ventor, Mr. J. W. Foust, at Evansburgh, Crawford Co., Pa.

SOME weeks ago, a New York rogue sent circulars about the country, offering a choice steel-plate engraving of Gen. Jackson for the low price of 25 cents. Those who sent the quarter received in due time a two-cent postage stamp.

THE DISCOVERIES OF 1863.

We have received from the editor, the "Annual of Scientific Discovery or Year-Book of Facts in Science and Art for 1864." This is a volume of 350 pages being bound in uniform style with the preceding volumes of the series. It is ably edited by David A. Wells, A. M., M. D., author of "Principles of Natural Philosophy," "Principles of Chemistry," "First Principles of Geology, &c., It is published by Gould and Lincoln, Boston. The following extracts will give a good idea of the book, which we recommend as useful and entertaining to all persons interested in the progress of science, art, and mechanics :—

RAILWAY TUNNELS IN GREAT BRITAIN.

At a recent meeting of the Institution of Civil Enginners, Mr. J. S. Fraser stated that the aggregate length of the tunnels, now daily traversed by railway trains in the United Kingdom, amounts to eighty miles; and, supposing their cost to have been on an average fifteen pounds on a lineal yard, their construction must have caused the expenditure of six and a half millions sterling—equal to $400,000 per mile.

REPAIRING THE SILVERING OF LOOKING-GLASSES.

The repairing of the silvering on the backs of looking-glasses has hitherto been considered a very difficult operation. A new and very simple method, however, has been described before the Polytechnic Society of Leipsic. It is as follows: clean the bare portion of the glass by rubbing it gently with fine cotton taking care to remove any trace of dust and grease. If this cleaning be not done very carefully, defects will appear around the place repaired. With the point of your knife cut upon the back of another looking-glass around a portion of the silvering of the required form, but a little larger. Upon it place a small drop of mercury; a drop the size of a pin's head will be sufficient for a surface equal to the size of the nail. The mercury spreads immediately, penetrates the amalgam to where it was cut off with the knife, and the required piece may now be lifted and removed to the place to be repaired. This is the most difficult part of the operation. Then press lightly the renewed portion with cotton; it hardens almost immediately, and the glass presents the same appearance as a new one.—*Builder*.

CURIOUS ELECTRICAL PHENOMENA.

Prof. Tyndall publishes the following account of some curious electrical phenomena observed by Mr. R. Watson, and a party of tourists in ascending a portion of the Jungfrau mountain in Switzerland. Mr. W. in a letter to Prof. Tyndall says : "On the 10th of July, 1863, I visited with a party of three, and two guides, the Col de la Jungfrau. The early morning was bright, and gave promise of a fine day, but, as we approached the Col, clouds settled down upon it, and, on reaching it, we encountered so severe a storm of wind, snow and hail, that we were unable to stay more than a few minutes. As we descended, the snow continued to fall so densely that we lost our way and, for some time, we were wandering up the Lotsch Sattel. We had hardly discovered our mistake when a loud peal of thunder was heard, and shortly after I observed that a strange singing sound, like that of a kettle, was issuing from my alpenstock. We halted, and finding that all the axes and stocks emitted the same sound, stuck them into the snow. The guide from the hotel now pulled off his cap, shouting that his head burned; and his head was seen to have a similar appearance to that which it would have presented had he been on an insulated stool, under a powerful electric machine. We all of us experienced the sensation of pricking or burning in some part of the body, more especially in the head and face, my hair also standing on end in an uncomfortable but very amusing manner. The snow gave out a hissing as though a heavy shower of hail were falling; the veil on the 'wide-awake' of one of the party stood upright in the air, and on waving our hands, the singing sound issued largely from the fingers. Whenever a peal of thunder was heard, the phenomena ceased, to be resumed before the echoes had died away. At these times, we felt shocks, more or less violent, in those portions of the body which were most affected. By one of these, my right arm was paralyzed so completely that I could neither use nor raise it for several minutes, and I suffered much pain in it at the shoulder-joint for several hours. At half-past twelve, the clouds began to pass away, and the phenomena finally ceased, having lasted twenty-five minutes. We saw no lightning, and were puzzled at first as to whether we should be afraid or amused."

THE TENEBROSCOPE FOR PROVING THE INVISIBILITY OF LIGHT.

