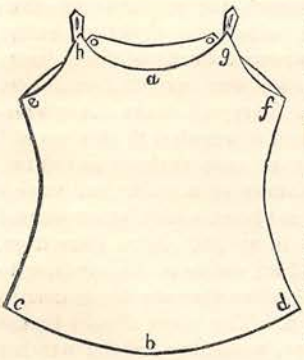


and thus being pulled off. To avoid this, I make the child a little flannel chemise, which fastens on each shoulder, and can be slipped over the feet. The accompanying diagram shows the shape of this little garment, which I have found fits better than any other I know of.

The size for a full-sized child of three months is—length from *a* to *b*, 10 inches, back $10\frac{1}{2}$ inches; width, *c* to *d*, 13 inches; *e* to *f*, 10 inches; *f* to *g*, 4 inches; *g* to *h*, $6\frac{1}{2}$ inches; tabs, $1\frac{1}{2}$ inch. The sides, *c* to *e* and *f* to *d*, are joined together; the slants, *f* to *g* and *e* to *h*, being herring-boned. The tabs are put on the front, and two little buttons in the corresponding corners at the back.

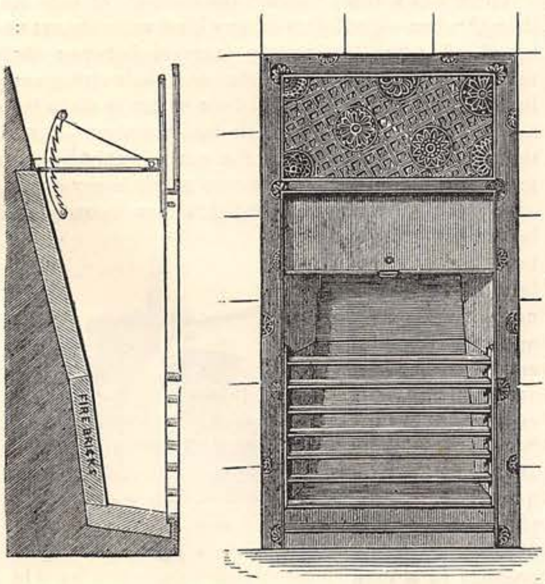
During the period of vaccination, I do not let the child wear any linen chemise, nor any more petticoats than are absolutely necessary, and I make the frock-sleeve come to nothing almost on the shoulder, cutting it quite plain instead of the ordinary puff.

For my own part, I prefer to have a child in short clothes before it is vaccinated. I am of opinion that, with ordinary care, any fairly healthy infant may be "shortened" at ten weeks, or, if it be warm weather, even earlier. The garments should be long enough to cover the feet.

THE GATHERER.

An Improved Stove.

For a long time past, we have been compelled to burn extravagant quantities of fuel in our sitting-rooms, without receiving in return a proportionate amount of heat. It is only lately that builders have considered the best means for warming our rooms in



an effectual manner. Grates are now being built nearer the floor than used to be the case, and the distance from the back to the front of the grate is decreased, while the sides are splayed out to allow a greater radiation of heat. In addition to these improvements, fire-brick sides and backs are being used in the erection of grates, instead of the iron plates which carried off most of the heat as soon as it was generated. Still, we must admit that even now our stoves are not perfect, for generally the bottoms are composed of iron gratings, which admit the air too freely just where it is not required, compelling a swift and imperfect combustion of coal. The grate shown in our illustration is one which deserves our support, as it comprises all the principles which we have advocated. This stove is manufactured at the Norfolk Ironworks, Norwich; and, as will be seen, is provided with a blower for drawing up the fire, and a damper, easy of regulation, for creating a draught. Combustion is attained by air passing through the bars of the grate, and by this means a hot bottom is maintained, so that all the cinder is consumed, which in our ordinary stove would be cooled down by the cold air and not burned. And this grate, we are told, burns only one-third of the fuel consumed by the ordinary stove.

A Hidden Quotation.

In the following lines may be found a well-known quotation from Shakespeare, one word in each line:—

MY HOME.

A little cottage bowered in green,
With rose-bush clambering here and there
By trellised porch, and blooming fair
Round lattice-panes: can any scene
In other lands with this compare,
Or could you name a place more sweet,
Or would the flowers that bloom elsewhere
Smell half so fragrant and so rare?
Ah! roam the wide world as I will,
Sweet home! you're dear to memory still.

W.

A Substitute for Silk.

