

THE GATHERER.

What is the "Gramme" Machine?

Dynamo-electric machines are those which, on being started, gradually work themselves up into a highly charged state, and finally give off an electric current of very great strength. Perhaps the best of these is that invented by M. Gramme, a Parisian mechanic. It is now largely used for electric lighting purposes all over the Continent, and we learn from America that the streets of San Francisco are about to be lit by electricity thus generated. In England it has become familiar through being used along with the Jablochkoff candles on the Thames Embankment. The Siemens machine, however, competes very successfully with it in this country: the recent lighting of the Albert Hall on so splendid a scale having been effected on the Siemens system.

Fig. 1 represents the continuous current Gramme

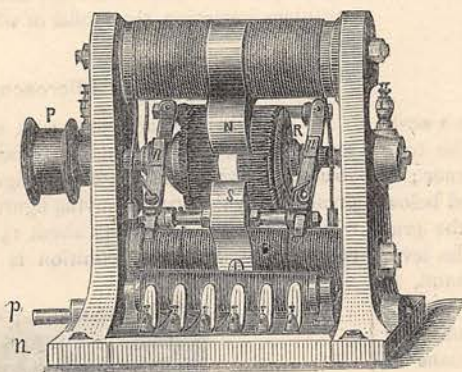


FIG. 1.

machine, that is, the one yielding a uniform current of electricity. It consists essentially of a metal frame supporting two electro-magnets, between the poles of which another electro-magnet—called a Gramme's Ring—revolves. E and E' are these electro-magnets—coiled, of course, with insulated copper wire; N is the north pole of E, and S is the south pole of E'. Between N and S there is an intensely magnetic space when a current of electricity circulates round the wires of E and E'. In this rich magnetic space a coil of insulated wire R, wound on a soft iron ring or core, is mounted on an axle which can be rotated by a belting on the pulley P. When the coil R is rotated in the magnetic space, a current of electricity is set up in the coil. Now, if part of this current be allowed to flow into the electro-magnets E E', these will intensify the magnetic space between their poles still more, and the result will be that a stronger current will be set up in the coil R. Hence R will be able to give a yet stronger current to E and E', which in turn will react on R. This process of give and take—by which the electro-magnets of the machine are enriched with magnetism, and the current in the coil is exalted

in strength—is the dynamo-electric principle. The current set up in the coil is drawn off by sheaves of copper wire p and n : p being the positive pole and n the negative pole of the machine. Only a portion of it is used to feed the electro-magnets, the rest being utilised for the electric light or for other purposes.

The internal arrangement of the coil and ring is shown in Fig. 2, where N and S are the poles of the electro-magnets, p and n the poles of the coil whence the current is drawn off. The soft iron ring R is wound continuously with a coil of insulated wire, but this coil is subdivided into twelve sections by wires, $c c$, running to the axle A, where their ends are insulated from each other, but bared, so that, as the axle revolves, the copper sheaves p and n slide over them, and make contact with them one after an-

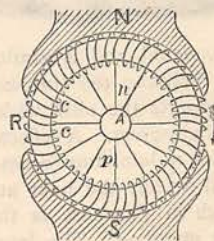


FIG. 2.

other. In this way these sheaves pick up the tribute of current which each coil has to give, and as the coils are of one size, and the rotation very rapid and uniform, a uniform current is drawn off by the sheaves.

Answer to An Old-fashioned Charade, p. 320.

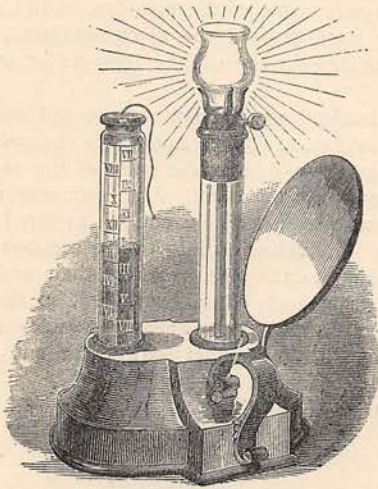
HARMS — C — CHARMS.

