SCIENTIFIC AND PRACTICAL.

UTILIZED DAYLIGHT.

The London *Building and Engineering Times* describes a system designed to give light in passages and portions of offices, stores and other parts of buildings where, from close packing and want of space sunshine scarcely penetrates. It consists in inserting semi-prismatic lens lights in such positions as will allow refracted daylighted to be admitted, even on a dull and cloudy day. These semi-prismatic lights are made in a variety of forms. they consist of cast iron frames, into which are glazed either rectangular or hexagonal semi-prismatic reflecting lenses made from clear crystal glass, so placed that the light is reflected through the lens at such an angle as to slope from the front to the back of wherever they are *in situ* At the distance of 60 feet from the front of the premises, we are able to read the smallest print, and the only source of light in a cellar used as a storage was that which passed through one of the pavement lights under notice. The same principle has been applied in an improved safety coal plate, in flagged or asphalt pavements, and these are being extensively used in the streets of the metropolis; also in the form of sloping boards instead of window sashes, and giving as much protection as unsightly iron railings, besides affording ventilation, whilst they reflect additional light into basements outside of which they are fixed.

THE ELECTRIC LIGHT.

The *Daily Beacon* of Akron, Ohio, contains a four column account of the trial of the electric light in that place a few days ago. From it the following extracts are taken:—

"Just as the hands on the Central Engine House clock touched the hour of 2 o'clock this (Saturday) morning, the great drive-wheel of the engine in the basement began to revolve, signalizing the first actual test of Akron's long-looked for electric light system. At noon yesterday the concluding work had arrived at such a forward state that Mr. Marshall, the Brush Electric Light Company's mechanical engineer, felt himself justified in telegraphing to Mr George W. Stockly, Vice President and Business Manager, at Cleveland, that as matters looked then the light would probably be "a go" by evening, and stating that more definite information would be given later on. By 6 o'clock the work of adjusting the lamps of the iron tower—the final task of all—was taken in hand, and word was accordingly sent to Mr. Stockly that the test would surely be made after midnight. That gentleman had greatly desired to be present at the test, but for some reason did not arrive. Two o'clock a.m. was chosen, because the moon would set at 2.19, thus affording all the concomitants for a successful trial.

Simultaneously with the starting of the engine, a rush was made by the small group of interested spectators, to the platform on the north of the building. Looking down over the business blocks of Howard and Market streets, the big tower itself could scarcely be discerned. The moon was low and a slight haze hung over the city. All of a sudden, apparently in mid air, a great white light sprang out as if by magic. For an instant every building stood out in bold relief, and an exclamation of admiration escaped the lookers on. But it was only for an instant, for the light almost as suddenly went out, leaving the darkness more "visible" than before. There was some fault in the insulation.

Meanwhile another break was made for a good point of observation from which to see the effect of the Buchtel College light. Here everything was found to be working most successfully. Every angle of the structure stood out in bold relief and intervening houses and portions of streets within range were suffused with a mellow, silvery light, not unlike that of the moon. Admiration of the sight was universal, and watches were produced to test the light, with satisfactory results.

The Howard-Market street tower was the next point of interest to be visited. A few minutes work sufficed to discover and right the fault in the wire, and then upon word by telephone from the *Beacon* office the engine was again started. At first only two of the carbons ignited, but soon all four were ablaze, and the transformation was marvelous. Howard and Market streets, which before had been quite dark, were now brilliantly illuminated; sidewalks and roadways were as bright as moonlight could make them, and buildings were lighted up from roof to basement. In all directions the light seemed ample and satisfactory. A few tests were made to ascertain the power and extent of the illumination. West Hill was brought out in strong contrast with the dark sky beyond. As far south on Howard as the postoffice and east on Market to High there was no perceptible diminution in the light. On East Market between High and Broadway, the angle in the street cut off the direct rays for a short distance, but the reflections from the adjacent buildings in a measure destroyed the shadows. Near East Market street railroad bridge the effect of the Buchtel College light began to be seen. Houses, instead of being illuminated on one side were lighted up on two. The face of a watch could also be seen from either direction. At a point in the yard of the Central High School building, where the circles of radiation were expected to lap, a very short shadow in the direction of the college was discernible, showing, first, that the counter lights had the effect of very nearly destroying the shadows, and, secondly, that the iron tower light was somewhat the more effective. On East Market street, at Fir, the college light appeared to predominate, though the tower light was visible, and its rays were measurably effective at least as far as Fay street. The latter street was well lighted, and possibly the cross streets beyond.

