SCIENTIFIC AND PRACTICAL INFORMATION.

CONCRETE TO EXCLUDE RATS.

A correspondent of the *Building News* says: "Nothing can be better to exclude rats than to concrete the surface of the ground beneath wood floors; not only for this, but also to prevent the growth of vegetable matter, and to prevent, as well, damp rising. All ground floors, whether wood, paved, or tiled, should have a layer of concrete, 3 inches to 4 inches thick, between them and the soil. I have been in the habit of doing this for years, and all such houses have dry floors, and are vermin-proof, as far as the latter are concerned, as rats cannot disturb well made concrete. The concrete should be made of moderately fine gravel (broken flint or glass added to it is an improvement), mixed with Portland cement, in the proportion of 1 of cement to 7 of gravel. Not too much water should be used, but the cement must be thoroughly mixed with gravel, and, when deposited in place, well trodden or beaten with a grass beater. Three or four inches, at most, is sufficient in thickness."

A RAT PLAGUE.

Strange news comes from the Hill Districts of Burmah. The English authorities—commissioners and chaplains of Rangoon and others—have sent out a pitiful appeal for help. Ten thousand villagers are starving. It is not drought, as in Bengal, protracted cold and untimely rains, as in Asia Minor, nor grasshoppers, as in Kansas, that has brought so many people to dire necessity. It is rats. An area of six thousand square miles has been overrun with these "British vermin," which have spared nothing in their widespread devastation. The appeal declares that the people are entirely destitute; their accumulations have been exhausted, and they have no occupation but husbandry to depend on for daily food. With rats so numerous as to eat up everything, nothing short of aid from without can keep the people alive. As nothing is said about subsisting on the enemy, it is to be presumed that the up-country Burmese are, like the lately afflicted Bengali, confirmed vegetarians, and would sooner starve than eat flesh.

THE JAPANESE GOLD FIELDS.

We are indebted to Professor Henry S. Munroe of the Imperial College, in Tokio, Japan, for a recent report prepared by him upon the gold fields of the Island of Jesso. The results obtained give very little promise of the precious metal being mined to any great extent, since the highest average value, per cubic yard of the gravel examined in any one field, reaches but 3·77 cents. In the large majority of cases, this value is greatly lessened, being reduced to as low as some hundredths of a mill. The poorest gravel worked in California by the hydraulic process yields from five to ten cents per cubic yard, while the average is said to be from twenty-five to thirty-five cents. These are thick gravel deposits, and thin places, like the Toshibetsu field, which gives the high average above mentioned, are usually much richer. The upper valley portion of this Toshibetsu field, Professor Munroe thinks, might be profitably worked, as it yields 5·66 cents per cubic yard; but this view is again rendered questionable by the enumeration of obstacles in the shape of the dense vegetable overgrowth, and the inefficiency of the laborers.

NEW PLANETS.

During the month of June last, three new planets were discovered, two by Professor C. H. Peters, Nos. 144 and 145, respectively of the 11th and 12th magnitude, and one by M. Borelly, at Marseilles, No. 146, 11th magnitude.

THE JAMIN MAGNET.

There are no phenomena in physical science of which the cause is less understood than the phenomena of magnetism. That there are relations existing between the latter and the phenomena of electricity is well known; the one produces the other, and reciprocally. But as to what takes place within a magnetized body—what changes occur in its interior constitution at the instant when the magnetization begins or ends—no one has yet been able to adduce a certain and definite explanation. To the very lack of this last may be ascribed the slow progress which has been made in improving the construction of the magnets themselves. The nature of the steel, its degree of temper, the number and dimensions of the plates, their form, the area of the polar portions in contact with the armature, the dimensions of the armature itself, all are important elements to be taken into consideration; but the sum of our knowledge, as to the selections to be made under these divers conditions, results in an assemblage of empirical recipes rather than in a logical and connecting series of scientific rules.