A substitute, or what it is believed will ultimately prove to be an efficient substitute, for silk and other fabrics, has for several years been favourably known to the great manufacturers of Yorkshire. This is the "dressed" fibre, to use the technical term, of the Rheea plant. Hitherto, however, grave difficulties have stood in the way of its introduction into the market on anything like an extensive scale and until some inventor

THE RHEEA PLANT.

cares to take his chance of making a large fortune, by designing a machine that will enable the fibre to be prepared for manufacture at a price that will bring it into active competition with other textile fabrics, we cannot hope to reap much benefit from this plant.

The Rheea plant, also known by its Indian name Ramie, and popularly as Chinese grass, is a member of the *Urticaceæ* or nettle family. It is found throughout the greater part of tropical or Eastern Asia, and grows to a height of about four feet. There are two types of the plant, namely, *U. nivea* and *U. tenacissima*, but the latter is far and away the better adapted for industrial purposes. The useful portion is the fibre of the inner bark, which has to be bleached and separated into threads. For hundreds of years, the Chinese have been accustomed to do this work by hand, skinning the stalk and scraping off the outer bark with a knife. But as one man can turn out only 2 lbs. a day at the utmost, this process is, of course, wretchedly slow. The raw material thus produced consists of clear ribbons of a light yellow colour. When these have been ungummed, bleached, dressed, and combed smoothly, they form the strong and brilliant staple for the manufacture of such goods as Japanese silk, a fabric of which ladies speak in terms of the very highest praise.

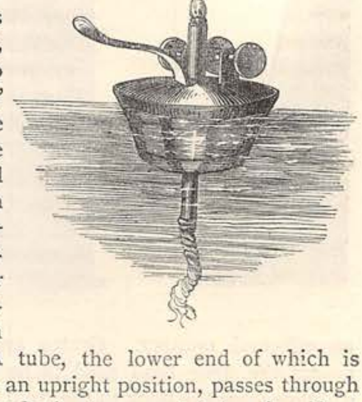
Besides possessing great strength, the Ramie fibre is quite as elastic as cotton, and more so than hemp or flax. In fact, it is inferior in the respects named to silk alone. But we have yet to make allowance, before exhausting the list of its merits, for its beautiful lustre and intense whiteness, for the easy cultivation of the plant, and for its rapid reproduction. A plantation where the plant grows in regular, thick rows will yield three crops per annum, with as many as 500 lbs. of fibre to the acre. A mowing-machine, with thick short blades, gathers the plants, which are collected in sheaves and then left in stacks. After a few days, the leaves wither and fall off, owing to the handling to which they are subjected while they are being carried to the dressing-machine. The plant should be cut from eight to fifteen days, according as the weather is dry or damp, before it is stripped of its bark.

In 1871 a reward of £5,000 was offered by the Government for the best machine or process for the preparation of the fibre. All the competitors save one retired before the day of trial, and the sole candidate was only partially successful, but as he received the sum of £1,500 we may fairly assume that his invention was meritorious. However, no practical use was made of it, and Government have again come forward—to their credit be it said—with the offer of two handsome rewards, one for the best, the other for the next best machine. The competition will take place in August and September, 1879, at Sahâranpur, in the North-west Provinces of India, and all entries must be made by the December previous.

A Novel Night-Light.

There was a time, "within the memory of men still living," when night-lights of any kind were almost unheard of, when during the interval between their retiring to rest at a decent hour and their rising early in the morning, people cared little or not at all to have a lamp dimly burning in their bed-chamber. But all that has passed away, and the use of night-lights is growing more and more common nearly every day.

A great variety of night-lights has been placed before the public, but inventiveness in this direction is not yet exhausted, and we have to call our readers' attention to the engraving of the "Floating Oil Burner," of which a very brief explanation will suffice. The burner consists of a cup-shaped float with



a convex top. A tube, the lower end of which is loaded to preserve an upright position, passes through the float, extending both above and below it. Near the upper end of the tube, a slot is cut in its side to receive the edge of a toothed wheel, by which the wick is raised or lowered. For convenience in moving the burner, a curved handle is attached to the top of the float, in which a ball is placed, that can be shifted so as to counterbalance the heavier side and cause the float to lie evenly in the oil. The float is air-tight, and being made of thin sheet-metal cannot become saturated.

Answer to Double Acrostic on page 64.

S nar K
A l L
N eriss A
T ao U
A lbatros S

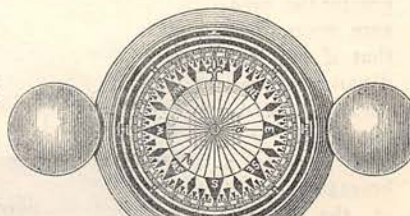
A New Heat-Generator.