At the last meeting of the British Association, the Abbe Moigno exhibited and described an instrument invented by M. Soleil, of Paris, for illustrating the invisibility of light, and called the "Tenebroscope." It is well known to scientific men, although the general public do not sufficiently appreciate the fact, that light in itself is invisible unless the eye be so placed as to receive the rays as they approach it, or unless some object be placed in its course, from whose surface the light may be reflected to the eye, which will generally thus give notice of the presence of that object. Thus, if a strong beam of sunlight be admitted into a darkened chamber through a small opening, and received on some blackened surface placed against the opposite wall, the entire chamber will remain in perfect darkness, and all the objects in it invisible, except in as far as small motes floating in the air mark the course of the sunbeam by reflecting portions of its light. Upon projecting a fluid or small dust across the course of the beam its presence also becomes perceptible. The instrument exhibited consisted of a tube with an opening at one end to be looked into, the other end closed, the inside well blackened, and a wide opening across the tube to admit strong light to pass only across. On looking in, all is perfectly dark, but a small trigger raises at pleasure a small ivory ball into the course of the rays, and its presence instantly reveals the existence of the crossing beam by reflecting a portion of its light.

SOME PHENOMENA PRODUCED BY THE REFRACTIVE POWER OF THE EYE.

In a paper read before the British Association, 1863, by Mr. A. Claudet, the author gave an explanation of several effects of the refraction of light through the eye; one of which is, that objects situated a little behind us are seen as if they were on a straight line from right to left. Another, that the pictures of external objects which are represented on the retina, are included in an angle much larger than one-half of the sphere at the centre of which the observer is placed ; from this point of view a single glance encompasses a vast and splendid panorama extending to an angle of 200°. This is the result of the common law of refraction. All the rays of light passing through the cornea to the crystalline lens are more and more refracted in proportion to the angle at which they strike the spherical surface of the cornea. Consequently, the only objects which are seen in their true position are those entering the eye in the direction of the optic axis. By this refraction, the rays which enter the eye at an angle of 90° are bent at 10°, and appear to come from an angle of 80°. This phenomenon produces a very curious illusion. When we are lighted by the sun, the moon or any other light, if we endeavor to place ourselves in a line with the light and the shadow of our body, we are surprised to find that the light and the shadow seem not to be connected at all, and that, instead of being in a line, they appear bent to an angle of 168° instead of 180°, so that we see both the light and the shadow a little before us, where they are not expected to be. The eye refracts the line formed by the ray of light, and the shadow and the effect is like that of the stick, one-half of which being immersed in water, appears crooked or bent into an angle at the point of immersion. This enlargement of the field of vision to an angle of 200° is one of those innumerable and wonderful resources of nature by which the beauty of the effect is increased. Our attention is called to the various parts of the panorama which appear in any way a desirable point of observation, and we are warned of any danger from objects coming to us in the most oblique direction. These advantages are particularly felt in our crowded towns, where we are obliged to be constantly on the lookout for all that is passing around us.

THE CHEMISTRY OF GUN-COTTON.

All vegetables, from the cabbage to the oak, are built up of little sacs or cells. Some of these cells, as those in the pulp of the orange, are visible to the naked eye, being $\frac{1}{25}$ of an inch in diameter; others are but $\frac{1}{1500}$ of an inch in diameter, and can be seen only by means of a compound microscope. The walls of these cells, in whatever plant they may be found, are always composed of the same elements combined in the same proportions; forming a definite chemical compound, which has received the name of cellulose.

In some plants the cell walls form a very small quantity of matter in proportion to the contents of the cells, in others they form a very large proportion. The cellulose in the beet-root is but 3 per cent. of the weight, while the fibers of linen and cotton are almost pure cellulose.

An atom of cellulose is composed of 12 atoms of carbon, 10 atoms of hydrogen, and 10 of oxygen, $C_{12}\,H_{10}\,O_{10}$. If cotton is subjected to the action of nitric acid under certain conditions the acid and the cellulose of the cotton are both decomposed. Nitric acid consists of 1 atom of nitrogen and 5 of oxygen, NO_5; 1 atom of the oxygen of the nitric acid combines with 1 atom of the hydrogen of the cellulose, the remaining NO_4 taking the place of the hydrogen thus removed. Thus 4 atoms of oxygen are carried into the cotton in place of 1 atom of hydrogen. This oxygen is held to the nitrogen with which it is combined by a very feeble affinity, and if exposed to a temperature of 273°, it leaves the nitrogen, and combines with the hydrogen and carbon—burning those substances so suddenly as to cause an explosion.