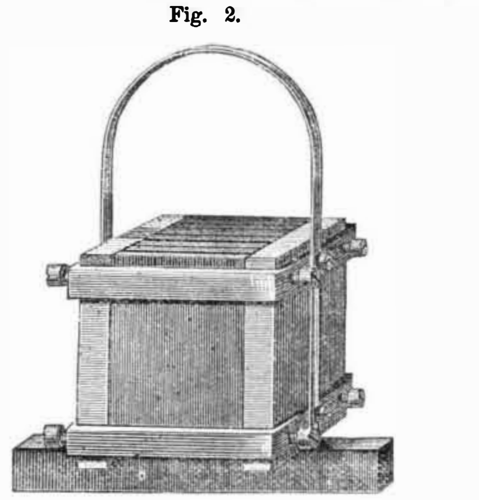
For some four years past we have had frequent occasion to allude to the discoveries and investigations of M. Jamin, a distinguished French physicist, who has succeeded in establishing a large number of important facts, thus realizing advances of great value in the construction of magnets. While it would be impossible, in the space here at our disposal, to review M. Jamin's work in detail, a few of his more salient discoveries may be profitably recalled. At the outset the investigator found himself obliged to invent a method of study. The ordinary way of determining the power of a magnet consisted in applying an armature and measuring the amount of weight which, attached thereto, the magnet would sustain. This plan, besides being crude, frequently involved error, since it may easily happen that one magnet, in reality better than another, will yield to a less weight, while a very slight modification of the polar faces often results in very great differences in the total weight which a magnet is capable of supporting. M. Jamin's device for overcoming these difficulties consists simply of a nail suspended by a string from the arm of a balance. The nail, presented at various points of a magnetized bar or at corresponding points of several bars, is attracted, and the degree of attraction is noted by the balance, so that it is obviously easy thus to measure the magnetism of different localities, and to compare several magnetized plates with each other. If several magnetized bars are superposed, it has been found that the attraction (measured at the extremity of the assemblage by means of the nail) augments with the number of bars, and then becomes stationary. To illustrate, one bar or plate attracts the nail with a certain force, say 750 grains; two plates, superposed, exercise a force of 875 grains; three, 1,425 grains; four, 1,575; and five, either the same as four, or perhaps 15 grains more. The fifth plate, therefore, adds nothing, or nearly nothing, although it has been magnetized in the same manner as the others, and when tested singly is as powerful as any one of them. This, however, is not all; if the plates be separated and re-examined, it is found that they are less powerful than before, and that their union has resulted in loss. They have, in other words, acted upon each other unfavorably.

While the facts contained in the foregoing paragraph are not novel, having already been pointed out by Coulomb, it has been reserved for M. Jamin to discover that they are not exceptional or fortuitous, but absolutely constant and regular, and also to find a means of preventing this tendency of the superposed plates toward mutual deterioration. This means is simply the attaching, to the ends of the bundle of plates, of pieces of soft iron which partake of the magnetism of the extremities. If, under these new conditions, the experiment above described be repeated, the fifth plate is found to add as much as its predecessors, and the number of plates may be largely augmented before the effects, which in the former case are noticeable manifest themselves. Finally, with a certain number of plates, 20 for example, the soft iron pieces become saturated with magnetism, and further additions are of no value or are mutually injurious. If, instead of employing bars, thin ribbons of steel be used, superposed as above explained, the magnet invented by M. Jamin, and represented in Fig. 1, is obtained. The plates are curved, and the poles, brought near together, are separated by a piece of brass to which they are firmly screwed. The various advantages gained by this form, apart from those mentioned above, we have already discussed in detail in back issues of this journal. Perhaps the most important is the facility with which the magnet may be taken apart and put together, or with which the number of plates, and consequently the degree of magnetism, may be varied.

Fig. 1.

The latest form of magnet devised by M. Jamin is represented in Fig. 2 (which, with the former illustration, we extract from *La Nature*). The poles are of soft iron and are applied to the extremities of several steel leaves, which are made broad in proportion to their length. Singly the plates support but very small weights; but when combined with the iron end pieces, the latter absorb the magnetism, rendering the assemblage sufficiently powerful to carry twice or three times its own weight.

Fig. 2.



A very remarkable peculiarity of this magnet, which is not clearly explained, is that neither pole, when tested separately, has any very marked attractive force; but when the armature is applied simultaneously to both poles, it is very strongly held, and yet the attraction does not seem to act over any appreciable distance. It appears, in fact, that the magnetic current must be completed before the maximum force is developed.

Co-Operation in Building.

Hon. Josiah Quincy, in a letter printed in the Boston *Advertiser*, says: A number of Germans who were accustomed in their own country to a system of coöperation, purchased a tract of land in Dedham. Ten of them erected houses for their own use. A separate mortgage for about $2,000 was taken on each house to secure a joint and several bond signed by the ten owners, by which they agreed to pay $6 a week into a savings bank to the credit of the mortgagee and trustee. One half of each deposit is enough to pay the interest semi-annually at seven per cent, and the other half goes on on interest, with a certainty that in a few years it will pay the principal and leave the houses unincumbered. On the first days of January and July, the mortgagers have sent their deposit books to the trustee and mortgagee, who has drawn the semi-annual interest and returned the books with their accumulations to the owners, every payment increasing his security, and the association taking only the risk that every holder of real estate takes who leases his property. Ten or more industrious and temperate men, who had confidence in one another, might form such an association with peculiar advantages. They might choose their locality either together or separately, giving an excellent security that they would pay their interest semi-annually, and the principal in a fixed time.

