

attachment to the larger valves, when desired, indicators of different kinds for showing the exact position of the gate.

The Darien Canal.

At a recent meeting in Bordeaux, M. De Lesseps said that American support had been secured for the Darien Canal project.

Dr. Campany, the military physician, who was engaged in the sanitary arrangements during the construction of the Suez Canal, is about to be sent to Panama to ascertain what measures will be necessary for the preservation of the health of the laborers, who are to be recruited in South America.

Geological Specimens from Luray Cave.

Our readers will remember a series of letters published in these columns not long ago describing a recently discovered cave in a beautiful valley in Virginia, about 80 miles southwest from Washington.

This Luray Cave undoubtedly possesses the most wonderful geological formations yet discovered on this continent. The accessible portions of it extend some three or four miles, and there are other parts still unexplored.

Thomas N. Dale.

Thomas N. Dale, one of the pioneer silk manufacturers of Paterson, N. J., died suddenly of heart disease, at that place, July 17th. After a successful career as a merchant in this city, Mr. Dale went to Paterson, in 1862, and soon after erected the large silk mill known by his name.

Hearing the Lightning through the Telephone.

Referring to the accounts we recently published concerning the use of the telephone for hearing the electrical action of supposed earth currents during thunderstorms, Mr. Wm. S. Aldrich, of Burlington, N. J., calls our attention to his observations, of similar character, published in SCIENTIFIC AMERICAN, August 3, 1878.

The Ammonia Bath.

A correspondent residing at Honolulu, Sandwich Islands, says that a good health preservative, especially in summer, is to sponge the body with cold water, containing a small percentage of some alkali, such as ammonia.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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VOL. XLI., No. 6. [NEW SERIES.] Thirty-fifth Year.

NEW YORK, SATURDAY, AUGUST 9, 1879.

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(Illustrated articles are marked with an asterisk.)

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WHAT TO DO NEXT WINTER.

A "country clergyman" sends a timely and suggestive communication, from which we quote the following:

"Among your forty thousand subscribers, all of whom it is presumed are specially ingenious persons, there must be very many who are disposed to exercise their talent, philanthropically, and without hope of reward. I am desirous to learn in what way to utilize an immense amount of unemployed power, which might be made a source in the aggregate of immense wealth. It is, however, human power that I mean. We have just passed through our winter season, and there is now a call for all the labor that the market affords. But during several months of the winter usually many farmers, or more especially laboring men, hired men, young men, and boys that work for a living, are very much at a loss what to do with idle time. Will you, or some of your correspondents, publish a few lines on this most important subject? What indoor work can be done by people of very little education, in order to keep the pot a-boiling, to help pay the rent, and otherwise make both ends meet? Of course the work must be something that is not usually done in large factories or by machines. One would think there must be a great variety of articles required by the public that shall come under this class of work. Even there might be some kind of work that should be done partially in a factory, the rest of which should be done by hand in the homes of the people. A proper answer to this question, as I suppose it might be answered, would make farming more profitable, tend to keep young men on the farm, save many unwilling idlers from congregating at the store or saloon, and give, what of all things they desire, to many idlers profitable work."

No doubt a great variety of productive employments suitable for different parts of the country can be pointed out by our practical readers, employments which do not require any particular manual dexterity, which can be taken up at odd moments and, however unremunerative, would be vastly more profitable than sheer idleness. We shall be happy to make a note of any suggestions that may be submitted.

Meantime it may not be out of place to consider whether there is really any need of new occupations for farmers and farm hands; whether there is not already on the farms an abundance of purely manual as well as intellectual farm work which sadly needs doing, and which, were it done, would greatly increase the profit and comfort of country living.