Oxygen is introduced into gunpowder through the medium of the same agent, nitric acid; but in that case the nitric acid is combined with potash, in the form of nitrate of potash, or saltpetre.

The extent to which hydrogen is displaced by NO_4 in gun-cotton depends upon the manipulation. As prepared for photographic use, there are not enough of the atoms substituted to carry in sufficient oxygen to burn all of the hydrogen and carbon. If photographic gun-cotton is set on fire in a close vessel only a portion of it will be burned. But when treated by Baron von Lenk's process, the German chemists say that 3 atoms of hydrogen are displaced by 3 atoms of NO_4. This would be sufficient to burn all of the hydrogen, and to burn a portion of the carbon into carbonic acid, and the remainder into carbonic oxide.

$C_{12}\,H_{10}\,O_{10}+3\,NO_5$ would become $C_{12}\,H_7\,O_{10}+3\,NO_4$; 3 HO escaping. On burning this would become $4\,CO_2+7\,CO+7\,HO+3\,N$.

These products are all gaseous at temperatures above 212°, and if cotton was pure cellulose, this form of gun-cotton would burn without leaving any residuum whatever. But as the cotton is not pure cellulose it leaves on burning a small deposit of ash.

Since writing the above we have received a statement of Karoly's analysis of the gases resulting from the combustion of gun-cotton, from which it seems that the theoretical results above stated are almost exactly realized in practice. Karoly gives the following proportions in a hundred parts:—

Nitrogen,	12.7
Carbonic acid,	20.8
Carbonic oxide,	29.
Hydrogen,	3.2
Carbon,	1.8
Water,	25.37
Light carbureted hydrogen,	7.2

PROF. HOFFMAN, of London, has patented a process for making a new coloring matter by means of iodine extracted from sea-weed, and which produces a beautiful violet, blue violet, or red violet. The patented process consists of mixing in certain proportions the substance called rosaniline with the iodides of ethyl-methyl, or amyl. This dye may be used in the same manner as the aniline colors, and is already in the hands of practical people in all the manufacturing districts, and bids fair to be "the color of the season."

MR. JOHN P. SCHENCKL, the inventor of the celebrated Schenckl shell, died recently of consumption at Nuremburg, in Germany, whither he went last summer for the benefit of his health. Mr. Schenckl was for several years a gunsmith in Boston.

Manufacturing Items.

THE new buildings erected the past season in addition to the before extensive works of Woodruff and Beach, in Hartford, are now occupied. The boiler-shop, one of the finest in the country, is nearly filled with the furnaces and boilers of one of the new steam frigates, the engines of three of which are being constructed here. In the new foundry are two immense cranes, each capable of lifting and moving forty or fifty tuns weight. A huge pit about 20 feet square and 14 feet deep, is being dug to contain the mold for a casting, which will require not less than 28 tuns of iron, a larger quantity than has ever been cast here before. A cylinder, for which 13 tuns of metal was melted, was cast on Thursday last, and is now being unearthed. The arrangements of the new foundry, which make it the most complete in the country, are from designs by Edward J. Murphy. Some idea of the amount of machinery necessary to propel one of the first-class ships, for which Messrs. W. & B. are constructing the engines, can be gained by the statement that the engines and boilers for each will weigh about 500 tuns, the brass-work alone weighing about 450,000 lbs. The engines for the three vessels will task the resources of this immense establishment for about two years. New tools and machinery are being added as fast as they can be obtained, but there is such a demand all over the country for new machinery that it is difficult to get tools as fast as required. A new steam derrick will soon replace the present one in use in the yard.

THE monthly pay-rolls of the Manchester (N. H.) factories says the *Mirror*, are as follows:—Manchester Mills, $42,000; Amoskeag Mills, $22,000; Amoskeag Machine Shop and Gun Factory, $16,000; Stark Mills, $12,000; Print Works, $10,000; Locomotive Works, $5,500; Langdon Mills, $5,500; Brugger's Stocking Factory, $5,000; Duck and Bag Mill, $2,000; Edge Tool Factory, $2,000; Martin's paper mill, and the numerous small mechanical works in Mechanic's row, $3,000. Previous to the war, the largest average monthly pay-rolls for labor alone were in 1856–7, and came up as high as $108,000, from the class of establishments named above. They are now paying for workmen $194,000 per year more than then.