Summing up the work performed, it is a moderate statement of the case to say that the guaranty of the Brush Company, of ample light within a radius of half a mile from each light-centre, was fully met. The experiment was most satisfactory, and all who beheld it were delighted and voted the Brush Electric Light a pre-eminent success.

THE ELECTRIC LIGHT IN A SCOTCH COLLIER'

Mr. Watson, of Earnock, has resolved, if at all practicable, to use the electric light in the lighting of his colliery, not only on the surface, but at the pit bottom, in the roads, and at the working faces. He recently selected Swan's electric lamp for this purpose, and the first steps have been taken incidental to its introduction in the colliery. Besides Mr. Watson there were present Mr. Graham, electrician, and Principal Jamieson, Glasgow; Mr. Grant, Kilmarnock; and Mr. Gilchrist, manager, Earnock. It is intended to erect the dynamo-electric machine in the engine house connected with the Guibal fan at the colliery, and the gentlemen named were engaged indicating the horse-power of the fan engines to ascertain the surplus power for driving the machines. From the engine house the electric cables will be led down the nearest pit shaft into the workings. In the Swan lamps, the glowing, or incandescence is carried on in vacuo, and it is claimed for them that even in presence of inflammable and explosive gas they are absolutely safe. The preliminary operations attending the introduction of the light will occupy nearly a couple of months. —*Scotsman.*

ELECTRICAL SCIENCE.

The story of electricity forms the most romantic chapter in the history of science. The curious thing about it is, that it has been a progress from utter and absolute ignorance to the most familiar and extensive practical results. In all the other sciences—mechanics, optics, physiology, astronomy—there was a basis of common knowledge, consisting of many familiar facts to start with, and there is every rudiment of science in the loose observations of uninstructed people concerning things that fall within the range of ordinary experience. But electrical science has no such starting point—nothing was known by common people of any such agent. Lightning was hardly regarded as a terrestrial thing. It was the bolt of Jove, minister of God's wrath, or a malign agency of the prince of the powers of the air, a kind of preternatural phenomenon; and, when amber was rubbed and found to attract light bodies in a mysterious way, it was assumed to have a soul and to be a sacred thing. This little seed of the science did not germinate for thousands of years. It was an instructive test of the culture of the human mind and shows what an enormous amount of preliminary mental activity had to be expended before men were prepared to engage in the study of nature. The natural was filled with this force which we now call electrical; all things were pervaded by it, but it was beneath the surface; it did not strike the senses and compel attention; it could be discovered only by thought and the investigation could not commence until the human intellect had been turned in a systematic way upon natural things. But when experimental inquiries in electricity were once begun their results were so curious and peculiar that they exerted a powerful fascination over the wonder-loving and by this stimulus the science grew rapidly. It has given rise to a brilliant series of electrical and magnetic discoveries, inventions and useful applications of the widest range and highest utility to civilization, such as no other science has afforded. The intellectual movement has been from the zero of total ignorance, through long observation and experiment, up to the richest harvest of wonderful works.—*From Ediler's Table in Popular Science Monthly for April.*

THE PLANETS IN MAY.

Venus is morning star. In December, 1882, she will be seen all over America making a transit or crossing the sun's disc. Astronomers are already laying their plans for the observation of this transit, the greatest astronomical event anticipated in this country in the present century. Jupiter is morning star, close to the sun, and close to Saturn. Mars, Mercury and Neptune are morning stars, the first rising a few minutes after 3 o'clock, the second at 4.30, and the last rising with the sun. Uranus is the only evening star, rising now a quarter before 2 o'clock. The May moon fulls on the 13th. The most beautiful celestial picture of the month occurs on the morning of the 26th, for the waning moon will then be near Venus, Saturn and Jupiter, though she passed her conjunction with them all on the previous day. As Venus rises on that morning about ten minutes after three o'clock, Saturn ten minutes later, and Jupiter about ten minutes after Saturn, if the sky is clear it will be safe to promise a superb planetary show, well worth taking pains to witness The new moon of the 27th throws her shadow over a portion of the earth, and causes a partial eclipse of the sun. It is invisible here, but visible in the northern part of North America and in Northern Asia.