Our correspondent writes from a historic town in Massachusetts, and has in mind the wants of New England farmers and farm hands. Time was when the average New England farmer was a man of more than average intelligence and thrift. Now it may be questioned whether the average New England mechanic is not his superior in these particulars. And the difference is shown not so markedly in the farmer's winter idleness as in his unthrifty laboriousness at all seasons. The characteristics of the Yankee mechanic, which have made him king of artisans, are not those of the Yankee farmer. The one is alert, ever ready to discover and adopt improvements, and always bent on making the best use of the materials at his command. The other is remarkable rather for plodding industry, for unthrifty economies, for slowness in changing his practices to meet the changing wants and conditions of the times.

Even among the more intelligent New England farmers there is a serious lack of knowledge as to the capabilities of the soil under cultivation, as to the crops that can be made most profitable, and the best means of producing such crops, not to speak of the preservation of the fertility of the soil; of means for preventing the ravages of insect pests; of methods of supplementing garden and field crops by the rearing of fine grades of fowls, sheep, and other live stock; of augmenting the bulk and variety of the food supply by restocking useless ponds and streams with fish, and so on. In a thousand ways the farmers of New England are pursuing unthrifty methods, by which they lose every year as much as they win, by which they miss possible advantages that might increase enormously both their wealth and enjoyment.

No doubt it would be an immediate benefit to many a poor farmer to be told how by indoor industry in rough weather he could add a hundred dollars to his income. Certainly that would be better than to spend the time in idle gossip at the cross-roads store. But the chances are ten to one against the farmer, who could so waste his time, having a farm so well kept that the same labor would not be worth twice as much if it were applied directly to the clearing up of neglected corners, to repairing fences, out-buildings, tools, and machinery, to say nothing of efforts to gain a higher knowledge of the science of farming, to improve the condition of the farm, and increase its productive capacity.

It is safe to say there is not a farm in New England the value of which could not be advanced—perhaps doubled or trebled—by a few years of intelligent effort. It is certain that not one farm in a thousand is in so perfect a state of cultivation, or its capacity so widely developed, that its products might not be greatly increased in a single year by cultivating in the best way the crops best suited to it and the nearest market, avoiding products for which it is ill-adapted or which can be more cheaply raised elsewhere. Accordingly it may be fairly questioned whether the supplementing of poor farming with some sort of manual labor not related to farm work would not be less profitable than to encourage poor farmers to become intelligent and wisely economical farmers. Trying to compete with skilled labor and machinery by hand work cannot be other than discouraging,

even to save otherwise idle time; to do it when the time can be put to better use, more especially when the main business of life demands all of one's time and thought, is certainly not the height of wisdom. Shiftless farming, even when allied to winter thrift, can never accomplish as much as skillful farming fostered by winter study and perennial intelligence and thoughtfulness. New England needs good farmers, rather than any hybrid class of unskilled farmer-mechanics.

And what is true of farm owners is equally true of farm workers. There is no way in which young farm hands can employ their spare time so profitably as in studying to become intelligent farmers. And the best work that can be done for the young people of our rural districts lies, it seems to us, in the direction of encouraging among them, especially in winter, studies calculated to make their summer work more intelligent and more profitable to themselves and to the community as a whole.

PROBABLE OPPORTUNITIES FOR NEW DISCOVERIES IN ACOUSTICS.

The heretofore received theory of hearing by the telephone was that the thin diaphragm of metal, like that of the phonograph, served as a sort of artificial ear drum, which was vibrated to and fro by the electrically produced magnetic attractions and repulsions of the iron core. The most recent experiments, by observers such as M. Du Moncel, M. Ader, and H. Wildbrand, show that this explanation is incorrect, because the magnetic intensity of the telephone is found to be altogether too feeble to move or overcome the inertia of the metallic diaphragm.

The corrected theory now is, that the sounds heard in the telephone are due to a movement of the molecules composing the iron core of the telephone, induced by the electrical current. These molecular movements are conveniently transmitted to the ear by the iron diaphragm; but paper or glass may be substituted for the iron; indeed, the diaphragm may be altogether removed, and the sounds will then be transmitted to the ear through the wooden case or handle of the telephone.