Explosive Gelatine.

This explosive gum, the latest contribution to the science of devastation which Mr. Nobel has made, is likely to become very valuable in mining operations and in gunnery. It is said to be more powerful than dynamite, to resist deterioration by water, and to be callous to shocks when mixed with certain substances which are insoluble in nitro-glycerine, such as acetine and benzine. It is formed by dissolving ten per cent. of gun-cotton in ninety per cent. of nitro-glycerine with the formation of a gelatinous mass, and curiously enough, the addition of a small percentage of camphor to the whole (4 per cent. camphor to 96 per cent. of the gelatine) eminently fits it for artillery purposes.

A Time-keeping Night-Lamp.

Our engraving represents an ingenious oil lamp which, besides giving a good reading light, also indicates the time. It is the recent invention of M. Henri Behn, a Frenchman, and can be obtained in Paris. The bottom of the lamp is the oil can, and above it project two upright glass tubes as shown. The left



tube contains some oil, and is graduated with a scale of hours; it is therefore the time-keeper. The tube on the right supports the oiled wick and burner; it is therefore the light-giver. A reflector inclined below the flame throws a luminous beam across the graduated tube, and reveals the hour at which the level of the oil, which in this case is the clock-hand, is for the moment standing. The lamp is so arranged that an hour is required for it to consume the amount of oil contained between two gradations of the scale.

A Paper Dome.

America is indeed the birthplace of minor novelties, and one of the latest of these is a roof of paper, in the form of a dome erected over the astronomical observatory of Rensselaer Polytechnic Institution. It is the design of Professor Greene, of Troy, N.Y., and consists of a paper skin one-sixth of an inch thick, and as hard as wood, fastened in sections over a light framework of pine-ribs. It is hemispherical, measures 29 feet in diameter, and weighs in all only 4,000 lbs., so that it can be moved round by hand on the balls which support it—an advantage in an astronomical dome.

A Steam Life-Boat.

A novel kind of boat has been lately devised by Mr. Edmund Thompson, who has already made several alterations in iron ship-building. It consists of a duplicated centre and stern, a single bow uniting them. Between these two hulls, so to speak, is a channel or tunnel in which, and some distance forward of the stern, the screw is placed. The hulls are, of course, joined in the upper portions, and only a single rudder

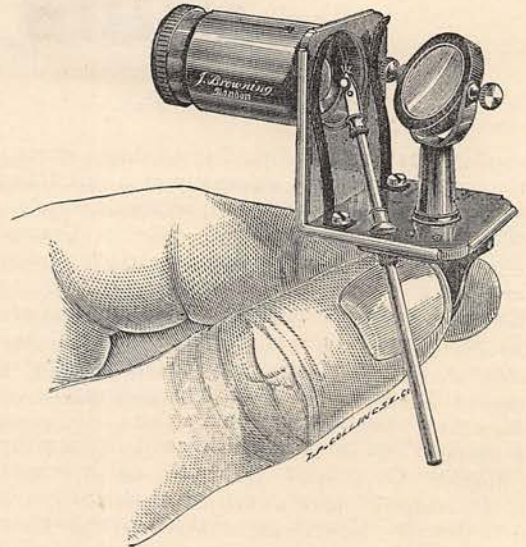
is used, and this is fixed at the spot where the hulls join. There are several advantages claimed for this boat, but before detailing them we may mention that the vessel is of steel with an inner skin, between which and the exterior plating will be a series of compartments with water-tight bulkheads dividing them. It is expected that if any injury should take place these compartments, being practically water-tight, will suffice to keep the boat afloat.

But, in addition to this manifest advantage, the inventor claims others scarcely less important. For instance, the screw being protected by the "tunnel" aforesaid will not be likely to get fouled by wreckage or *debris*, and being removed from the stern is not so liable to racing in heavy weather. It is also expected that the peculiarity of the construction will render the boat much more "handy," but this no doubt still remains an open question.

