PHOTOGRAPHIC NOTES.

Photographing on Wood.—The new process by W. J. Rawlings is highly spoken of, and is as follows: Whiten the face of the block by means of a mixture of albumen and zinc white. Next coat the dried block with collodion containing nitrate of silver. Dry it by heat. Dissolve off the coating with ether and alcohol. Apply a second coating of the collodion, dry and remove it as before. Dry and expose under the negative. Bring out the print and fix in hypo; wash and dry.

New Developers.—Two more substances are to be added to the already extensive list of developing agents. Herr Schmidt has, according to the *Photographische Correspondenz*, discovered the developing properties of methyle-para-amidophenol-meta-kresol and para-oxyphenyl-glycin. Life is short, says the *Photographic News*, and it is, therefore, a matter of congratulation that these substances are to be called methol and glycin respectively.

Red Printing Process.—In the *Revue Photographique*, M. Letellier gives the following process, by means of which prints of a red tone can be obtained: In a small quantity of water mix 72 grammes of nitrate of uranium and 20 grammes of nitrate of copper, the solution being neutralized with a little carbonate of soda. It is then made up with water to a liter. Paper sized with gelatine or arrowroot is floated on the solution for a minute or two, and dried in the dark. Printing is carried out beneath the negative until the image is fairly visible. It is then developed with an 8 per cent solution of potassium ferrocyanide, until the required density is obtained. Fixing is accomplished by well washing in plain water. If sepia tones are required, the uranium copper solution is neutralized with ammonia, and the developing solution made up to 2 per cent only.

Rewards for New Processes.—The Administrative Council of the *Societe Francaise de Photographie* have decided to offer the following prizes: First, a silver medal to the inventor of a simple and sure process of obtaining positives direct in the camera; second, a silver medal to the inventor of a process of artificial lighting which will permit of instantaneous photographs being made in the studio. The system must be free from danger, without smoke or odors, and without complicated apparatus. All communications to be made to the society before the 31st of December next, at their address, 76 Rue des Petits Champs à Paris.

Detection of Crime by Photography.—Once again photography has played an important part in the detection of fraud. It would appear that in France gold articles are marked by being stamped with tiny marks representing horses' heads, insects, etc., according to the parts of France where the articles are made. The genuineness of some gold rings manufactured at Havre, and which were stamped with a mark representing some kind of insect, was doubted, and in order to detect the fraud, and convince a French jury, M. Londe—a gentleman well known in French photographic circles—undertook to make photomicrographic reproductions of the doubtful marks, and also of genuine marks. This done, it required but a comparatively small magnification to entirely remove all doubt as to the difference that existed.

The New Concentric Lens.—The new lens is intended for landscape, architecture, and copying purposes. Open a pair of compasses to about three inches, and draw a curved line two inches in length; now close the compasses sufficiently to draw another curved line half an inch within the other. Between the two curved lines draw a straight one, and the result will be the representation of a convexo-plano lens combined with a plano-concavo lens. Imagine two such lenses set in a mount with their concave surfaces opposed to one another, and you have a correct picture of Messrs. Ross' new concentric lens.

We see at once that the instrument has a novelty of form; for achromatic lenses generally, which have flat or other contact surfaces, and which give a positive image, have the radius of their convex surface shorter than the other; here it is necessarily longer, for the curves are concentric, and the convex is the outer one. The convexo-plano, or outside lens, is made of glass having a high refractive power and relatively low dispersive power; while the plano-concavo, or inner lens, which is cemented to it, is constructed of glass having a lower refractive power than its fellow, while at the same time it is of the same or higher dispersive power.

Among the advantages claimed for the new lens are the following: It will give uniformly perfect definition over a flat field of a circle of about seventy-five degrees in diameter; it is free from astigmatism, distortion, and glare; its illuminating power is wonderfully uniform over the entire field; it has more depth of focus than other lenses of the same aperture; it does not require to be stopped down in order to gain marginal definition, and it differs in other ways from all lenses hitherto constructed.