M. Du Moncel has made a telephone receiver, consisting merely of a piece of board having a magnetized watch spring fastened thereto by one end, and a fine helix secured to the board under the free end of the spring.

In this device only molecular vibrations can take place; but when the board is applied to the ear speech can be heard more clearly than with an ordinary telephone, or even the speaking microphone.

The results of these new experiments and observations seem to indicate that molecular vibrations must hereafter be taken into account in things relating to acoustics, and that a broad field for new discoveries in connection therewith is now opened to the student.

THE NEW BUREAU OF NATIONAL SURVEY.

The organization of the new system of national survey, under the directorship of Clarence King, has been completed, and the scope of the coming summer's work has been announced. The great central mineral belt, extending through Colorado, Utah, Nevada, and California, will be studied first, the main purpose in view being to find out what minerals there are, and where they are.

Mr. King says that in view of the practical questions which affect so many millions of national wealth, little attention comparatively will be bestowed on purely scientific questions. In other words, as he expresses it, "We will allow the fossils to rest quietly in their beds and permit the rocks to 'dip' as they please, until we have settled some of the more important questions relating to economic geology." The precious metals alone, however, are not to engross attention. The plans include a thorough investigation of the coal, iron, and lead deposits of the United States, which will be conducted concurrently with that of the gold and silver deposits.

The field-work of the present summer will be occupied with "The Metallic Wealth of Colorado," centering at Leadville; "Lead Silvers of Nevada," centering at Eureka; "The Great Comstock Lode;" "The Central Gold Field of California."

The Leadville division will be under the charge of Mr. S. F. Emmons, geologist, and Mr. A. D. Wilson, topographer. In charge of the Eureka division will be Professor Becker, geologist, and Mr. F. A. Clark, topographer. Mr. King himself will supervise the work at the Great Comstock and in California.

Professor Raphael Pumpelly, so well known by his scientific researches in this country and in Asia, will, it is hoped, take charge of the investigation of the coal and iron deposits. Mr. Arnold Hague, late Imperial Expert of China, Mr. C. K. Gilbert, late of the Powell Survey, and Dr. F. V. Hayden, will be engaged in the work.

Major Powell's connection with the survey and with the Land Commission will not interfere with the work of ethnographical and ethnological research in which he has been so long engaged. The field work in this direction during the present summer will be devoted to completing the investigation of the architecture, the manufactures, and the family and tribal characteristics of the Pueblo or Village Indians of New Mexico and Arizona.

The very important work of classifying the public lands will be advanced as rapidly as possible. Notwithstanding the enormous industrial and financial interests which center, at present and prospectively, in our Western mineral lands, and the national importance of the scientific exploration of

them, the new Bureau enters upon its work sorely hampered by the meagerness of the appropriation made for its support.

HOW TO PRESERVE CIDER.

A pure, sweet cider is only obtainable from clean, sound fruit, and the fruit should therefore be carefully examined and wiped before grinding.

In the press, use hair cloth or gunny in place of straw. As the cider runs from the press let it pass through a hair sieve into a large open vessel that will hold as much juice as can be expressed in one day. In one day, or sometimes less, the pomace will rise to the top, and in a short time grow very thick. When little white bubbles break through it, draw off the liquid through a very small spigot placed about three inches from the bottom, so that the lees may be left behind. The cider must be drawn off into very clean, sweet casks, preferably fresh liquor casks, and closely watched. The moment the white bubbles, before mentioned, are perceived rising at the bung-hole, rack it again. It is usually necessary to repeat this three times. Then fill up the cask with cider in every respect like that originally contained in it, add a tumbler of warm sweet oil, and bung up tight. For very fine cider it is customary to add at this stage of the process about half a pound of glucose (starch sugar), or a smaller portion of white sugar. The cask should then be allowed to remain in a cool place until the cider has acquired the desired flavor. In the meantime clean barrels for its reception should be prepared, as follows: Some clean strips of rags are dipped in melted sulphur, lighted and burned in the bung-hole, and the bung laid loosely on the end of the rag so as to retain the sulphur vapor within the barrel. Then tie up half a pound of mustard seed in a coarse muslin bag, and put it in the barrel, fill the barrel with cider, add about a quarter of a pound of isinglass or fine gelatine dissolved in hot water.