There are two hulls, and only one screw. Will the duplication of the hull militate against the propelling force in greater proportion than in an ordinary launch with only a single hull? The inventor believes he will succeed, and we wish him every success with his very ingenious invention, the model of which only has been tested.

A Pigmy Microscope.

An extremely small compound achromatic microscope, suitable for the waistcoat pocket, has been constructed. The actual size of this pigmy magnifier is represented by the accompanying figure. The two powers which it possesses magnify about 15 and 35 diameters respectively, and the definition is so good that the



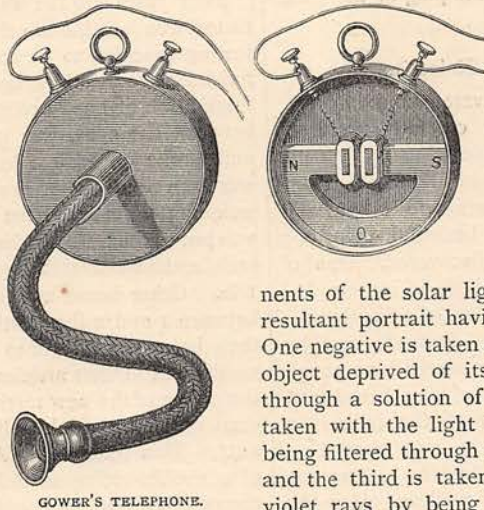
surface markings on some of the coarser diatoms, such as the *Isthmia*, can be seen. It will prove very useful for exhibiting specimens to a number of people—as, for example, at a party—for it can be passed from hand to hand without disarrangement, and the tremor of the hand does not affect its definition.

Gower's Telephone.

The speaking telephone of Professor Bell, now so familiar to most people, is wonderfully perfect in its articulation, but weak in its voice, for the ear must be placed close to it to hear at all. Gower's telephone is an improvement on this, since it can be heard throughout a room. It consists of a horse-shoe magnet, with coils of insulated copper wire on its two poles, which are brought close together as shown in the figure at N S. The diaphragm is a circular iron plate of a larger size than that used in the old form of Bell telephone. The vocal electric currents pass through both coils, which conjointly pull on the diaphragm, setting it into forcible vibration. The case of the telephone is of resonant wood or copper, and the cover, as shown, is fitted with a speaking-pipe which can be lifted to the mouth in speaking. The "call" used to call the listener is a harmonium-reed free to vibrate under the breath in the magnetic field of the magnet and near the coils, a slit in the diaphragm permitting the sender to set it in vibration by a sharp puff, which causes the receiver's telephone to emit a sound resembling a toy trumpet.

Horse-Chestnut Starch.

The natives of Holstein make a starch from the ripe horse-chestnut, which they rate superior to that from wheat or potatoes. The shelled nuts are crushed by hand in water and strained, the thick pap remaining being again put into water, stirred, and kneaded through a sieve; only the liquor is kept this time, and it is strained through a very fine sieve, after which it is allowed to stand until next day, when the dregs are washed in pure water and strained through muslin until the water comes away clear and colourless. The meal is next dried on a clean white cloth, after which it is ready for use as starch.



interfered with by the closing of doors and windows against the fresh air. There is, fortunately, a very simple remedy in such cases. On returning to town, paterfamilias should take care to see that the pipes and drains are in good order, that the cellars and closet are freed of rubbish, and that the whole house is thoroughly well aired before the fiat for repossession goes forth. Carbolic acid plentifully used in the cellar is both a cheap and valuable disinfectant. If these straightforward precautions are observed, no personal harm can result from the home-coming of the pleasure-seekers.

Self-coloured Photographs.

