

The Depths of Coal Mines.

M. Grousset's proposal to sink a shaft 1,500 m. in depth has attracted general attention to the depths of existing mines. Some American technical journals claim that there is a copper mine in Michigan with a shaft 1,972 m. in depth. M. Haton de la Goupilliere, director of the Paris School of Mines, has been interviewed on the subject by a correspondent of *La Nature*, to whom he gave some interesting details. From the data in his possession he found the greatest depths of mine shafts did not exceed 1,200 m. Beyond that it was only a question of bore holes. M. L. Poussigue, director of the Ronchamp Mines, in the Haute Saone, has made inquiries as to what were the greatest depths attained in Europe. In Bohemia, at Pibram, he found the Marie shaft with a depth of 1,130 m., the Adalbert shaft with the same depth, and the Franz Joseph with exactly 1,000 m. The Sainte-Henriette shafts at Flenu, near Mons, Belgium, are said to hold the record, with a depth of 1,200 m. Between 1,000 m. and 1,200 m. the temperature of the rock was 45 degrees; thanks to good ventilation, the atmosphere of the pit at that depth was successfully lowered to 20 degrees, although even at that temperature continuous work was trying.

A DRAWING OF SUN SPOTS.

To the Editor of the SCIENTIFIC AMERICAN:

I take the liberty of sending you a drawing of the sun as observed by me, May 19, 5 P. M., with a 3 inch instrument, power one hundred. The two large spots are fine specimens of typical sun spot phenomena, while the faculae about the developing spots at the edge of the disk seem to afford good examples of the first stages of sun spot development.

L. H. HORNER.

Springfield, Mass., May 20, 1895.

Telegraphing Without Wires.

Professor A. E. Dolbear, in the *Electrical Engineer*, says: The increasing interest in the attempts to telegraph without wires both here and abroad makes it worth while to make mention of some facts which have been forgotten or ignored, and I venture to point out that the method which has lately been employed so successfully in England for telegraphing across a sheet of water between three and four miles wide with no connecting cable was fully described by Professor John Trowbridge, of Harvard University, in 1880. He made his original researches between the Observatory in Cambridge and the city of Boston, between which is a time signal wire having the circuit broken by clock once a second. He found he could hear the clock beats a mile away from the line by connecting a telephone to a wire five or six hundred feet long and grounding their ends parallel with the circuit.

His experiments and conclusions are detailed in a paper given before the American Academy of Arts and Sciences and are published in their Proceedings for 1880. How completely he covered this ground of doing telegraphic work by means of earth conduction will be seen by the following quotations from those Proceedings:

"The theoretical possibility of telegraphing across large bodies of water is evident from this survey which I have undertaken.

"Theoretically, however, it is possible to telegraph across the Atlantic Ocean without a cable. Powerful dynamo-electric machines could be placed at some point in Nova Scotia, having one end of their circuit grounded near them and the other end grounded in Florida, the conducting wire consisting of a wire of great conductivity and being carefully insulated from the earth except at the two grounds. By exploring the coast of France, two points on two surfaces not at the same potential could be found, and by means of a telephone of low resistance the Morse signals sent from Nova Scotia to Florida would be heard in France."

This is precisely what is being done in England, carrying out Trowbridge's method. In the various descriptions of methods and operations which I have seen there is no mention of the work of Trowbridge, and whatever merit and utility there may be in this method of doing telegraph work belongs to him. Shortly after the publication of the paper from which I have quoted, Dr. Edward Everett Hale wrote a short story for the *Atlantic Monthly* in which these earth sheet currents played an important part. Beyond that I have never seen mention of the discovery, for it was a discovery, and an important one too, that slight currents could be detected at relatively great distances from their source by means of a telephone connected to the ground.

The Meccan Pilgrims.*

The Mohammedan pilgrimage to Mecca is a unique custom in the religious history of the world. Notwithstanding the inroads of civilization upon the Orient, 100,000 human beings still undergo the greatest privations in order to kiss the famous black stone which forms part of the sharp angle of the Meccan temple. The benefits of the pilgrimage are great, for the sins of every pilgrim, no matter how dark they may have been, are forgiven by the Almighty, and the supplications of the pilgrim on behalf of others are accepted by God. Such was the teaching of the Prophet.