It may be asked why, seeing that this lens was conceived about four years ago, it has been so long in the hands of its makers. The answer is that lenses are not like boxes of pills or bottles of patent medicine, which can be filled by children and placed upon the market at a few hours' notice. Their construction requires skilled labor and personal supervision at every stage of the process, and Messrs. Ross have been wise to make no public mention of the lenses until they could report that the special glass of which they are made is permanent in its good qualities, and until they had accumulated sufficient stock to meet the demand which is sure to arise for them.

We recently had an opportunity of seeing this lens tried against many others, and have no hesitation in saying that the claims made for it are justified. Focusing a view on the ground glass of a large camera with this lens, and employing a large stop, it was quite startling to find the whole screen brilliantly illuminated, while, at the same time, the details of brickwork and slates were as sharply defined at the extreme margins as they were in the center of the field. The volume of light seemed strange to one who was accustomed to identify such sharpness of definition with the use of a very small stop.—*Photo. News.*

Petroleum.

Dr. William Anderson, in his recent presidential address before the Institution of Mechanical Engineers, gave the following:

One more subject which is attracting great attention, and which seems to open up a field for the inventive faculties of mechanical engineers, is the use of petroleum or mineral oil. As a source of power, petroleum is rapidly gaining ground, especially where motors of moderate size are needed. The records of the Royal Agricultural Society show that for many years past efforts have been made to produce petroleum engines, but never, until quite recently, with any practical success, chiefly, he thought, because oils of low flashing point, or petroleum spirit, were used. The dangerous nature of these would alone have condemned any engine, however efficient, for general use, except, indeed, in the form advocated by Mr. Yarrow, in which petroleum spirit acts only as the working substance or agent for the conversion of heat into work, and is therefore not expended, except by way of leakage, so that the difficulty of supply does not arise. It was not till the show at Nottingham in 1888 that Messrs. Priestman brought out their engine working with heavy oil having a high flashing temperature. That engine was tested by Lord Kelvin and by himself independently, and gave an efficiency of one brake horse power to 1·73 pounds of oil. At the next year's show the consumption fell to 1·42 pounds; at the next in 1890 to 1·243 pounds; and Professor Unwin this year reports that a brake horse power has been obtained by the combustion of 0·946 pound. It is proved by experience that these engines do not need any special attendants; neither boiler nor chimney is required; the fuel is much more cleanly, and the engine can be got to work in a few minutes; it is certain therefore that they will increase greatly in favor with the public, and will prove formidable competitors to gas engines. Naturally, also, Messrs. Priestman's success has stimulated the inventive spirit, and already more than one successful form of motor is in the field, the tendency being to simplify the details and to render them less delicate in adjustment. But much still remains to be done. The useful work on the brake is under 14 per cent of the energy latent in the fuel; while the heat carried off by the water jacket round the cylinder and by the exhaust is equivalent to 75 per cent of the total thermal capacity of the oil. This loss surely constitutes a storehouse from which we may hope to appropriate a good deal. He thought that probably a combination of the direct combustion engine with the spirit engine of the Yarrow type would give the best results, especially if a more advantageous cycle than that of the Otto gas engine can be adopted.

As a lubricant also petroleum is taking a prominent place. The circumstance that it is devoid of fatty acids makes it peculiarly fitted for use with steam machinery, and for work which it is desired to protect from rust or verdigris. It can be obtained also of any degree of fluidity, from the most mobile of liquids to the consistency of jelly, while its cheapness serves to recommend it to every consumer.

ORIGIN OF PETROLEUM.

It is commonly assumed, without any good reason however, that petroleum is of the nature of coal, and has been formed like it out of the *debris* of primeval forests or out of the remains of marine animals, and that, like coal, the deposit will be exhausted in time. But it seems not unlikely, as the distinguished Russian chemist Dr. Mendeleeff has suggested, that petroleum is constantly being formed by the action of water on metallic deposits in the heated interior of the earth; and that there is good hope, therefore, not only that rock oil can never be exhausted, but that it will be found in most parts of the earth if borings sufficiently deep be made; and it should be borne in mind that the depth of a boring adds very little to the cost of getting, because the oil usually rises naturally to the surface, or very nearly to it.