Many attempts to fix the native hues of objects by photography have been made hitherto, but all have failed. It is an etching of light and shade, rather than a painting, which the sun gives. Nevertheless, the climax to which all photographers are working is a means of producing sun-pictures which shall faithfully represent nature in all her varied livery of colour. Towards this goal an important step has recently been made by M. Cros, who, by combining three separate negatives of the same object, taken with different components of the solar light, has managed to produce a resultant portrait having all the tints of the original. One negative is taken with the light reflected from the object deprived of its green rays by being filtered through a solution of nitrate of nickel, the second is taken with the light deprived of its orange rays by being filtered through a mixture of chloride of cobalt, and the third is taken with the light deprived of its violet rays by being filtered through a solution of bichromate of potash. The first negative is therefore not impressed by the green rays coming from the object, the second is not impressed by the orange rays, and the third is unaffected by the violet rays. If, then, each of these negatives be illuminated by the kind of light which it has been deprived of, the lacking colours will be restored to each, and if the three images so obtained be blended together, by means of total reflecting prisms of glass, a resultant image of the object in its natural colours will be obtained.

Are Empty Houses Dangerous?

This question may be fitly asked and answered at a season when thousands of families are thinking about deserting their homes for a few weeks, to enjoy themselves at the seaside or in travel. It is asserted that houses that have been shut up for a time may become breeders of disease when they are re-occupied, and that such disorders as typhoid fever and diphtheria have occurred under these circumstances. The cause is considered to lie in the disuse of cisterns, pipes, and drains, the putrefaction that is engendered by the impure air in them, the unimpeded access of this foul air to the house, which is at all events not

Floating Signal Lights.

Mr. Nathaniel J. Holmes has produced an improved form of floating light signals for burning on the surface of the sea. These lights are produced by the action of the water itself, which is admitted into contact with a chemical compound contained within the floating vessel as it rides on the sea. Phosphuret of calcium is the compound employed, and the action of the water liberates phosphuretted hydrogen gas, accompanied by sufficient heat to cause the latter to burst into a

bright flame, which can be seen for a long distance, as the signal rises upon the swell. By means of an automatic arrangement, the ingress of the water and appearance of the flame are so regulated as to produce flashing signals of definite duration and at fixed intervals, so that each signal-light can be made to distinguish itself by a particular signal of a certain code, such as the Morse telegraphic code, which has been recently proposed for lighthouses. This arrangement consists in fitting to the top of the vessel containing the chemical a cock, having a plug rotated by clock-work. This cock is so constructed that in one position of the plug it opens a direct communication between the interior of the vessel and the air, by which the gas may be discharged, and in another position it admits into the vessel a definite quantity of water—each passage being closed while the other is open. Thus, for every discharge of gas, only the equivalent of water is admitted sufficient to develop the next discharge; the frequency and direction of the discharges being regulated by the speed of rotation of the plug of the cock.

A Curious Stalactite.

As the newly-discovered Luray Cavern, in Virginia, is being carefully explored, fresh marvels are constantly cropping up. Indian bones, sealed in alabaster, arrow-heads, tracks of bears and other wild animals, and many beautiful dripstone growths have been discovered. One of the most singular of these is represented in the figure. It consists of a fragile tube of alabaster suspended from the roof by stony rootlets, and terminated by a rough bulb, like the apple of the bread-fruit tree. The formation of the bulb is a kind of puzzle, but it is supposed to have been built up by the calcareous water overflowing a nucleus originally formed at the point of the tube by a tassel of arragonite crystals.

Banana Flour.

Flour made from the fruit of the banana-tree before it is quite ripe is a growing export from Venezuela, where that tree is employed to protect the coffee plantations from the effects of drought. Many specimens of it were exhibited at the Paris Exhibition, as well as samples of a cognac made from the ripe banana. The flour contains about 66 per cent. of starch and 3 per cent. of azotic matter. Being essentially feculent food, it ought, therefore, to be supplemented by animal matter. The amount of sugar contained in it is very considerable.

A Mechanical Short-hand Reporter.