This is the old fashioned way, and will keep cider in the same condition as when it went into the barrel, if kept in a cool place, for a year.

Professional cider makers are now using calcium sulphite (sulphite of lime), instead of mustard and sulphur vapor. It is much more convenient and effectual. To use it, it is simply requisite to add one-eighth to one-quarter of an ounce of the sulphite to each gallon of cider in the cask, first mixing the powder in about a quart of the cider, then pouring it back into the cask and giving the latter a thorough shaking or rolling. After standing bunged several days to allow the sulphite to exert its full action it may be bottled off.

The sulphite of lime (which should not be mistaken for the sulphate of lime) is a commercial article, costing about 40 cents a pound by the barrel. It will preserve the sweetness of the cider perfectly, but unless care is taken not to add too much of it, it will impart a slight sulphurous taste to the cider. The bottles and corks used should be perfectly clean, and the corks wired down.

A little cinnamon, wintergreen, or sassafras, etc., is often added to sweet cider in the bottle, together with a drachm or so of bicarbonate of soda at the moment of driving the stopper. This helps to neutralize free acids, and renders the liquid effervescent when unstopped; but if used in excess it may prejudicially affect the taste.

CHANGES IN PHOTOGRAPHY.

The substitution of dry sensitive plates for the common wet plates has made great progress during the past year or so; the old cumbersome method of dipping a collodion covered glass plate into water containing nitrate of silver, then taking the picture before the plate has time to get dry, is becoming obsolete both for indoor and outdoor work.

Dry plates, having a sensitiveness equal to or exceeding of wet plates, are now easily prepared, and their convenience and economy have been fully demonstrated. The traveling photographer no longer needs to load himself down with water bottles, liquids, and bath apparatus. He simply provides a few slips of prepared dry glass, with which and a light camera he climbs to the difficult places and secures the views he wants. The gallery artist is no longer obliged to waste his business time in waiting for the preparation and development of wet plates after his customers have come; but he may now both prepare and develop the dry plates out of business hours, and thus attend to two or three times as many sitters as heretofore. These dry plates may be kept on hand ready for use for an indefinite period.

At the present time gelatine is the base used as the skin with which to cover these plates. The gelatine is dissolved in warm water, bromide of ammonium is added, and the mixture is digested with heat. A solution of nitrate of silver is then added, and the mass is thoroughly mixed and cooked, being kept at a uniform moderate temperature for four or five days continuously. The mixture is then poured on the surface of the glass plates, dried in the dark, and the plates are ready for use. Such plates require an exposure of only two to three seconds in the camera in order to take the picture. If greater sensitiveness is wanted, then the gelatine-silver mixture must be kept under heat for seven or eight days instead of four or five. This is a very curious fact. Why the sensitiveness is increased by prolonging the time of cooking has not yet been ascertained. The development of the picture is effected by the use of a solution of pyrogallol acid followed by a solution of ammonia and bromide of potassium. The results produced are said to be in all respects excellent.

SPIRIT PHOTOGRAPHS.

For some time a certain class of newspapers have abounded in marvelous tales of spirit photography, the work of a lady photographer of Rochester, N. Y., assisted of course by the ghosts of her clients' ancestors and departed friends.

Recently two lady sitters were impressed by the old-fashioned yet familiar costume and aspect of the spirits attending them in their pictures; and set to work to trace their probable pre-spirit history in the pages of an old magazine for ladies. The search was successful, the original of one of the spirits proving to be an engraving entitled "Nourmahal" and the other "The Last Rose of Summer." No doubt the spirits can give good reasons for masquerading in those particular costumes, but as yet they have failed to do so.