Petroleum is an almost pure hydro-carbon, the American variety having a composition homologous with marsh gas or fire damp, CH_4, that is, composed according to the general formula $C_nH_{2n}+_{2n}$ ranging in value from 1 to 15. The Caucasian oil has the general formula C_nH_{2n}; and olefiant oil gas or ethylene, C_2H_4, appears to be the lowest of the series, n rising in value to 15. When exposed to heat—either in the ordinary process of distillation or when, by working under pressure, the temperature is raised above that due to the atmospheric boiling point—the crude oil "cracks," as it is termed, and the vapors of different boiling points, but still preserving a homologous chemical composition, are given off in succession, and in varying proportions; indeed, in some districts rock oil issues from the ground in the form of gas, even at ordinary temperatures and pressures.

Petroleum, in a form not to be distinguished from the natural product, has been produced artificially by the action of steam at high temperature and pressure upon the carbides of metals, more especially on those of iron; the water is decomposed, the oxygen combining with the metal, and the hydrogen, in part, at least, with the carbon. This circumstance, among others, led Dr. Mendeleeff in 1877 to propound a theory, which he would sketch very briefly, because if correct it gives an assurance of inexhaustible supplies of oil, and also indicates the probability of its occurring in every part of the world, quite irrespective of the age of geological formations; and so holds out motives to engineers to perfect the means of penetrating much deeper into the heart of the earth.

Laplace's theory of the origin of the planetary system is generally accepted as correct; and according to it the earth must be composed of the same materials as the sun. This view has in latter days received striking confirmation from the spectroscope, by means of which it has been demonstrated that there exist in the sun many of our metals, and especially iron, in the state of vapor, while meteoric stones, which belong to the same order of substances as the planets, have been found by actual analysis to be largely composed of iron and its carbides. The law of the diffusion of gases would lead us to expect that on the condensation of the metallic vapors the substances of higher specific gravity or greater atomic weight would collect chiefly nearer the center of the future globe, while the lighter matters would tend to aggregate on the surface. The mean specific gravity of the earth is about 5, while that of its superficial deposits ranges from only 2½ to 4, so that it is evident that the interior of the globe must be composed of substances having high specific weights—such as iron, for example, which ranges between 7 and 8. Moreover it is certain that the rocks at a comparatively short distance down from the surface exist in a highly heated if not in a molten condition; and that the solid crust covering them is relatively thin and easily fissured, as is abundantly proved by the upheaval of the land in geological and even in modern times, and by the earthquake disturbances which prevail more or less over the whole world even now.

Dr. Mendeleeff points out that the oil-bearing regions generally lie parallel to mountain ranges, such as the Caucasus in Russia, the Alleghanies in America, and the Andes in Peru; and that petroleum does not appear to belong to any particular geological formation, inasmuch as it occurs in Europe usually in rocks of the tertiary period, while in the United States it is found in the Devonian and Silurian strata, which are so nearly devoid of animal and vegetable remains. He also points out that, on account of the volatile nature of rock oil, it could not have been borne from a distance like many other deposits, but must have been formed very near the spot where it is found.

The fissuring of the earth's crust by the upheaval of mountain chains and by other disturbances allows surface waters to penetrate into the heated internal portions of the earth; and there, coming in contact with the glowing metals and their carbides, they give rise to the chemical reactions which result in the formation of petroleum in the state of vapor, and in the evolution of steam. These vapors penetrate through the fissured crust into the upper and cooler regions, where they are either wholly or partially condensed, forming deposits of petroleum very commonly associated with water; and the gases which cannot be condensed by cold escape to the surface. The precise compounds which are formed depend upon the temperature and pressure met with; and hence we find associated every grade of product—gas, oil, mineral pitch, ozokerit, and other substances. The extraordinary average persistence of the oil wells leads to the conviction that the substance must be forming as fast almost as it is removed; and he had very little doubt that improved boring appliances will enable engineers to penetrate to depths not even dreamed of now; so that, by the time that our coal resources come to an end, from the exhaustion of the mineral, or from the condition of perpetual strike to which we seem tending, oil springs will be tapped which will have the priceless advantage of yielding their riches without the agency of underground labor.

A HINT TO INVENTORS.—An elastic stove pipe coupling would do more good than seven long sermons.—*Texas Siftings.*

Extinct or Nearly Extinct Vertebrates.