We ought to notice a device by Signor Michela, which is styled "The Stenographic Machine." The claims

put forward in its behalf are that after a fortnight's practice any person can take down in short-hand a speech, no matter how rapidly it may be delivered. The invention is a little instrument, in form like a piano, having twenty-two keys, white and black; and the stenographic signs are small and impressed on slips of paper. Signor Michela professes to have classified all the sounds which the organs of speech can produce, and to have so constructed the machine that it shall report with unfailing fidelity "winged words" in German, French, Italian, Spanish, and English. The invention is said to be very ingenious, and to have satisfactorily undergone a series of practical tests. Its linguistic accomplishments rather puzzle us, but doubtless if the machine is to revolutionise—as the phrase is—the whole art of short-hand reporting, we shall yet hear a good deal more of it.

A Remarkable Strength-testing Machine.

Four years ago the United States Board appointed to test iron, steel, and other metals, ordered a 400-ton testing machine to be constructed. It has just been finished, tried, and accepted. At the trial recently a forged link of hard wrought iron, 5 inches in diameter between the eyes, was gradually strained in tension and broke off with a loud bang at 722,800 lbs. It was then necessary to see if, after the great recoil, the weighing parts had been disarranged, so a horse-hair was put to the test. In diameter it was $7\frac{1}{1000}$ ths of an inch, and was stretched 30 per centum, and broke at 1 lb. Other horse-hairs were next tested and broke between 1 and 2 lbs. Other weighing machines were then brought into use to check the accuracy of these small tests. Other articles were then introduced to try the power of the new testing machine for compression, even articles of such delicate structure as eggs and nuts. This remarkable American invention consists of a double-acting straining cylinder, and runs on a carriage at one end, and at the other a movable weighing apparatus, the two being connected by a pair of screws 48 feet long, and the weighing apparatus is a reversed hydrostatic press, having diaphragms instead of pistons. The load is transferred by means of such fluids as alcohol and glycerine, and successive series of large and small diaphragms, to a system of scale beams. By this means 800,000 lbs., acting through an unimaginably small space, move a graduated indicator $\frac{1}{1000}$ th of an inch per lb.; 1 lb., in moving the indicator $\frac{1}{1000}$ th of an inch, moves the platform against which the load presses $\frac{1}{42,000,000}$ th part of an inch.

Effect of Perfume of Flowers on Health.

Contrary to a popular belief, it has been recently found by an Italian professor that fine vegetable perfumes exercise a positively beneficial influence on the atmosphere, by converting the oxygen of the air into that powerful oxidising, and therefore purifying agent, ozone. The essences found by him to produce the most ozone are precisely those which usage has



A CURIOUS STALACTITE.

selected as the most invigorating, such as cherry, laurel, cloves, lavender, mint, juniper, lemon, fennel, and bergamot, several of which are ingredients in the refreshing *eau de Cologne*. Anise, nutmeg, thyme, narcissus, and hyacinth flowers, mignonette, heliotrope, and lilies of the valley also develop ozone; in fact, all flowers possessing a perfume appear to do so, whereas those having none do not. This interesting intelligence will be gratifying to all, especially to lovers of flowers, and the cultivation of these lovely disinfectants of nature should be promoted in all marshy or foul places.

Insoluble Cement.

A useful recipe for cement, which is insoluble not only in hot and cold water or steam, but also in acids and alkalis, has been recently given by a German chemist. The cement consists of a preparation of chromium and one of isinglass. The two preparations are kept apart until the adhesion is required. For the first, take crystallised chromic acid $2\frac{1}{2}$ grammes, water 15 grammes, and ammonia 15 grammes, and to this solution add 10 drops of sulphuric acid, 30 grammes of sulphate of ammonia, and 4 grammes of fine paper. The gelatine preparation is made by dissolving isinglass in dilute acetic acid (one part acid to seven parts water). To apply this cement to envelopes, the isinglass solution is brushed on the flap, while the chromium solution is brushed over the underlying part. To close the envelope the flap is moistened with the tongue in the usual manner, and pressed down on the chromium solution, when an insoluble adhesion is obtained.

The Praxinoscope.