As soon as the pilgrim reaches the last stage near the sacred city he makes two prostrations in prayer, and divests himself of his worldly raiment. Then he assumes the pilgrim's sacred robe, and sets his heart on Mecca.

The sacred garment called the Ihram consists of two seamless wrappers; one is wrapped round the waist and the other is thrown loosely over the shoulders. The pilgrim's head is left uncovered. After he has assumed the pilgrim's garb he must not anoint his head, or shave any part of his body, or pare his nails. Having entered upon the pilgrimage, he faces Mecca with the devout intention of making the journey to the sacred shrine. Lifting his hands heavenward he cries: "O God, I purpose making this pilgrimage. May the service be easy to me. Accept it from me!" Then, as he proceeds on his journey, he sings the sacred pilgrim song known as the Talbya, which

fat, or the "Mount of Recognition," about twelve miles from Mecca. It was in this place that our first parents, Adam and Eve, forfeited heaven, and were deprived of their primeval purity for eating wheat. The temptation over, the serpent escaped to Ispahan, the devil to Seistan, and Adam to Ceylon. Mother Eve remained at Arafat, but after wandering many years Adam found his wife on this "Mountain of Mercy," and hence it became known as "Arafat," or the "Mount of Recognition."

The next day is the tenth and is known as the "Day of Sacrifice," and as such is celebrated throughout the whole Mohammedan world. The historian Gibbon wrote of Islam as a religion without a priest and without a sacrifice, a strange error for so accurate a writer. Throughout the whole world this day of sacrifice is observed, and especially at Mecca.

Rising early in the morning, the pilgrim says his prayers and then casts stones at three pillars known as the three devils, the first of which is the "great devil." Holding the pebble between the thumb and fourth finger of the right hand, he throws it at a distance of not less than fifteen feet and cries, "This I do in hatred of the devil." It is said this ceremony was performed by Father Abraham.

Having stoned the devil, the pilgrim then proceeds to perform the sacrifice. The victim may be a sheep, or a goat, or a cow, or a camel, according to the means of the pilgrim. Placing its head toward the sacred stone, its forelegs being bandaged together, the pilgrim stands on the right side of his victim and plunges the knife into its throat with great force and cries with a loud voice: "Allahu akbar"—"God is most great! Accept of this sacrifice, O God!"

The ceremony of sacrifice concludes the Meccan pilgrimage, and the pilgrim then gets himself shaved and his nails pared, and the pilgrim robe is removed. The three days following are well earned days of rest. They are known as the "days of drying up of the blood of the sacrifice." Before he leaves Mecca the devout pilgrim should once more kiss the black stone and throw stones at the devil. He should also drink a cup of water from the Zamzam well, the very well from which Hagar drank when she ran away from home with her son Ishmael.

The pilgrimage to Mecca is known as the "Hajj" and the pilgrim as a Haaji. A visit to Mecca at any other time is called the Umrah. If a Moslem possesses the means of performing the pilgrimage once in his lifetime and omits to do so, it is a mortal sin, and he places himself beyond the possibility of redemption. This doubtless accounts for the popularity of the undertaking.