"WONDERS OF THE HEAVENS"

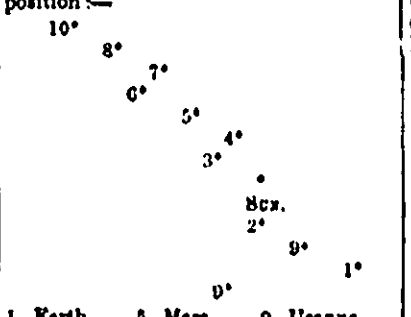
Rev. C. Collins, of Pennsylvania, recently preached a sermon of inquiry as to the ominous astronomical indications for 1881-2, which is attracting considerable attention. In this discourse he presented a summary of astronomical facts and comments, which we copy as follows:—

"The year 1881 will be one of remarkable interest from an astronomical standpoint, for during this year the planets of our system will reach a point in their orbits not attained (some astronomers tell us) for 6,000 years, while others say that a similar combination occurred about 1800 years ago.

The sun is the centre of our system, and around the grand colossal star, which is nearly a million and a half times larger than the earth, and about 350,000 times as heavy, revolve all of our planets, each apparently going regardless of all others, and yet all bound together by that mutual attraction, commonly called gravitation. Each planet has an orbit independent of the others, and goes on its journey regardless of what its neighbours may be doing. These orbits differ relatively every month, so that astronomers find it at once fascinating and profitable, to figure out the relative positions occupied by each at a given time.

To the uninitiated it seems almost miraculous that a "star gazer" should be able to tell just when an eclipse is to occur, but when we consider that the planets move just like a majestic clock, each orb going its round as a part of the grand celestial mechanism, making just such a distance in such a time, it ceases to be more than a study, which has been mastered by attention and application.

Just now the heavens are full of interest, for all the planets are drawing nearer to the point which they are to reach Sunday morning, June 19, 1881, at about three o'clock. At that hour the stars will be in Taurus, and will be in this position:—



1. Earth. 5. Mars. 9. Uranus.
2. Moon. 6. Jupiter. 10. Alcyone
3. Mercury. 7. Saturn. Sun.
4. Venus. 8. Neptune.

By this it will be observed that all the planets, Uranus alone excepted, will be arrayed with the sun and Moon, against our little earth. We know what an effect, even the Moon, small as it is, has on our tides; then what must be the result, when so many, aggregating many million times larger than the earth, shall be pulling against it?

Another feature, which should not be overlooked, is this! Directly in range with these planets is Alcyone, or *eta* Tauri, the central star of the Pleiades. This star is said to be the grand centre of the universe of worlds we see swinging around us on a clear night; and a few have gone so far as to locate Heaven itself on this star. The fact that this star also seems to take a hand in tugging at the earth makes it look all the more ominous.

Attempts have been made to show that the builders of the Pyramid of Egypt had an eye to this conjunction, and that it was so placed, that at this particular time, Draconis or Mazzaroth passes the meridian of the entrance passage of this great Pyramid. We know that the Egyptians were great star-gazers, and that they knew the heavens like a book; but is it not straining a point to suppose that they had an idea of the grand event? It will not be believed by everybody.

This transit marks a quarter era on the celestial dial of the grand processional year of our sidereal heavens, which is also indicated by Alcyone, the supposed centre.

It would take too much space to speculate upon the results of this remarkable grouping of the planets. Suffice it to say, that when they have in times long since past, reached similar positions, dire and wondrous have been the effects upon the earth.

During one of these conjunctions the continent Atlantis sank into the Atlantic Ocean. At others, many provinces, islands, etc., have suddenly either disappeared beneath the waves or shot up into being, from the briny deep. Volcanoes and geysers become active, and indeed the entire universe seems out of gear. These facts will make the approach of June 19th, 1881 be watched with interest, and every unusual event in the interim will be attributed unto it.