Engineers have long been aware that other substances than coal might be used in steam boilers ; but the difficulty has been to get anything permanently cheaper and less troublesome. The higher price of coals has stimulated the inventive genius of the mechanic with extra activity, and, as usual, our trans-Atlantic brethren have not been behindhand where it was likely "money was to be made." We hear of a boiler whose fire-box has been constructed to burn petroleum instead of coal, and the experiments made with it at Paterson, New Jersey, appear to have been tolerably successful, although the invention was evidently capable of further improvement. The principle of combustion is that of the common oil-lamp on a large scale, only instead of a cotton wick there is one of asbestos, and for oil we have petroleum, or naphtha. Now asbestos is a fibrous silicious mineral, quite unaffected by ordinary heat. Its fibres are so many delicate thread-like crystals, arranged side by side, until the mineral has the appearance which has obtained for it the name of "mountain flax." A "wick" of this kind, therefore, has all the properties of cotton in being able to continually absorb liquids by capillary attraction, and has the advantage of being incombustible.

The arrangement for the supply of heat to the boiler by means of this asbestos wick is as follows:— The boiler on which the experiment was made was a small vertical one, about sixteen inches in diameter, and four feet in height. Under it was the heating apparatus or fire-box—an iron chest eight inches long, six wide, and four and a half deep, tapering slightly towards the bottom. The sides near the bottom, as well as the bottom itself, were perforated with minute holes. This box is filled with asbestos, and at the end is a pipe leading from a small tank filled with petroleum. The asbestos is first saturated with the combustible liquid; and thus "started," it will commence burning. As fast as the petroleum is burnt a new supply is drawn from the reservoir by the capillary attraction of the asbestos wick. The flow of oil can, of course, be regulated by an ordinary stop-cock. The flame which suddenly springs up when a light is applied to the asbestos plays in and out of the numerous holes perforated in the fire-box upon the boiler. The water therein is immediately converted into steam, and in a few minutes it was found that the latter had generated so rapidly as to have a pressure of 100 lbs. on the square inch.

Safety at Sea.

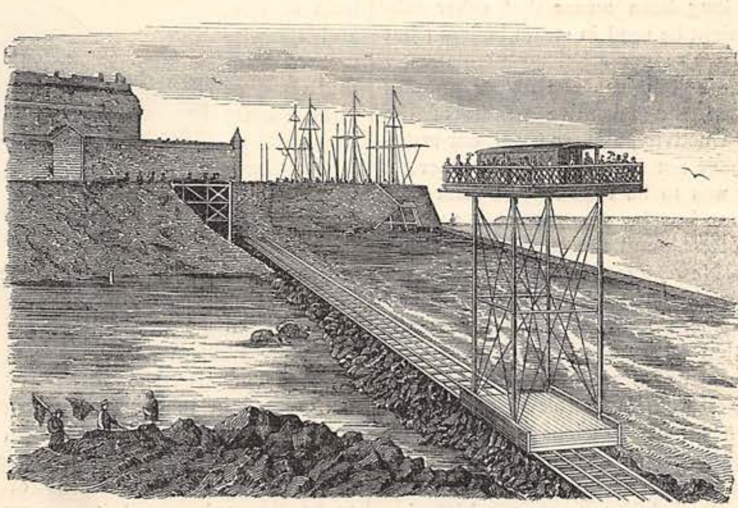
Until the mariner's compass was invented, sailors rarely ventured out of sight of land; but now, guided by the needle which points to the north, vessels can cross thousands of miles of ocean, and pass through fogs and the darkest night straight to their destination. But in voyages of such extent, when beyond all landmarks or lighthouses, and depending so much upon the compass, it is evident that the slightest error in that instrument may sacrifice hundreds of lives by running the ship upon the rocks. Ships and especially steamers are now often built of iron, and this increases the chances of error, since that metal affects the magnetic needle, just as with a toy compass



which may be bought for sixpence, holding the steel blade of a pen-knife near it will cause the needle to deviate from its true direction. In order to avoid this, Sir William Thomson has invented a new form of compass, the "card" or face of which is represented in the annexed illustration. In the old compass the needle is very large, and to efficiently correct the deviation caused by the metal in an iron ship, no less than two tons of iron would have to be disposed around it—a mass so great as to be practically out of the question. Here, however, instead of a single large needle, eight small ones placed parallel to each other are employed, being suspended upon thirty-two silk threads which extend from the centre to the rim. By this arrangement the error can be corrected by two pieces of metal like cannon-balls, not more than six inches in diameter, fixed on either side of the compass. Besides this main feature there are several minor improvements. The card in its centre has a tiny sapphire, like the jewel of a watch, which rests upon a delicate iridium point, so that friction is almost avoided: friction is also reduced by the use of "knife-edges" for the bowl of the compass to swing on, and these give a great susceptibility to the magnetic current and a true level. Then, lest this delicacy should cause too much vibration, under the compass there is a vessel full of castor-oil—a viscous fluid which when disturbed soon settles again, and keeps the card steady.