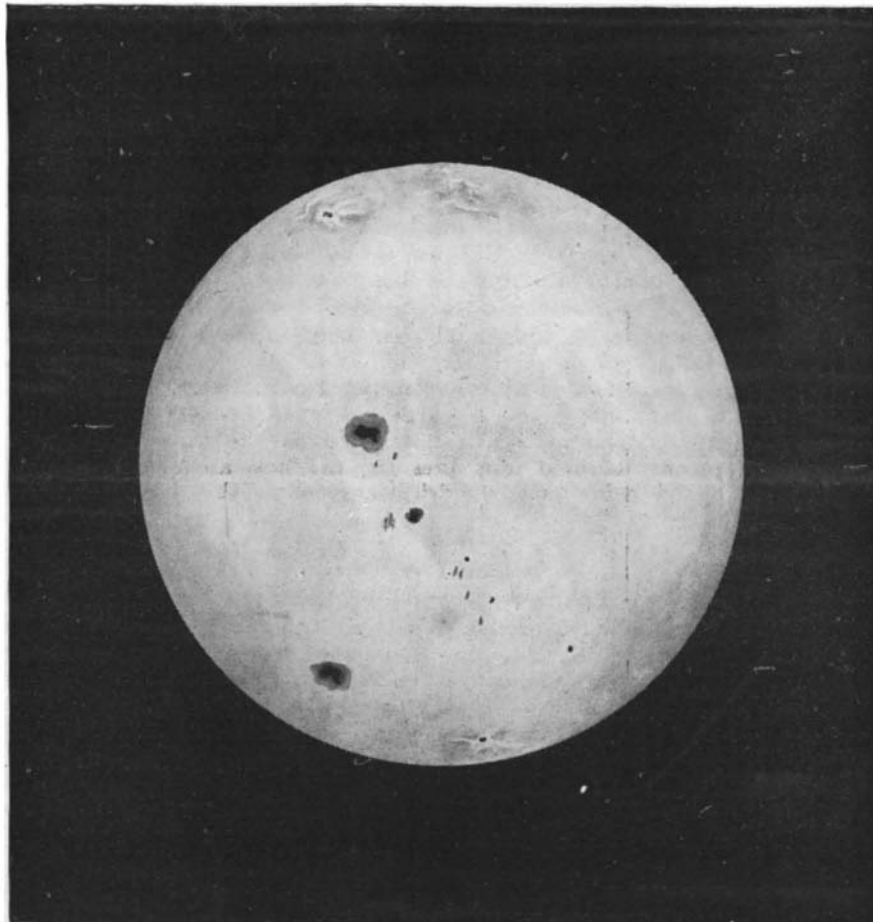
"He who makes a pilgrimage for God's sake shall return as pure from sin as the day on which he was born. Verily the pilgrimage doth put away poverty and sin just as the fire of a forge removes dross. The reward of pilgrimage is Paradise." Such are the words of the Prophet of Arabia.

The first account in English of the visit of a European to Mecca is that of Lodovico Bartema, an Italian gentleman, who made the pilgrimage in 1503. Only five Englishmen are known to have witnessed the ceremony at Mecca: Joseph Pitts, of Exeter, in 1678; Burckhardt, the Oriental traveler, in 1814; Richard Burton, of the Bombay army, in 1853; Dr. Bicknell, in 1862; and Mr. Keane, a petty officer of a steamship, in 1880. The narratives of each of these pilgrims have been published.

The Meccan pilgrimage was a compromise with Arabian idolatry, and no Moslem writer has ever yet attempted to give a spiritual explanation of its ceremonies. It is one of the most curious circumstances in the history of religion that the superstitious and silly custom of the Meccan pilgrimage should be grafted on to a religion which is monotheistic in its principles and iconoclastic in its practices. The spectacle of the Moslem world bowing in the direction of a black stone while it worships the one true God stamps the religion of the Prophet of Arabia as one of compromise.

Fifty Thousand Truants.

The Board of Education of New York City has received a summary of the school census recently taken by the police. According to this report there are 168,020 male and 171,736 female school children in this city. The table shows there are 50,069 truants, which means an expenditure of between \$5,000,000 and \$6,000,000 for new schools before these delinquents can be taken care of. There is now \$6,500,000 available for the erection of new school buildings and it is estimated that twenty-five of them will be required.



SUN SPOTS.

begins with the pilgrim's cry, "Labbaika!" It runs thus:

I stand up for Thy service, O God, I stand up!
I stand up! There is no partner with Thee! I stand up!
Verily Thine is the praise! The blessing! And the Kingdom!
There is no partner with Thee, O my God!

When he reaches Mecca he bathes himself and then proceeds to the temple and kisses the black stone. He then encompasses the temple seven times; three times at a quick step or run, four times at a slow pace. And each time as he passes around he touches the corner of the temple and kisses the black stone. Being spiritually refreshed, he runs to the top of the little Mount Safa, and, on reaching the summit of the mount, he turns toward the temple at a distance and cries: "Surely God hath aided his servant the Prophet and hath put to flight the armies of the infidel with His own power!" He then runs from the top of Safa to the summit of the Mount Marwah, and this he does seven times. It is an exercise which tries the energy of even the youthful pilgrim, while the white haired pilgrim puffs and blows beneath the excessive weight of his religious devotions.

Upon the seventh day of the pilgrimage the crowd of pilgrims assemble in the great mosque, and at 2 o'clock in the afternoon listen to an Arabic sermon which sets forth the excellences of the "Hajj," as the pilgrimage is called.