The Secrets of Philadelphia Butter.

Every one has doubtless heard of the celebrated Philadelphia butter, the delicious flavor of which renders it a delicacy which, in markets outside of its place of manufacture, brings prices which sometimes range as high as a dollar a pound. How it is made is told in a new and excellent little work, recently written by Mr. X. A. Willard, editor of the dairy department of Moore's *Rural New Yorker*, and entitled "Willard's Practical Butter Book." A notice of the volume will be found elsewhere. On the subject of Philadelphia butter, we take from its pages the following:

The celebrated Philadelphia butter comes mainly from Chester, Lancaster, and Delaware counties, Pennsylvania. The spring house is about 18 feet by 24 feet, built of stone, with its foundation set deeply in the hillside, the floor being about four feet below the level of the ground at the downhill side. The floor is of oak, laid on sand or gravel; this is flowed with spring water to the depth of three inches, and at this hight the flowing water passes out into a tank at the lower side of the spring house. The milk, when drawn from the cow, is strained into deep pans which are set in the water upon the oaken floor. Raised platforms or walks are provided in the room for convenience in handling the milk. The walls of the spring house are about ten feet high, and at the top on each side are windows covered with wire cloth for ventilation. The depth of the milk in the pans is about three inches, and the flowing water which surrounds the pans maintains a temperature of about 58° Fah.

The milk is skimmed after standing 24 hours, and the cream is put into deep vessels having a capacity of about 12 gallons. It is kept at a temperature of 58 degrees to 59 degrees, until it acquires a slightly acid taste, when it goes to the churn. The churn is a barrel revolving on a journal in each head, and driven by horse power. The churning occupies about an hour; and after the buttermilk is drawn off, cold water is added, and a few turns given the churn, and the water then drawn off. This is repeated until the water as it is drawn is nearly free from milkiness. The butter is worked with butter workers, a dampened cloth meanwhile being pressed upon it to absorb the moisture and free it of buttermilk. The cloth is frequently dipped in cold water and wrung dry during the process of "wiping the butter." It is next salted at the rate of an ounce of salt to three pounds of butter, thoroughly and evenly incorporated by means of the butter worker. It is then removed to a table, where it is weighed out and put into pound prints. After this it goes into large tin trays, and is set in the water to harden, remaining until next morning, when it is wrapped in damp cloths and placed upon shelves, one above another, in the tin-lined cedar tubs, with ice in the compartments at the ends, and then goes immediately to market. Matting is drawn over the tub, and it is surrounded again by oilcloth so as to keep out the hot air and dust, and the butter arrives in prime condition, commanding from seventy-five cents to one dollar per pound

Mr. Isaac A. Calvert, who markets his butter at those high prices at Philadelphia, attributes his success to three points:—1. The food of his cows. 2. Temperature. 3. Neatness and dainty refinement at every step, from the moment the milk flows from the udder till the dollar in currency is paid for the pound of butter. He says: "I have found that I make my best butter when I feed on white clover and early mown meadow hay. I cut fine, moisten, and mix in both corn meal and wheaten shorts. Next to meal I regard shorts, and prefer to mix them together. I feed often, and not much at a time. I do not use roots, unless it be carrots. My pastures and meadows are quite free from weeds. I cannot make this grade of butter from *foul pastures* or low grade hay.

"*Temperature.*—This I regard as a matter of prime importance in making butter that commands a high price. Summer and winter I do not permit my milk room to vary much from 58°. In summer I secure the requisite coolness by spring water of the temperature of 55° Fah., flowing over stone or gravel floor in the milk house. This can be accomplished without water in a shaded cellar ten feet deep. As good butter can be made without water as with but the milk and cream must be kept at all times a little below 60°.

"We skim very clean, stir the cream pot whenever a skimming is poured in, and churn but once a week, summer and winter. Just before the butter gathers, we throw into the churn a bucket of ice cold water. This hardens the butter in small particles and makes a finer grain. In the hot months this practice is unvarying.

"In working, we get out all the buttermilk, but do not apply the hand. A better way is to absorb the drops with a linen cloth wrung from cold water. The first working takes out all the milk; at the second we handle delicately, with