of these ponds are so large as to merit the appellation of lakes. They often contain many million gallons, wasting their goodness on the desert air. The whole expanse of the Balakhani plateau is dotted with them.

At present there are eight pipe lines in operation conveying the oil from the wells to the refineries. The aggregate length of these is over sixty miles. They are quite a modern institution, having only been introduced by Nobel Brothers during the last few years. Previous to that, the oil used to be conveyed in barrels down to the coast.

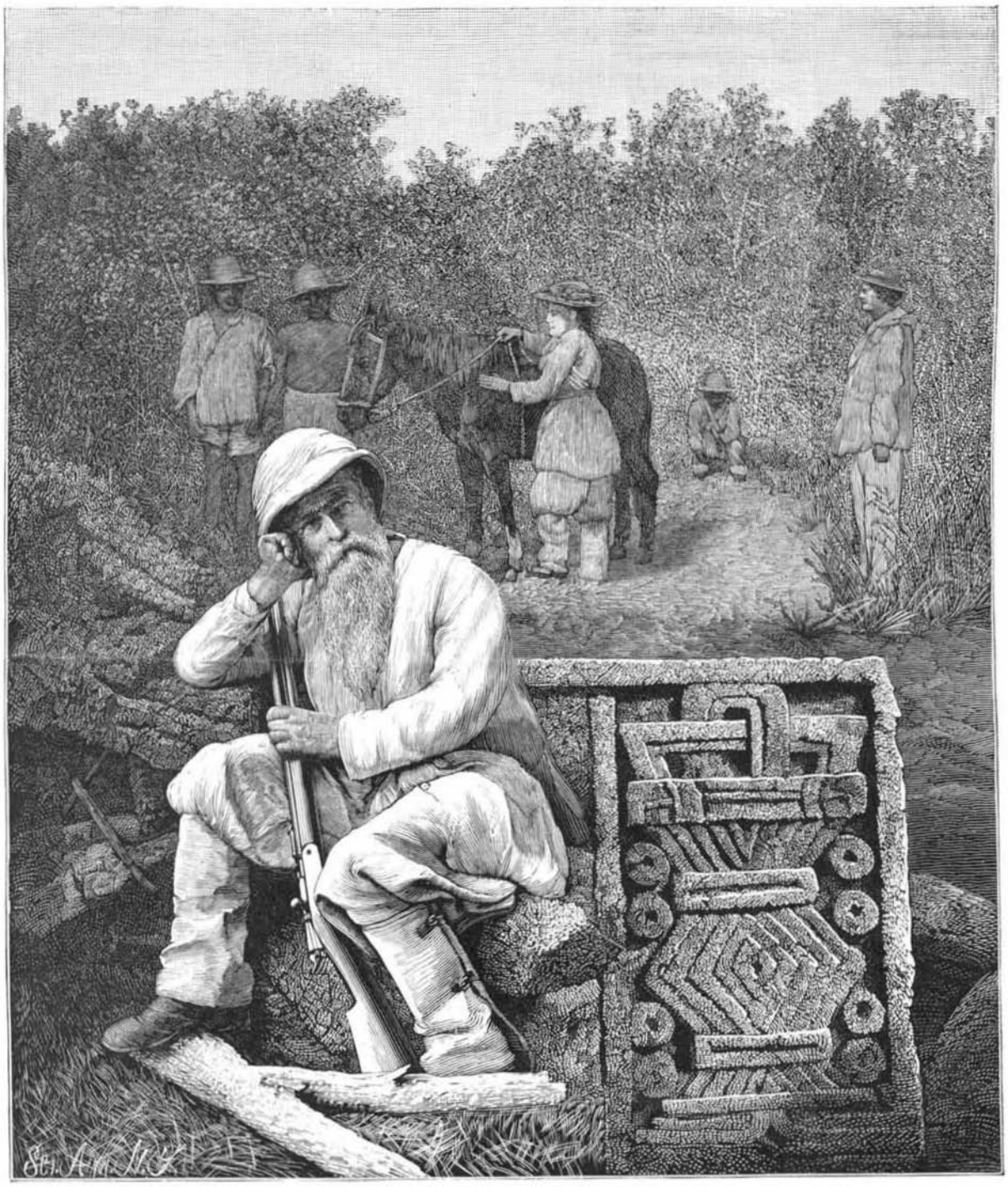
Various schemes are constantly being discussed for conveying the oil to Europe. One of these, in favor several years ago, was a pipe line a thousand miles long, to run from Baku across the Caucasus to the railway system in Southeast Russia. Another extended from Baku to the Black Sea to Poti or Batoum. This may be regarded as the most practical, and if any pipe line ever be laid down from Baku, this will inevitably be the one. At present there is a deal of talk of running a pipe line from Baku to the Persian Gulf, with the idea of securing Baku the exclusive control of the markets of Asia.

The refining operations are carried on at what is known as the Black Town (*Tchorni Gorod*) at Baku, which was illustrated in SCIENTIFIC AMERICAN a few weeks ago. Baku is situated on a magnificent bay, with deep water close inshore. An island, lying across the mouth, serves as a breakwater, and renders the bay safe for shipping in the roughest weather. It is hardly necessary to remind the reader that the southern part of the Caspian is never frozen over, as is the case with the ports at the mouth of the Volga. From the Shakhoff peninsula to Sultan Point the Bay of Baku has an extent of nearly fourteen miles of waterside, of which more than six miles are already taken up by the Black Town, Baku itself, the quarantine port, and the dockyard. The Baku section is fronted by more than a mile of limestone quaying, reminding one of the Thames embankment. Handsome buildings and well stocked shops are rising along this quay, at the back of which extend the best quarters of the town, the old Persian fortress, the municipal offices, and the numerous native bazaars. South of it is the quarantine port, with numerous piers, where the steamers unload their cargoes from the Volga and the ports of Persia. An astonishing amount of trade is transacted here. Beyond lies the handsome dockyard, a very extensive establishment more adapted for the maintenance of a regular fleet than the insignificant gunboat flotilla Russia now keeps up in the Caspian Sea. This, and the stone barracks of the garrison, etc., complete the southern side of the bay.