Another invention of the same gentleman's, fully as important, is the patent sounding machine, the tube and scale of which are here shown. Everybody who has been fishing has sounded the depth of water from the punt with a plummet of lead attached to a string, and this simple plan has till very lately been practically the one in use on board ship. But as a ship sails along, the line, as the weight sinks, drags out behind at a wide angle instead of dropping straight, so that the depth appears much greater than it is. To prevent this the steamer must be stopped, but as on a dark night, near shore, sounding should be taken almost perpetually, this involves loss of time, and with sailing ships immense trouble; and the inconvenience, it is feared, has often caused the precaution to be neglected, and led to terrible shipwrecks, as that of the *Schiller*. By Sir William Thomson's plan soundings can be taken while the steamer is going many miles an hour, without delay, and with perfect accuracy. It is founded on the fact that the deeper anything sinks into water the greater the pressure upon it, so that if you can discover the pressure you know the depth. For this purpose a brass tube, closed at the bottom and open at the top, is attached to the line just above the plummet. Some sulphate of iron is placed in this outer tube, and then a smaller glass one, exactly like the tube of a thermometer, is inserted—this last being open at the bottom and closed at the top, and coated within with a solution of prussiate of potash. As the apparatus sinks, the increasing pressure of water above it gradually forces the sulphate of iron in the brass tube up inside the glass tube, compressing the air within, and causing the prussiate of potash to turn a deep blue colour. This colour extends up the glass tube to a height in proportion to the pressure, or depth of water. When drawn up it is laid upon a graduated scale, and read off very much like a thermometer—the blue colour answering to the mercury, and telling the depth in fathoms. As it depends wholly on the pressure above, it is quite independent of the length of line run out by the motion of the ship; but in this machine, instead of the old rope or line, a fine steel wire is used, which offers so much less resistance to the water as to hang almost vertically under the vessel. As the bottom of the sea and depth of water are now mapped out just like the surface of the land—its hills and dales corresponding to the shoals and depths of the ocean—this machine, which can be used without the slightest inconvenience or loss of time, enables a captain to know in the darkest night how near he is to the shore. In fogs and misty weather, ships can even in this way guide themselves across the broad Atlantic, as it were, by feeling the bottom.

Sir William has also invented an azimuth mirror which can be adjusted to his compass, and facilitates taking observations of the stars; and a deflector, which is an instrument to check the compass and reveal any error that exists without the help of marks on shore, which have hitherto been necessary, and without "sights" of the sun or stars. It consists, briefly, of pairs of magnets, which are placed on the compass, and the ship being directed in turn to the four cardinal points—north, south, east, and west—these read off upon a scale what is called the directive force of the needle. If it is equal on all four courses, the compass is correct; if not, it must be adjusted until the deflector reads each way the same. All these, and especially perhaps the two first, are highly valuable aids to safe navigation.



ROLLING-BRIDGE OF ST. MALO, FRANCE (TIDE OUT).

The Rolling-Bridge of St. Malo.

It was formerly customary, when the tide was out, for people to cross over by way of the beach from St. Malo to St. Servan, two villages on opposite sides of a narrow inlet on the northern coast of France; but when the tide was in, passengers were compelled to make a considerable *détour* to reach their destination. We need hardly be surprised to find, therefore, that in course of time some more direct means of communication between the two places, which should be available at all seasons, soon became a felt want.

First of all, a line of rails was laid down on the beach. Next, a large carriage-platform was constructed for carrying passengers, vehicles, and cattle. This stood on long iron pillars or shafts, and was otherwise supported by a lattice-work of metal spars. The wheels were made with a strong clip that firmly gripped each rail, and prevented the carriage from being knocked over or pushed up by tempest or waves. When the contrivance was placed in position on the rails, the carriage stood perfectly clear of the highest tides and rough seas. At the St. Servan side, a steam-engine was set up, and a long, stout, endless chain connected the carriage with the engine. As soon as it was ready to start, the "prime mover" was set going, and "hauled" the carriage from one end of the journey to the other by means of the chain. The engraving is taken from the "Practical Dictionary of Mechanics."