Mr. A. F. Lucas has a readable article upon the animals which are recently extinct or threatened with extinction as represented in the National Museum.* The West Indian seal (*Monachus tropicalis*) is uncertainly placed in this category, for but little is known of it, and its habits and habitat seem favorable for its perpetuation. The California sea elephant (*Macrorhinus angustirostris*) is possibly entirely extinct, none having been recorded since fifteen were sent in 1884 to the National Museum. The walruses, too, are threatened with extinction, the Pacific species, *Odobænus obesus*, being in greater danger than the Atlantic, *O. rosmarus*. The source of danger lies in the whalers, who capture the animals for oil and ivory. Between 1879 and 1880 there was brought to market 1,996,000 gallons of walrus oil and 398,868 pounds of walrus ivory. In 1879 the ivory was worth 45 cents a pound; in 1880, $1.00 to $1.25; and in 1883, $4.00 to $4.50. The European bison (*Bison bonasus*), which is at present restricted to Lithuania and the Caucasus, is protected in both localities. In 1880 the Lithuanian herds numbered but 600, and the number is smaller at present. The Arctic sea cow (*Rytina gigas*), the history of which has already been given in our pages,† was exterminated in 1767 or 1768.

Three species of birds from the Hawaiian Islands are probably extinct. The last ornithological collector who returned from these islands found no specimens of the mamo (*Drepanis pacifica*), and but about half a dozen specimens represent the species in museums of the world. It was probably exterminated in obtaining feathers to make the yellow war cloaks of the Sandwich Island kings. The Hawaiian *Chætoptila augustipluma* is represented but by two specimens, and the small tailless rail (*Pennula ecaudata*) of the same archipelago is nearly as rare. It would appear that nearly all the native birds of the islands are also threatened with extermination.

The California vulture (*Pseudogryphus californianus*) is now extremely rare, and largely restricted to Southern California. "The free use of strychnine in ridding the cattle ranches of wolves and coyotes has caused the disappearance of this bird, which has been poisoned by feeding on the carcasses prepared for the four-footed scavengers." The dodo (*Didus ineptus*) of Mauritius, and the solitaire (*Pezohaps solitaria*) of Rodriguez, have a history too well known to be recounted here. They are represented in the National Museum by a few bones.

So, too, the fate of the Labrador duck (*Camptolæmus labradorius*) and of the great auk (*Alca impennis*) has often been told. Of the former but thirty-six specimens are in existence. Two of these in the National Museum were collected by Daniel Webster. The last specimen was taken in 1878. Specimens of the great auk are not so rare, and yet they command enormous prices. The last skeleton sold brought $600, the last skin $650, and an egg brought $1,500. The great auk was probably exterminated in 1840.

Pallas' cormorant (*Phalacrocorax perspicillatus*) of the region around Kamschatka has a brief history. It was killed by man for food. In 1741 it was "frequentissimi" on Bering Island. About a hundred years later it was extinct, and is represented to-day by four stuffed specimens and twenty-three bones in all the museums of the world.

Of the lower vertebrates Mr. True refers to the great Galapagos tortoises and their relatives of the Mascarene Islands, and the tile fish. The former have already formed the subject of a paper by Dr. Baur in this journal,‡ and it is only necessary to say that probably they are exterminated from another of the Galapagos group. The giant tortoises of the Mascarene Islands were extremely abundant in the seventeenth and eighteenth centuries, but their use as food caused their extinction at the beginning of the present century. "Save the few bones rescued from the marshes of Mauritius and the caves of Rodriguez, nothing is left to show that these large and formerly abundant tortoises ever existed."

The history of the tile fish (*Lopholatilus chamæleonticeps*) is among the strangest known. So far as we have any information, no one, fisherman or naturalist, ever saw a tile fish (the common name is an abbreviation of the generic) until March, 1879, when a Gloucester fishing schooner took about 6,000 pounds. In the following years 1880 and 1881 a few were taken by the U. S. Fish Commission steamer. In March and April, 1882, vessels arriving in American ports reported passing through large numbers of dead and dying fish off the southern coast of New England and Long Island. Vessels reported sailing for forty to sixty miles through floating fish (in one instance through 150 miles), so that it became evident that a vast destruction had taken place. Captain Collins estimates from these reports that an area of 5,000 to 7,000 square statute miles were so thickly covered that the total numbers must have exceeded a billion. The next fall the Fish Commission searched in vain for these fish on the ground where they were formerly so abundant; and no one has since reported a specimen.