The new instrument devised by a M. Reynaud, which is entitled the "Praxinoscope," differs from the phenekistiscope in one important respect at least, namely, there is no interruption to the vision, nor is it necessary to reduce the amount of light to any appreciable extent. Thus the observer can view an ever-changing image without interruption; indeed, several people may view the illusion at the same time. The praxinoscope is composed of a circular case open at the top, placed upon a vertical axis, and having a series of figures round the inside of the circumference, which represent the different phases of the action. Between the circumference and the centre of the instrument, a polygon of plane mirrors is fixed—every mirror corresponding to one of the series of figures in the interior of the circumference. By the motion of the system the substitution of the images in the mirrors is produced, and so an appearance of animation is given to the image. The effect is very curious, and the praxinoscope will doubtless play an important part in optical studies.

A New Screw Steering Apparatus.

A very novel and ingenious apparatus has lately been invented, by means of which the steering of vessels is much facilitated. In addition to the usual screw propeller, Mr. Kunstädter has mounted a

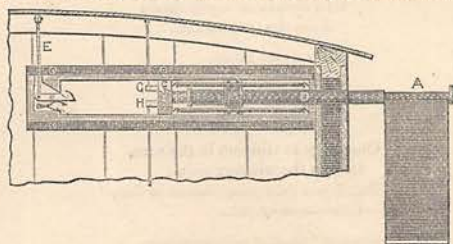
smaller one which runs beside the rudder-blade. It is curiously connected with the screw shaft by a "universal" joint, by means of which the strain is kept exactly upon the centre of the shafts, while at the same time the helm, in its own propeller, may be turned about in any direction desired, without interfering with the forward motion of the vessel.

In fact, the joint above referred to is apparently the chief feature of the action; and although the stern-post of the vessel to which it may be attached will be more or less strained by the double working of the propeller, there are such carefully adjusted bearings connected with it, that the inventor claims almost absolute immunity from injury.

But the fear of any injury whatever may be put aside in the cases of all vessels of average tonnage, for only one propeller is necessary, both for steering and for steaming purposes. Mr. Kunstädter says that by his new apparatus a ship can be turned much more rapidly than by the existing helm, and that the use of his invention will eventually obviate the use of tug-steamers. This is not unlikely, but we should like to know what the owners of tug-steamers think of Mr. Kunstädter's invention.

Passenger Flag Signals.

In railway trains built up of isolated cars, like those in Europe, some means of inter-communication



between the passengers and the guard or engine-driver is a desirable safeguard. Hence many trains are now fitted up with some patented bell whereby the guard can be alarmed from any carriage. Mr. Stewart's system consists not only in the ringing of a bell to alarm the guard and the engine-driver, but in putting out a danger flag from the carriage in which help is required. Both acts are done simultaneously by pulling a cord, marked E in the accompanying diagram, which springs a trigger, thereby liberating a flag A, carried by a staff D and frame C. The flag, thus freed, shoots out from the side of the carriage under the pull of two springs G, H, and unfurls itself to the breeze. At the same time the flagstaff is caused to close the circuit of an electric battery and ring a bell in the guard's van. The bell continues to sound until the flag is replaced and held back by its trigger, and as the position of the flag with regard to the carriage prevents the passengers from doing this, it can only be done by the guard answering the call in person.

Effects of Coloured Glass on Animal Life.

Some French gentlemen have lately been performing a series of experiments to ascertain the influence of

different coloured glass upon animal life. Their conclusions are very curious and worth recording.

It appears that flies' eggs are hatched more rapidly under the blue or violet light than under a green shade. The eggs and the young of trout and frogs have also been experimented upon with this uniform result:—Violet rays bring forth the young soonest, then blue, yellow, and white light follow in succession. Darkness, however, will not prevent the hatching or development of the object experimented upon, although it will delay the result; red and green rays are likewise injurious.