AN ingenious pocket map, made of two pieces of paper, thirteen inches by five, has been contrived by M. Carrington, of London; these by being folded in a peculiar way, give at pleasure a complete map of the world and of the heavens.

AT the recent periodical meeting of the British Electric and International Telegraph Company, it was stated among other things that the best marine cables were perishable, and there was a necessity for providing means for replacing them.

A YOUNG man who was carried fifteen or twenty times around a shaft in Taylor's soap-stone works at Perkinsville, Vt., the other day, had every article of his clothing torn from him, but escaped without a scratch upon his person.

THE first locomotive engine was landed last month at Ceylon from the ship *Palmerston*. It was landed on a bamboo raft, and was to be drawn to the railway station by a team of three elephants.

THE dam across the Merrimack at Lawrence, is —the overfall—900 feet long, and the water falls 25 to 27 feet.

THE oil wells of Pennsylvania have produced 554,000 barrels of petroleum since February, 1862.

The Constitution of Nature.

We have received a pamphlet under this title, written by Mr. William Andrew, of Milwaukee, Wis. It treats of the operations of nature; some idea of its contents may be formed from the appended paragraph, the only one, we regret to say, we can find room for. If any of our readers desire to peruse the pamphlet they can address the author as above:—

"MATTER AND VACUUM.—A pure vacuum is space void of all matter. Were all matter out of the universe, nature would then be nothing but a pure vacuum, and this pure vacuum would have some kind of an aspect. This aspect would be something similar in quality to the zigzag light which is formed when concentrated electricity suddenly divides the air, as when it lightens. Could a certain amount of space be freed of all matter, say a cubic mile, the freed space would have an appearance similar to the vacuum caused by concentrated electricity dividing the air, as when it lightens."

MISCELLANEOUS SUMMARY.

FIFTY-DOLLAR UNITED STATES TREASURY NOTES.—COUPONS DETACHED.—A few days ago, says the *Baltimore Sun*, one of the banks of this city received, in the way of business, a fifty-dollar United States Treasury note, dated Dec. 1st, 1863, payable two years after date, with interest of five per cent. per annum, the latter payable semi-annually. Subsequently it was ascertained that the interest coupons had been detached from the note, The United States Treasurer at Washington was thereupon inquired of as to the effect on the value of the note by the detachment of the coupon, and replied as follows:—"The coupons having been detached, it ceases to be a legal tender until the 1st of June, 1865, at which time it will be received for its full face value." This is an important fact to all persons receiving Treasury notes with coupons attached.

GOOD WOOL.—The first requisite for good wool is fineness, which is governed by and produced under the laws of stock-raising, as the breed of variety, climate, the summer and winter food of the sheep and their management. The second requisite is softness. This depends on the character of the yolk or oily secretion that fills the tube of the hair or fiber. This yolk crystallizes in the fiber after shearing, and renders it brittle and harsh, or soft and silky, according as its character is formed by those matters which govern its growth. The last requisite is the length of the wool or of the fiber composing it, and this is governed by climate changes and the condition of the animal.

THE REBEL TORPEDO BOATS.—It is stated in the *Herald* of the 20th inst., that the torpedo vessel which blew up the *Housatonic* and attacked the *Minnesota* is a Northern invention, and her constructor an individual named "Guider." This person states that he offered his boat to the Government for a certain sum and that it refused to purchase her, and that afterwards certain agents of the rebels in this city purchased her for $15,000 in gold. After the transaction the boat was carried South and set to work. The whole story is highly improbable, and we give it place only as one of the rumors of the day.

REMEDY FOR BOILS.—Dr. D. B. Hoffman, of San Diego, Cal., says (*San Francisco Medical Press*) that "Tincture of iodine, *double* strength, of the formula given in the United States Dispensatory, applied thoroughly to boils, bunions, and carbuncles, will cut short the suppurative stages more than one-half, as well as relieve the patient of all pain. All of the feverish symptoms, with alternate agues, chills, and unpleasant feelings in the same, that are met with in delicate females and other persons, are relieved almost entirely by the first application."

HOW TO SAVE A DROWNING PERSON.—It may not be generally known that when a person is drowning, if he is taken by the arm from behind, between the elbow and shoulder, he cannot touch the person attempting to save him, and whatever struggles he may make will only assist the person holding him in keeping his head above water. A good swimmer can keep a man thus above water for an hour. If seized anywhere else the probability is that he will clutch the swimmer, and perhaps, as is often the case, both will be drowned.