The New York *Herald*, which has attained so much celebrity for the accuracy of its weather forecasts, commenting on these facts, says:—

"The present celestial activity should be closely watched and compared with the phenomenal weather now transpiring on our own atmosphere. The new year, if we may judge from present indications, promises to be one of marked meteorological phenomena, which should be diligently investigated from every point of view, stellar and terrestrial."

PAPER MAKING

Paper making in Canada is yet in its infancy There are twenty-six mills in the Dominion. None of them, however, manufacture writing paper, and only three of them make medium printing papers, the balance being occupied with wrapping and ordinary printing qualities The Province of Nova Scotia has one mill which is lying idle for want of enterprise. New Brunswick has one mill making wrapping papers. Quebec has seven mills, one of which makes medium printing and flat papers. Ontario has seventeen mills, two of which make the medium printing There is a splendid opening in the Dominion for English or American manufacturers of writing and other paper of fine quality. The City of Toronto could keep a paper mill of very large capacity running on number three printing quality alone for newspapers. The River Humber could furnish a good site and water for such an enterprise The Provinces of Nova Scotia and New Brunswick would each keep a mill of two tons per day capacity going, making news and job papers. The young Province of Manitoba is to have a paper mill erected some distance from Winnipeg this summer. The City of London is to have a one hundred thousand dollar mill erected this season on the River Thames. Why cannot Toronto capitalists follow suit near the city on the banks of a suitable river like the Humber? The envelope industry is on the increase in this city. An enterprising firm commenced making about three years ago Lately another company has started, and very shortly another firm will be turning out envelopes by the million The ordinary white and Manilla papers are obtained from the Ontario and Quebec papers makers, but the better qualities have to be imported from England and the United States. How long this state of things is to exist is for the Canadian capitalists to decide. Money is cheap, and the demand for better qualities of papers is extensive enough to induce others to make paper outside a few self styled millionaires who have become such by making common grades only. There is far more money to be made out of the manufacture of fine than common papers. About five tons of bookbinders' board are consumed daily in the Dominion, outside of straw board. At present this article has to be imported from Scotland and the United States. The freight and duty would in themselves be a large profit, and Toronto would be a good centre in which to manufacture. Cannot some monied men be induced to embark in an enterprise which would prove a paying one.—*Toronto Evening Telegram.*

TUNNELING THE ENGLISH CHANNEL.

Progress has been reported in the work of constructing a railway tunnel under the Straits of Dover between England and France The operations so far have been conducted with satisfactory results, and the managers of the enterprise are hopeful of final success, although it is altogether too early to speak with any confidence, as the point where the real difficulties of the undertaking may be looked for have not yet been reached. The feasibility of tunneling under the English Channel between Dover and Calais was asserted many years ago by engineers of experience. The ground of their belief was the identity of the geological formation of the opposing shores, and other evidence of a continuity of the geological formation common to both sides. Soundings made at very short intervals along the line between the opposing headlands confirmed this theory. The chalk bluffs on both sides of the channel rest upon blue clay, and the lower part of the chalk formation, to a great thickness, is of a clayey character sufficiently impervious to water to permit boring. The soundings showed this formation to extend across from shore to shore, descending gradually to a depth of 180 feet below high water in mid-channel, and rising at the same gradient to the other side. In 1872 a company was organized to make a tunnel that would permit railway transit under twenty-one miles of water between the two countries at their nearest approach to each other. Preliminary surveys were made and the results presented to the governments of France and England with appeals for countenance and aid. A joint commission was appointed to investigate on behalf of the governments. Concessions were subsequently obtained from both countries, with assurances that if private enterprise should succeed in demonstrating the practicability of the undertaking, material aid would be furnished. With this encouragement the work was begun. Trial shafts were sunk on both shores to determine the character and thickness of the chalk formation intended to be pierced. It was determined to follow the line of two hundred feet below the bed of the channel at the lowest point of the line. These preliminaries occupied several years. When all preparations had been made, the work upon the tunnel was commenced. The plan proposed is to follow by a descending tunnel the eastern dip of the gray chalk towards Dover, until the depth of two hundred feet below the sea bed is reached, and then to push straight across the channel with a horizontal passage way until the opposite shore is reached The tunnel will then sweep around and ascend to the surface by an incline, following the dip of chalk formation on the English side. The grey chalk is to this method entered and followed in its natural position throughout, from dry land on one side of the channel to dry land on the other. It is proposed to carry a circular bore, seven feet in diameter, from side to side, and when this has been accomplished the two governments agree to subsidize the work. the it may be enlarged to the dimensions required for practical operations The cutting is done by a boring machine advancing half an inch a minute The horizontal bore has reached but a short distance beyond the low water tidal level on the English side, and it is not yet known whether difficulties may be expected from jets of water forcing their way through fissures. The problem which the first boring is intended to solve is the possible—and feared—existence of a break or fault in the chalk about midway of the channel, causing a deep fissure. Should this exist all hope of a tunnel communication would be at an end. With the boring continued unceasingly at the present maximum rate of sixty feet a day, it will be considerable time before the ten and a half miles to mid-channel are bored through and the existence or non-existence of the dreaded central fissure demonstrated.

