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 themselvesand 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 r epulsions 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 bunghole, 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 bunghole, 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 unstoppered; 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 pyrogallic 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 continue ringing 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 Foucaut, 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 Oxbows, 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.