On the following day he visits the little valley of Mina, or the "wished for" valley, which Adam longed for when he was turned out of Eden. The next day, after morning prayer, the pilgrim ascends Mount Ara-

* Thomas P. Hughes in the *New York Sun*.

A Sectional Steamboat.

Everybody knows the ingenuity with which the French make preparations for new requirements in their military expeditions, an ingenuity which resembles closely that which the Americans display in their engineering operations for civil purposes. At present the only military enterprise occupying French attention is the establishment of its influence in Madagascar, and Le Genie Civil describes some curious devices which have been invented for the invasion of that country. The capital of Madagascar, Tananarivo, is situated among the mountains of the interior, and is inaccessible, except by footpaths, the government having always prohibited the construction of roads by which artillery could be brought against the city. French armies are, however, not deterred by such trifling difficulties, and a campaign against Tananarivo has been carefully planned. As there are no roads, a river, the Ikonpa, which extends from the sea to the foot of the mountains, just below Tananarivo, is to be used as a road. This river is very shallow and obstructed by sand bars, and the problem is to construct vessels capable of navigating it. This problem has been solved, so far as the gunboats are concerned, by building eight compound boats, or rather rafts. Each of these boats is divided longitudinally into six compartments, each compartment being watertight and independent, so that it can float alone, while, in case of need, any number of them can be bolted together, side by side. These separate compartments, or shells, are of galvanized steel and very light, so that they can be easily transported overland, thrown into the water, and bolted together as they float. When in place, a deck is put over them, on which is placed, near the front, a small boiler of the locomotive type. To balance the weight of this, the engine is set near the rear end of the deck, and is connected directly to a light stern wheel, which serves for propulsion. An upper deck, on which are the pilot house, shields of steel plates for riflemen, and a light cannon, covers the whole extent of the lower deck. All the vulnerable parts of the craft are protected from musketry by steel shields. The whole affair, with stores, crew, and armament, draws less than fifteen inches of water. To provide for passing sand bars, a powerful turbine pump is placed at the very front of the vessel, with a suction pipe which can be lowered as required to any distance less than one meter from the surface of the water. On reaching a sand bar this suction pipe is run out, and the turbine set at work. The sand, mixed with water, is sucked out with great rapidity from in front of the craft and thrown, by a discharge pipe, to one side, and a passage through the bar is in this way soon made.—American Architect.

A LIGHTNING PHOTOGRAPH.

To the Editor of the SCIENTIFIC AMERICAN:

I send you a photograph of lightning, which I made about 11 o'clock on the night of May 5, during one of the most remarkable electric storms ever witnessed in this section of the country. There were three distinct bolts of lightning at the same instant. One of them, after seeming to coil itself around one of the others, darted off to an electric light tower, which stands 150 feet high near the northeast corner of the square occupied by the buildings of the Institution for the Blind, located in this city, and seen in the foreground of the picture.

I send this because I think it will be of interest to you and your readers.

GEO. F. TOWNSEND.

Austin, Tex., May 13, 1895.

American Diggers in Greece.

A gymnasium and other well paved buildings have been uncovered at Eretria, as well as three inscriptions, three heads, and some good architectural fragments. The excavation of the theater has been nearly completed.

The excavations among the ancient Greek ruins at Eretria have been carried on some years by the American School of Classical Studies at Athens. The gymnasium and other buildings which have been uncovered are probably part of the buildings on each side of the ancient street laid bare last year between the theater and the naval school of King Otho.

When the houses found last year were cleared a floor of cement and pebbles was discovered about a yard below the surface. The well-paved buildings mentioned by Mr. Peabody are doubtless of a similar construction.

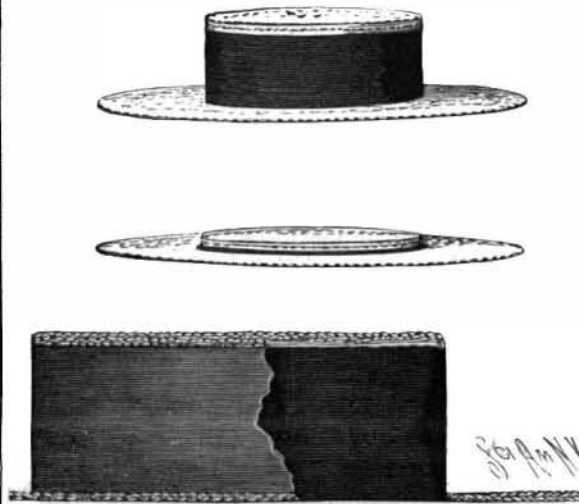
Sales of Patents.