SCIENTIFIC NOTES.

Old and faded daguerrotypes will often become as bright as new if placed in a very weak solution of cyanide of potassium.

Nature raises water for refreshing the earth from 13,000 to 14,000 feet in some portions of South America, and even 16,000 feet for the highest inhabited regions of Thibet.

Oil of sheep's feet is said to be much superior to horse-foot oil and neat's-foot oil, with which it is generally confounded in commerce. When pure it is of a very pale yellow colour.

When cotton waste or shavings are saturated with oil, a large surface is exposed to the action of the air, and if the oil has the property of absorbing oxygen, it may absorb the gas so rapidly as to take fire. This is the way in which spontaneous combustion takes place. As petroleum naphtha does not absorb oxygen, it never takes fire by spontaneous combustion.

A contemporary says that one of the most effectual recipes for cleansing sponges, and certainly one of the cheapest, is a strong solution of salt and water, in which they should soak for a few hours, and then be thoroughly dried. Sponges should not be left in a sponge dish; they should be kept suspended where the air can freely circulate around them. Quick evaporation of the moisture is the main thing to keep them in good order.

At the instance of the Secretary of State for the Colonies of Great Britain, Professor E. Ray, Lancaster, has prepared a report on the artificial growth of sponges, which shows that they could be grown in localities where none now exist. Experiments in the Adriatic Sea were made by sinking small bits of sponge in suitable localities, and in the course of seven years these fragments of a single sponge had each grown into a sponge itself, large enough to be saleable.

Braconnot recommends the following as a cheap indelible ink:— Twenty parts of potash are dissolved in boiling water, ten parts of fine-cut leather chips and five parts of flowers of sulpher are added, and the whole heated in an iron kettle until it is evaporated to dryness Then the heat is continued until the mass becomes soft, care being taken that it does not ignite. The pot is now removed from the fire and allowed to cool, water is added, the solution strained and preserved in bottles. This ink flows easily from the pen.

The Chinese have at length discovered the social advantages of the telegraph and a contract has been signed between the Chinese Government on the one hand, and the Great Northern Telegraph Company, of Copenhagen, for the establishment of a telegraph line between Shanghai and Tientsin, the harbour for Pekin, a length of about 1,000 miles. There will be nine or ten telegraph stations on the line, and a school will be opened for instructing Chinese youths in the art of telegraphing. The Danes are skilful telegraphists, and have the advantage of being apt at languages, so that the undertaking promises to be successful.

An important trial of armour plates of the kind proposed for the new British vessels *Conqueror* and *Majestic* took place recently at Portsmouth The plates were made on the Ellis system. Around an iron armour plate backing is placed an iron frame, on the top of which is placed a two inch plate of iron of the same size as the iron plate. The three pieces having been bound together are brought to a welding heat, and the space between the two plates filled with cast steel. When the whole is cooled it is reheated and rolled down to the desired thickness Three rounds from a 125 pound Palliser gun, loaded with 50 pound charges and fired at a distance of 30 feet, made penetrations of only 5 inches, 4.9 inches and 5.6 inches respectively in one of these composite plates. 8 feet long, 5 feet 3 inches wide and 10½ inches thick