SHORTHAND.—We have received from the author, D. P. Lindsley, of Hartford, Conn., a small pamphlet explaining his system of shorthand writing, which he claims to be superior to any other. Mr. Lindsley tells us that girls show particular aptitude for learning this rare accomplishment. We have known $20 per hour to be charged by shorthand reporters, and this is certainly a fair field for extending the employments of women.

A BELGIUM paper says that petroleum oil lamps are affected by music—a certain note on a brass instrument puts them out. M. Duhem extinguished eight lamps in succession by the sound of a trumpet. He was one of the late M. Jullien's band, and is professor at the Brussels Conservatoire of Music. These petroleum lamps, probably, were unable to appreciate the music of M. Duhem.

THE NATIONAL DEBT OF ENGLAND.—The English correspondent of the New York *Times* says:—"War feeds war, and has its own prosperity. When England was engaged in the war with Napoleon, the Bank of England suspended specie payments for twenty years. But money was plentiful, wages were high, there was work for everybody, and though England came out of the war with a debt of $4,000,000,000 it has never impeded, but rather increased her prosperity. A great debt at home is an element of that prosperity. Owed abroad it would be a constant drain upon the country. Owed at home, it is a stimulus to industry. Not a penny of it is lost. It is like taking money from one pocket and putting it into the other. Those who pay the interest on this debt must work a little harder, and those who receive it have more capital to invest and more money to spend. The effect upon the nation has been a constant and vast accumulation of wealth. It is not debt, but capital. There can be no doubt that the wealth, power and security of England have been immensely increased by this so-called national debt; and where is there any reason to apprehend that like causes will not produce like effects on the other side of the Atlantic?"

GREEN PICKLES.—Dr. Gerard Avink publishes in the *Rochester Democrat and American* a very sensible article upon the folly of the common practice of greening pickles, and tells how to detect the copper, which he says is "a beautiful and simple experiment, within reach of everybody." It may be conducted thus:—Cut a greened pickle into small pieces, and put them in a glass of rain water, adding ten to fourteen drops of sulphuric acid; put the bright blade of a knife or any bright steel surface in the liquid for twenty-four hours, and if the pickle contains copper it will be found upon the steel blade, as though it had been coated by the galvanic process. All pickles greened in brass or copper kettles show this result. The green color comes from verdigris, which is a deadly poison. The quantity usually taken with pickles does not often kill, but it produces disease. Such pickles are furnished to our soldiers in large quantities. Why are they colored? Only to please the eye, and make them represent green cucumbers. A poisonous pickle may be eaten upon a full stomach, it never should be upon an empty one. They should never be allowed among sanitary stores.

SUBSTITUTE FOR GUNPOWDER.—Dr. Paul Swift, of Haverford College, Pennsylvania, lately discovered that sulphureted hydrogen in carbon, forms a very explosive compound, it having blown a hole through a thick oaken bench, upon which the first experiment was tried. The carbon being placed under a receiver imbibes from 90 to 100 times its bulk of sulphureted hydrogen, and becomes very explosive. The doctor, aided by Dr. Robert Chase, of New York, is now pursuing a course of experiments which have thus far been eminently successful. They are confident of having found a substitute for gunpowder, which can be manufactured at less than half the cost of the article now in use.

JELLY OF CODLIVER OIL.—M. Dufourmantle proposes the following recipe for preparing a jelly of this disagreeable medicine. Take of codliver oil, 30 grammes, isinglass, 2 grammes, water, a sufficient quantity to dissolve the isinglass. When the latter is dissolved, add the oil gradually, stirring constantly, aromatizing it at the same time with anise or other oil, four drops. A large tablespoonful of this jelly is a dose.—*Jour. de Pharm.*

BUTTER.—With the appearance of spring and "green feed" all fears on the butter subject will vanish. We shall probably enjoy the privilege again of slicking off our bread as much as we wish. In the meantime let us eat our crust in silence, and wait for the days of "buttercups and clover."

TO PROTECT DRIED FRUIT FROM WORMS.—It is said that dried fruit put away with a little sassafras bark (say a large handful to a bushel) will keep for years, unmolested by those troublesome insects, which so often destroy hundred of bushels in a season. The remedy is cheap and simple.

TO MAKE CLEAR COFFEE.—Stir one egg into half a pound of ground coffee, and set away for use as required. No further substance for settling will be needed, and the egg tends to preserve the aroma.