There are a number of concerns that purport to sell patents on commission, but in all cases, so far as we can learn, they induce patentees to pay them money in advance, on which the pretended sellers live, the patents never being sold. The trick is a barefaced

swindle. If any of our readers have knowledge of such payments, we should be glad if they would send us the particulars; not for publication, but for private use in establishing the fact of such payments, with view to a remedy.

A STRAW CRUSH HAT.

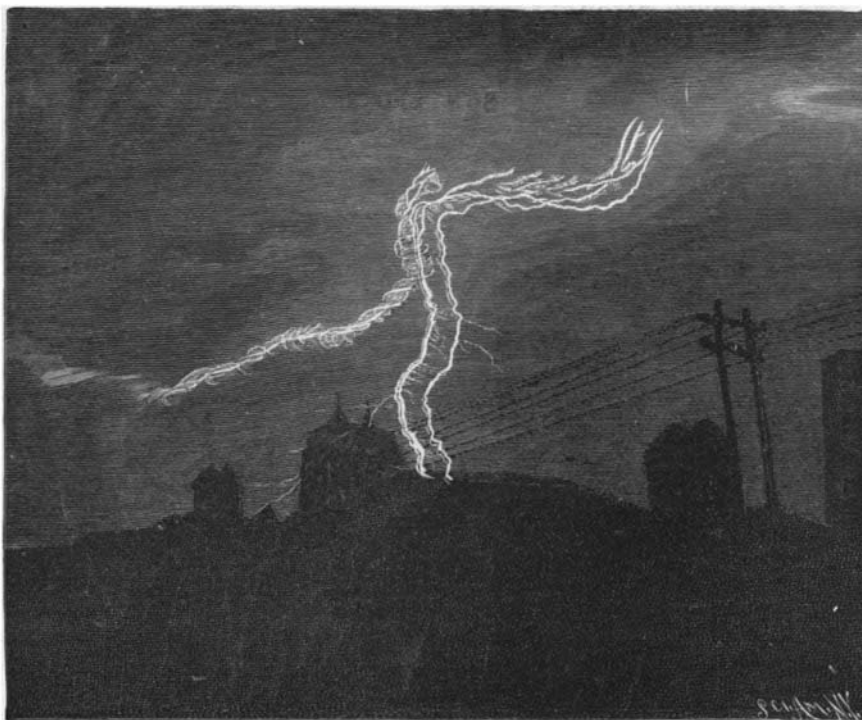
The high hat of the crush variety is old, but the brilliant genius who surpassed the inventor of the starched necktie in contributing the opera hat to the world of male fashion stopped short at silk and did not venture to produce a crush Leghorn. Such we now illustrate—a Parisian production—uncompromising and hard in appearance as Captain Cuttle's tarpaulin,

**A STRAW CRUSH HAT.**

but which, placed beneath the arm, succumbs to pressure; which left carelessly in a chair may receive the avoirdupois of a careless sitter without injury to its anatomy. Like other things in the realm of fashion, it is a deception. The upper crown is straw and the brim is straw; the sides, ordinarily covered with the band, are wanting; the band is there, but there is no substratum of straw. Instead, there is a steel spiral spring, which forces up the crown and stretches the wide band or ribband tightly. The cut, with this description, explains the artifice. When pressed the spring yields and crown and brim come into the one plane. Released from pressure, the sides are forced out to their proper cylindrical contour as the crown rises.

A Cure for Colds.

We are often told that while we may be able to cure consumption or pneumonia, yet we cannot cure a common cold. We desire to state in this connection what we have often said before, that we have a very favorite remedy for all these cases. We have tried it in very many instances and with almost invariable success. The remedy to which we refer is phenacetine. So soon as the patient feels the premonitory symptoms of the cold let him take a hot footbath at bedtime, drink

**A REMARKABLE LIGHTNING STROKE.**

freely of some warm drinks, and take five, seven and a half, or even ten grains of phenacetine. In a strong adult we do not hesitate to give the full dose of ten grains. The result is that the patient has a good night's sleep and awakens in the morning free from pain, while nearly all the symptoms of the cold have disappeared. Of course unusual care must be exercised during the day to prevent the body from becoming chilled.—Medical Compend.

