

10. Oleic acid.
11. Solution of cod liver oil in ether.
12. Common resin dissolved in alcohol.
13. Various other kinds of resin.
14. Picric acid.
15. Bichromate of potash.
16. Artificial tannin made by the action of nitric acid or concentrated sulphuric acid upon resins, gums, fernambuc wood, peat, etc. In this way a substance is produced which is as astringent as tannin, and will precipitate a glue solution in the same manner as tannin. It does not however deserve the name of artificial tannin; the investigation of the most eminent chemists having proved that in this way only a modification of the acid used is formed, which does not possess the property of preventing the skin fibres of the hides from adhering after drying and thus make the tanned skins soft and flexible. This is the true function of the tanning process, and not merely the solidifying of the glue or gelatine in the hide as was formerly supposed.

We are willing to expand on this subject by giving further details, if suggested by our readers.—*Industrial News.*

## Miscellaneous.

### A NEW SUN DIAL.

(See page 277.)

A correspondent of *La Nature* communicates to that journal the following description of a sun dial to be used as a regulator in the house, the instrument being placed in the window when it is desired to ascertain the time.

It consists of three parts, which may be easily disconnected by the removal of screws from two of them. The form, which is purely geometrical, comprehends the right line, the circle, and the ellipse. It is of the equatorial kind—the only one that is capable of giving exactness. In spite of its small size, the hour may be read on it from minute to minute as on a watch. The dividing lines indicate the even minute, while the odd minute is given when the shadow falls between two divisions, its passage through the interval having an appreciable duration of only fifteen seconds. In selecting this form it has been the author's object to obtain sensitiveness. The stability of the style prevents all danger of the instrument getting out of order. The instrument represented in the accompanying engraving was tried and found to be exact to a quarter of a minute, from seven o'clock in the morning to noon. The error, if there was any, diminished on approaching noon, when it became nil.

To make use of the apparatus, a window is selected which receives the sun. Then the exact hour is obtained from a watch, or by other means, and marked on the dial, account being taken of the difference between the true hour and the mean hour; this being indicated in a table glued under the base. Then the position is regulated by means of leveling screws. It is requisite (1) that the mid-day line the style, and a leaden wire shall be in the same plane, and that (2) the style be parallel with the axis of the earth, or make with the horizon an angle equal to the latitude of the place. When the dial has been regulated at the place selected a datum point is made there. It is more convenient to fix a very horizontal shelf on three screws, or to cause the dial to abut against a piece of wood worked into the form of a square, which shall mark the angle that the apparatus makes with the line of the window. We shall always be certain then to put the dial in the same place. By this regulator watches may then be set with all security. Since the invention of clockwork solar instruments have possessed no utility, except as regulators, on condition that they were instruments of precision. The exact hour, since the existence of railways, has become a social necessity.

This system of sun dial, when made of iron, is especially adapted for public uses in temperate regions. For such purposes it is only necessary to fix the base of the dial against a wall, point downward, and turn up the figures. Thus, a sun dial of 1.3 meters diameter, fixed at 3 or 4 meters above the ground, would carry divisions spaced 6 millimeters apart, which would make them perfectly visible. It would present every guarantee of precision, solidity, and durability. If the principal divisions were either hollowed out or formed in relief it would be easy to reprint the instrument. At the side of it there might be placed a table of corrections.

### A NAVAL EXHIBITION.

From the 10th to the 20th of April last there was held at the Agricultural Hall, London, a naval and submarine exhibition such as has probably never before been seen in any other country for extent and completeness. England is admitted to be the dominant power on the sea, and her great maritime industry is the most national of all industries. Of merchant steamers alone England possesses nearly 30,000, valued at \$442,500,000, while the cost of the 10,000 sailing ships carrying the English flag is \$200,000,000. Scarcely one of these ships was built on foreign soil. It is thought that at least one million of persons are interested in the building, maintenance and navigation of this vast fleet of vessels. With such resources to draw from it was an easy matter to hold a naval exhibition in London. During the ten days of its existence it was visited by more than 60,000 people. In the centre of the hall was a diving tank in which apparatus for the raising of wrecks and the saving of life at sea was tested and discussed. The appliances of this class in the exhibition were especially numerous. They comprised life-belts, floating decks, "unsinkable" ships, cork mattresses, air pillows, inflatable petticoats, and many inventions which sea-dogs of the Captain Cuttle school would, without hesitation, have denounced as "fiddle-faddles." There were means of curing a ship of all the complaints to which it may be subject; chains and weights to keep it from heeling over, and to right it again, even when thrown on its beam ends; arrangements to prevent its sagging; and patent railways to remove it from place to place. All the details of a vessel, it seemed, were the objects of inventive skill. Patent scuttles, scuppers, steam whistles, fog horns, rudders, rowlocks, boat lowering apparatus, steering gear, lamps, hammocks, pumps, anchors, cranes, capstans, winches, and similar paraphernalia have been the subjects of recent improvements, which, even if not always needed, yet prove how great is the mental activity in the shipbuilding world, which seems as little disposed to stagnate as the waves which it rules.

To know what an exhibition does not contain is quite as interesting as, and often much more useful than, a knowledge of its minutest details. There were limitations even to the collection, large though it was, under notice. One of the objects asked for but not forthcoming was an automatic lifting apparatus, by means of which all kinds of coal might be "grabbed" or scooped up, shipped, or unshipped, in a way similar to that in which grain is transported. The system now in vogue of "whipping" coal, under which a large staff of laborers must be employed to fill baskets and other receptacles with a spade, which are then drawn up by a steam crane, is altogether too slow and costly for modern requirements. The apparatus required is one which shall take up swiftly and cleanly, and carry without loss, a mixture of slack and large and small pieces of coal. Another class, although of less practical importance, in which there were no exhibits, was that of submarine vessels, such as Mr. Ericsson invented a few years ago. It was thought at that time that much use might be made of them in launching torpedoes against an enemy's fleet, and in passing from one shore to another unexposed to the most violent storms which might disturb the ocean's surface. A third need is connected with boilers for launches, of which there were but very few shown. These are open to much improvement, both in shape and in the position occupied by them in the limited hold of launches. The various stages of construction, and the relative values of steel and iron for shipbuilding, were also unrepresented.

Thoroughly complete, on the other hand, were the series of exhibits relating to diving, dredging, marine engines, steam steering gear, propulsion, life saving apparatus, boat lowering, pumping, rigging and refrigerating. There was also a fine collection of models, of the latest patterns of merchant steamers and men-of-war, lent by the Lords of the Admiralty and by the leading shipbuilding firms. Among these were the *Servia*, a new Cunarder, long and narrow as an eel, the proportion between breadth of beam and length of keel being so great that Captain Bedford Pim would stand aghast at it. The models of the *Devastation* and of the *Belleisle*—the latest types of ironclad and turret vessels—were inspected with much interest. Under the category of curiosities must be noted a model of the Eddystone Lighthouse, and, perhaps, a steam whistle, which sounded in all the notes of the musical scale, while as a somewhat novel feature was a lecture room in which exhibitors described their inventions, and well known scientific men lectured on points of technical interest.—*Industrial News.*