The photographs and engravings fell into the hands of a representative of the Rochester Union, who, in order to ascertain the process by which the ghostly picture was printed beside the sharply defined portrait, submitted them to a photographer who does not deal in spirits. The process was practically illustrated and explained as follows: A negative is first taken of the engraving. When the sitter comes for a picture the negative is turned the other side, the collodion put on and the glass put in the camera. In this manner the portrait of the sitter is on one side of the glass and what is intended for the spirit on the other. When the negative comes to be printed the paper is placed against the side of the glass having the portrait of the sitter and exposed to the light. The spirit being on the other side of the glass has to strike through it, which gives it the hazy appearance, while the portrait, being on the side next the light, comes out clearly defined. Any one who is desirous of doing so can test this for himself, and the illustration shown by the photographer explained the matter fully to the eyes of the inquiring newspaper man. The more artistic a photographer is, of course, the more unearthly he can make the work, and the gentleman in question said he could produce a picture of the most ghastly description.

THE ELECTRICAL ALARM COMPASS.

A short time since Mr. Henry A. Severn, of Herne Hill, England, brought out an ingenious compass alarm for use on shipboard. Its purpose is to make the compass signal automatically any considerable deviation of the ship from a desired course. Over the compass card are placed two index hands which can be adjusted to any angle; and these hands are so connected with an electric alarm that the moment the compass needle passes the limit of variation prescribed an alarm bell will ring in the captain's office, and continuing until the ship's proper course is restored. In this way any departure from the ship's course, as ordered by the officer in command, whether due to the steersman's inattention to duty or to a misunderstanding of the orders given, will be instantly made known. Of course when the officer gives his orders to the steersman he sets the index hands to correspond, and after that he is relieved of the necessity of constant observation of the compass to be sure that his order is strictly carried out.

This invention is just now receiving much attention in the scientific and other journals in England; and it is currently described as novel as well as likely to be useful. Its novelty, however, is open to question. In principle, and apparently in mechanical construction, it is substantially identical with the electro-magnetic attachment to ship's compasses patented in this country by Alfred Foucault, July 19, 1870.

The essential part of the claim for this patent was the construction and arrangement of a compass, so that, by reason of any material variation in the route of the vessel, the needle of the same would close an electrical or magnetic circuit and sound an alarm.

The apparatus used in demonstrating the practicability of this system was made in this city by Mr. William F. Holske, model maker, now at No. 33 Park Row. Why the invention has remained so long undeveloped is not known.

New Bridge Over the Missouri near Omaha.

The Burlington and Missouri Railroad Company in Nebraska are about to build a new bridge across the Missouri River at Plattsmouth, about one mile below the mouth of the Platte River and 22 miles below Omaha.

The entire bridge will be about 3,000 feet in length, about 1,000 feet being over the present bed of the Missouri River. The bridge is in the charge of Mr. George S. Morrison, chief engineer, who will personally attend to its construction. The contract for the beton and concrete work has been given to the New York Stone Contracting Company, and will be done under the supervision of Mr. John C. Goodridge, Jr., president of the company. The other contracts are not yet made. The foundation in the river bed will be 55 feet below low water mark; the bottom of the bridge 55 feet above high water mark. It will take about a year to complete the structure. The Union Pacific bridge at Omaha cost over \$2,000,000. The bridge at Plattsmouth is expected, from superior engineering, to cost much less. The Missouri River in the vicinity of Omaha is noted for its shifty character and treacherous quicksands. The river is now a mile further away from Omaha than it was last year, and has formed a new channel or cut off through the Ox-bows, making the river about six miles shorter in length.

MR. ALVA CLARK, the famous telescope maker of Cambridge, Mass., was for forty years a portrait painter. He is now, in the 76th year of his age, hale, hearty, and energetic in his business.