Lessons of the China-Japanese War.

An article in the Marine Rundschau upon the changes in warship building indicated as necessary by the events of the China-Japanese war, and especially of the battle of the Yalu, is most interesting. The writer has collated the various accounts of the events, and has had special information before him, and the table he gives of the damage inflicted upon the ships engaged, and more particularly upon those of the Chinese, illustrates the matter in full detail. A second table sums up the results of the detailed inquiry, and a third describes sundry improvements, mostly of a temporary kind, introduced by the Chinese themselves, such as covering in the barbettes of the Ting-Yuen and Chen-Yuen with light plating as protection against rifle fire, and to shut out the smoke. The conclusions of this writer are that armor protection is more than ever necessary; including gun emplacements, fighting stations, auxiliary engines and also water torpedo rooms. He advocates a complete armor belt, with numerous watertight compartments, and the making an absolute certainty that these last shall be closed as well as all other openings through which water may come in. Finally, he questions the value of fighting masts. Philo McGiffin, a graduate of our Naval Academy, who commanded the Chinese armor-clad at the battle of Yalu River, and who has returned to the United States, is reported as saying that the battle was a stubborn one, and was lost to the Chinese chiefly because they had no shells to use, but only solid shot. The Japanese, he said, were well supplied with shell, which did great execution.

Captain McGiffin, in a recent letter on his experiences with the Chinese navy, writes: "A layman has no conception of the awful nature of battle in modern naval vessels. Even the cruisers have steel sides, and the air of the inclosed spaces is very confined. The din made by the impact of heavy projectiles against these metal sides is awful beyond description. I wore cotton in my ears, but, in spite of that, am still deaf from that cause. The engineers in the Chen-Yuen stuck to their work, even when the temperature of the engine rooms was above 200° F. The skin of their hands and arms was actually roasted off, and every man was blinded for life, the sight being actually seared out. Late in the action, after my hair had been burned off and my eyes so impaired by injected blood that I could only see out of one of them, and then only by lifting the lid with my fingers, I was desirous of seeing how the enemy was delivering his fire. As I groped my way around the protected deck, a hundred pound shell pierced the armor about eighteen inches in front of my hand. In a second, my hand touching the steel was so burnt that part of the skin was left upon the armor. That shows how intense is the heat engendered by the impact of a shot, and how rapidly the steel conducts that heat. One shell struck an open gun shield of the Chen Yuen early in the action, and, glancing thence, passed through the open port. Seven gunners were killed and fifteen wounded by that shot. Early in the fight the Maxim gun in our foretop was silenced. The holes pierced by a shell could be seen from the deck. After the fight we found the officer and men on duty there all dead and frightfully mangled. That one shell had wrought the havoc. The detonations of the heavy cannon and the impact of hostile projectiles produce concussions that actually rend the clothing off. The Chinese sailors deserve all credit for their courage and obedience in that action. No duty was too difficult or dangerous. When the Chen Yuen's forecastle was ablaze from Jap shells, I ordered several officers to cross the shell-swept place to fight the fire. They shirked that duty, but when I called upon the men to volunteer to follow me, they did it promptly, and the ship was saved. It was while on this duty that a shell, passing between my legs, threw me aloft and let me down upon the deck with such violence that I became unconscious, and was out of the fight. All of the officers, however, were not cowards. On my ship were several who had been educated in this country, and they were as brave and devoted as men could be. Others, however, were in the safest place they could find amidships."

A Soap for Cleaning Silk.

A soap for this purpose is made by heating 1 pound coconut oil to 96° F., adding ½ pound caustic soda, and mixing thoroughly. Then heat ½ pound white Venetian turpentine, add to the soap, and again mix thoroughly. The mixture is covered and left for four hours, then heated again, and 1 pound of ox gall is added to it and well stirred. Next, pulverize some perfectly dry, good curd soap and add it to the gall soap in sufficient quantity to make it solid—1 or 2 pounds of curd soap will be needed. When cold, the mass should be pressed into cakes.