The northern side is taken up with the railway terminus and wharf and the 200 refineries, the latter of which form quite a town of themselves. As the name implies, the Black Town is a filthy, dirty hole, consisting of greasy stone buildings, surrounded by high stone walls and divided, the one property from the other, by regular quagmires of mud and oil. From nearly all of the refineries dense clouds of smoke rise and blacken the atmosphere. Nobel Brothers' establishment is about the last along the bay, from Baku, excluding two or three others lying some distance away from the Black Town, farther in the direction of Shakhoff Point.

From our brief description it will be seen that Baku is a very extensive town with a large population, and possesses all the resources of civilization. An idea of its shipping may be formed from the fact that 7,000 vessels enter and leave the port every year. Passenger steamers run regularly between it and the towns on the Volga, particularly to Tsaritzin, of which point we give a view showing Nobel Brothers' vast depot.

The distance from Baku to Astrachan, at mouth of Volga, is 560 miles, and from Astrachan the product is transported up the river to Tsaritzin, whence it is carried by rail to the interior of the empire.



DR. LE PLONGEON AND HIS PARTY.

Marble Pictures.

Dr. Hand Smith has been engaged in studying the movement of colored particles within marble, ivory, and other dense substances; and the result is a process of developing paintings and designs below the surface of marble, thereby combining the two arts of painting and sculpture. Through the use of metallic oxides, worked in a special medium and fixed by a special treatment, designs in every shade and tint are produced within the stone. It is a peculiarity of the method that every hue penetrates at right angles to the surface without spreading laterally. Samples of the new art are now being exhibited at Piccadilly Hall, London, and include decorative designs and delicate paintings of autumnal foliage. The process will be applicable to statuary, pottery, and mural tablets, as well as architectural decoration.

DR. LE PLONGEON AND HIS PARTY.

The interesting architectural remains of Yucatan which have been illustrated in the past few numbers of the paper testify so clearly to the civilization and taste of peoples and races who were extinct before this country was discovered, and have elicited so much attention from all who are at all interested in architecture as an art and archæology as a science, that we give in the accompanying engraving portraits of Dr. and Mrs. Le Plongeon, who have for ten years been occupied in prosecuting these researches in the forests of Chichen Itza, and to whom much praise is due for their untiring effort and indomitable perseverance. Dr. Le Plongeon is seated in the foreground, with his head resting wearily upon his hand. Mrs. Le Plongeon, who has accompanied the worthy doctor in all his wanderings is represented in the middle of the picture, ready to mount her Indian pony. Two native attendants stand at the left of the picture by the pony's head, and Lieutenant Alcoeer, chief of the escort, stands at right of the group. In the foreground is seen a curious symbolical stone which had its meaning among the Maya priesthood, and which was discovered in a mound near the monument of Chaacmol.

Cure for Nitric Acid Burns.

Prof. A. Irving writes as follows to the *Chemical News*: Some weeks ago, in experimenting with "brown fuming nitric acid," I happened to splash a portion of this powerfully corrosive liquid upon the skin of the face. The pain caused, I need hardly say, was very acute, and in a few minutes an enormous blister arose upon the part affected. Copious application of cold water, then of such powerful bases as ammonia, potash, and lime in water, had no perceptible effect upon it, except perhaps to increase the violence of the inflammation. After a few minutes, however, I luckily bethought me to try the effect of a dilute solution of sulphurous acid, of which I had a good supply made but a short time previously. Assuming that the action of the strong nitric acid was an intensified process of oxidation, I cast about for a reducing agent which might safely be trusted to be innoxious, even if it did not afford much relief. The effect of its application was astounding. In a very few minutes the blister was reduced; the oxidizing process of the strong acid was completely arrested, without having reached the roots of the hairs on the face; the painful irritation was completely removed, and in an incredibly short space of time the wound healed.

Submarine Electric Lamp.

Recently, some very interesting experiments in submarine electric lighting were conducted on the Clyde, at Greenock, Scotland. The Tilly, a vessel built by Messrs. Hanna, Donald & Wilson for the fisheries at Batavia, has been fitted with machinery to supply current for a 15,000 candle power lamp, which it is intended to lower into the sea for a depth of ten fathoms or less, as the exigencies of the drift net fishing require. The whole of the electrical apparatus, as well as the gearing for raising and lowering the lamp, have been supplied by Messrs. Paterson & Cooper, the current being supplied by one of their No. 4 dynamo machines, coupled directly to a Gwynne high speed vertical engine, and running at 650 revolutions a minute. The lamp, which is inclosed in a flint glass cylinder 9½ inches diameter, is suspended from a davit over the vessel's side, and the two conductors consist of finely stranded copper cord inclosed in India rubber hose. These conductors pass over pulleys on the end of the davit, and the lamp is raised or lowered by a winch fitted to the bottom of the davit. The trial lasted for four hours, during which time the lamp was submerged, and kept alight with the full current of 60 amperes through it.