It has also been ascertained that the tadpole will die more quickly under the influence of the blue and violet rays, and in all cases the effect of the coloured light was more injurious than the white rays. So it seems that although colour is an assistance in the development of certain forms of animal life, the pure white light is necessary to bring it to perfection.

Quadruple Acrostic.

See here a sovereign of a modern state,
His country too, which in past times was great;
Though now reduced in area and in power,
She seeks this province as her lawful dower.
May her chief town, renowned in classic lore,
Resume the place it held in days of yore.

Rippling in a tiny flood
To the river-course,
Of a stream in sunny Spain
I am the true source.

'Tis a name given
To gatherings diverse,
Which we read often
In prose and in verse.

One longs to triumph in the race,
Or join the winning crew;
But if you beat your friends in this,
I cannot envy you.

O "sea-green" man of mighty power,
Late *avocat*, now borne by surging crowd
To hold the rule for one sweet fleeting hour,
Then hurled to death 'mid execrations loud.

This helps the speaker and the preacher
When gracefully 'tis used;
But, sad to say, in this our day
Its use is much abused.

Though now laid low, yet long ago
The people flocked to see
A wonder of the world, which then
Was standing close by me.

Fire and Flood Tell-Tales.

Automatic arrangements for giving alarm of the outbreak of fire have been in use for a number of years. More than twenty years ago, Alexander Bain, the inventor of the chemical telegraph, constructed a thermometer in which the rise of the mercury to a particular degree marked "danger," completed an electric circuit, and rang a bell. This little contrivance is now extensively used in ships' holds and warehouses where outbreaks of fire are apprehended. In common with most of these alarms, however, this method is defective, inasmuch as it does not distinguish between slow rises of temperature due to harmless causes and

sudden ones due to fire. M. Leblan, a French engineer, has constructed a tell-tale which takes account of this difference. The sensitive part consists of two expansible plates of sheet zinc, each about 60 centimetres long and 0.05 centimetre thick, cut from the same sheet of metal, so as to have the same power of expansion. They are folded into a gutter shape, so as to be more rigid, and while fixed at one end, they are free to expand at the other. One of these is swathed in flannel, and the other is bare to the atmosphere. When the variations of temperature in the apartment where the tell-tale is placed are sluggish, the flannel round the covered plate will not interfere with its expansion, and both plates, naked and clothed, will expand equally. But when there is a sudden rise of temperature the bared plate will expand the faster. The effect of this is to make it bring a contact screw, which it carries, into contact with a spring carried by the covered plate, and the electric circuit being thus closed, an alarm bell is rung.

Wrapping Food in Paper.

It is a matter of daily experience on the part of every one who purchases such common necessities of life as butter, bacon, cheese, sausages, &c., that these goods are almost invariably wrapped up in printed or manuscript paper. Perhaps we might also say that provisions for picnic and other hampers are stowed away in similar coverings, and it will therefore not be amiss if we call attention to the fact that danger has been discovered to lurk in these familiar wrappings. In the case of printed paper, the characters have often been transferred to the cheese or butter, and either they are cut away by the observant cook or they are unnoticed, and in due course become assimilated in the process of satisfying hunger. It is supposed that the ink or the paper itself may possibly by some chance contain something deleterious. But written paper is even more likely to be hurtful, inasmuch as in writing the paper has been in close contact with the hand, which not improbably may be giving off a perspiration, that may enter the pores of the paper and may there ferment, not with advantage to health in the event of any portion of the manuscript being allowed to accompany the food down unsuspecting throats. This subject has called forth some correspondence in certain German papers, and though we would not attach absurd importance to it, it may still be said that clean unused paper is so cheap, that provision dealers have small excuse for using either printed or written matter for wrapping up their commodities.

An Indestructible Writing Ink.

Good gall-ink being proof against alkalis, the addition to it of a strong solution of fine Prussian blue in distilled water will render it equally proof against acids, and it then forms a writing fluid that cannot be erased without destroying the paper. This straightforward recipe is derived from what ought to be good authority, and in giving it publicity we are actuated by the best intentions.