* Report National Museum for 1888-89, p. 609, 1891.

† L. Stejneger, Am. Nat., xxi., p. 1047, 1887.

‡ Am. Nat., xxiii., p. 1039, 1889.

A Cold.

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In dealing with the above subject we, of course, are aware of the fact that it has never as yet been clearly defined. Most or very nearly all text books consider it merely as a cause of a number of different pathological conditions, or sometimes the *morbus* at hand is considered a phase or manifestation of what is so familiar among us—"taking cold."

Dismissing further speculation along the line as not germane to the object now in view, I wish to call especial attention to the mechanism by which the effects of taking cold are brought about; and as theories and facts make up the bulk of our medical information, probably to theorize on this subject and draw a corollary of facts from the result would be the proper manner of procedure.

Any portion or the whole of the body exposed to a cold draught for a varied length of time of course suffers from irritation, and immediately wires the ganglion or center most intimately connected with that region, through the afferent nerves, and makes known the disturbance there. If the irritation is great (which we will assume to be a fact now) and the whole nervous system has to take cognizance of it, the disturbance is appreciated as an insult, and revenge is at once sought by sending out orders to have the secretions and excretions of the skin locked until peace is made. When the glands of the skin surrender their function, the ramparts of the citadel are taken, the skin becomes in a measure dry and chaffy, and loses its usual pliancy which is so essential to health. With the periphery thus in a state of blockade, it is not known by the economy at what time some of the more vital internal organs will suffer; so the nervous system trembles with fear, and we have a form of nervousness as a concomitant symptom of cold. The nervous system, still trembling with fear and maddened by the insult of irritation, resolves to carry on the secretions and excretions by precipitating a double duty on the internal mucous membranes or serous membranes, as the case may be. So when the nervous system orders a mucous or serous membrane on double duty it revolts at the idea of having a vicarious function to perform, and even refuses to carry on its normal function. It is now that we have the dry stage of cold. When the nervous system locked the secretions and excretions, it seemed to not realize the fact that it was at the same time locking in some of the venomous products of destructive metamorphosis which, so to speak, in a state of stagnation, undergo a sort of change and become irritating to the brain and nervous system, thus causing the dull lethargic feeling and indifference to mental and physical exertion, and the aching pains in the limbs.

After a while the mad internal membrane yields to its higher authority, the nervous system, and being overburdened by hyper-secretion and hyper-excretion, soon ceases to do its work physiologically and passes into a pathological state, and a catarrh is the result. Thus we may have coryza, pharyngitis, laryngitis, bronchitis, enteritis, etc., if a mucous membrane be involved; pleurisy, pericarditis, etc., if it falls on a serous membrane. Other troubles besides diseases of mucous and serous membranes are brought about by cold, but it is not our purpose to go minutely into them now.

In treating a cold, just bear in mind the mechanism by which it was brought about. The nervous system is willing to compromise on almost any plan which includes removal of the offending locked-up excretions. Diaphoretics propose to do that, and on their administration and promise the nervous system unlocks the pores of the skin, and equilibrium is restored.—*Southern Medical Record.*

How to Drink Milk.

Terpsichore gives a few practical hints about digestion as follows:

Do not swallow milk fast and in such big gulps. Sip it slowly. Take four minutes at least to finish that glassful, and do not take more than a good teaspoonful at one sip.

When milk goes into your stomach, it is instantly curdled. If you drink a large quantity at once, it is curdled into one big mass, on the outside of which only the juices of the stomach can work. If you drink it in little sips, each little sip is curled up by itself, and the whole glassful finally finds itself in a loose lump made up of little lumps, through, around, and among which the stomach's juices may percolate and dissolve the whole speedily and simultaneously.

Many people who like milk and know its value as a strength-giver think they cannot use it because it gives them indigestion. Most of them could use it freely if they would only drink it in the way we have described, or if they would, better still, drink it hot. Hot milk seems to lose a good deal of its density, and one would almost think it had been watered, and it also seems to lose much of its sweetness, which is cloying to some appetites.

Varieties and Uses of Mica.

George P. Merrill contributes to *Stone* some useful information on the varieties of mica.

There are several distinct varieties of mica, all characterized alike by a very perfect basal cleavage whereby they split readily into thin sheets, but differing in color, elasticity and composition. The most prominent varieties are (1) the white colorless variety, muscovite; (2) the white to yellowish brown or brownish red variety, phlogophite; (3) the black and frequently opaque varieties, biotite and lepidomelane; and (4) the pink lilac or rose colored lepidolite. Of these only the white variety muscovite is, excepting as a rock constituent, of economic importance, and need be described here.

Occurrence.—The micas are among the most common and widely disseminated of minerals, occurring in irregular shreds or six-sided tablets in rocks of all kinds and of all ages. They are particularly characteristic of the acid crystalline rocks, both eruptive and metamorphic.

The white variety is, however, much the more restricted in its distribution, and it is believed is confined wholly to the older acid rocks of the granitic or gneissic groups.

The prevailing form of the micas is that of small irregular flecks, from a mere point to a fourth of an inch in diameter, disseminated throughout the mass of a rock. In the younger eruptives, in limestones, and in granitic veins it not infrequently shows good crystallographic forms hexagonal in outline, which are easily recognized as mica from their property of splitting readily into six-sided thin sheets.

The white mica, or muscovite (sometimes called isinglass) of commerce, is derived wholly from pegmatitic or other coarse granitic veins in granite and gneiss. Besides mica, the chief constituents of the veins are quartz and feldspar, though there not infrequently occurs a pleasing variety of minerals, as beryl, tourmaline, apatite, cassiterite, etc. Indeed, such veins are the mineralogist's most fruitful fields, both as regards abundance and variety as well as perfection of crystalline form.

Properties.—The distinguishing characteristic of muscovite, and that which gives it its chief value, is its property of splitting readily into thin, transparent, tough and elastic sheets. It is but little acted on by heat, though gradually becoming brittle on prolonged exposure to high temperatures.

Uses.—The chief use of mica is in the form of thin sheets for stoves and furnaces. For this purpose it must be clear and free from bad spots, cracks, or blemishes of any kind. The most desirable color is stated to be wine red. Of late years there has arisen a considerable demand for mica in the form of strips some eight inches long by one inch wide for insulating purposes in the manufacture of electrical apparatus. The qualities essential for these purposes are toughness and freedom from iron. There is a considerable and increasing demand for ground mica, which allows of the utilization of the scraps, which must otherwise go to waste. At present eight grades are prepared, the coarsest being used to give a spangled effect to fancy grades of wall paper, while the finest is used in producing a uniform metallic white surface on the same. The intermediate varieties are used mainly in the manufacture of lubricants for heavy machinery.

Preparation.—Mica occurs in sheets of all sizes up to two or more feet in diameter and from the fraction of one to several inches thick. The larger sheets are utilized mainly for sheet mica, and for this purpose the blocks, after being taken from the quarry, are freed from all gangue material, split to such thinness as to trim readily, and, by aid of patterns, cut to standard sizes, the value of the cut sheets increasing very rapidly in proportion to their size. There is a great amount of waste in this process, and it is stated not above eight or ten per cent of sheet mica is obtained from the block mica thus treated. The waste material or scrap from the trimming, and, in some cases, the entire product, if sufficiently clean and free from gritty substances, is ground. This process, owing to the toughness and fissility of the mineral, is one of considerable difficulty, and at date of writing not more than two or three firms in the entire country are prepared to do the work.

Sources.—More or less mica has from time to time been produced by nearly every State bordering along the Appalachians, though the mining is nearly always more or less spasmodic and intermittent. Frequently mica forms a product of the feldspar and quartz mines, though the amount thus obtained is comparatively small. New Hampshire and North Carolina are at present the chief sources in the United States. From forty to fifty tons are annually produced, valued at from ten cents to five dollars a pound, according to quality. The chief foreign sources of mica are Canada and India.

SOME one has said that a man never realizes how much valuable advice his neighbors have to give away until he announces his intention to build a house.