Aluminum.

J. Morris, of Uddington, near Glasgow (German patent No. 22,150, August 30, 1882) claims to obtain *aluminum by treating an intimate mixture af alumina and charcoal with carbon dioxide.* For this purpose a solution of aluminum chloride is mixed with powdered wood, charcoal, and lamp black, then evaporated, until it forms a viscous mass, which is shaped into balls. During the evaporation hydrochloric acid is given off. The residue consists of alumina intimately mixed with charcoal. The balls are dried, then treated with steam in appropriate vessels for the purpose of driving off all the chlorine, care being taken to keep the temperature so high that the steam is not condensed. Now the temperature is raised, so that in the dark the tubes are seen to be at low red, and dry carbon dioxide then passed through. This is said to be reduced by the charcoal to carbon monoxide, which now, as affirmed by Morris, reduces the alumina to aluminium.

Although the quantity of the escaping carbon monoxide is in general a good indication of the progress of the reduction, it is nevertheless advisable not to continue the heating of the tubes or vessels until the evolution of this gas has ceased or even nearly ceased, as, in consequence of slight differences in the consistence of the balls, some of them give up all their carbon sooner than the others. The treatment of the balls with carbon dioxide for the purpose of the reduction lasts about 30 hours, when the substances are mixed in the proportions of 5 parts carbon to 4 parts alumina.

As Morris states, further, the metal appears as a porous, spongy mass. It is freed from the residual alumina and particles of charcoal by fusion and mechanical treatment, and then poured into moulds.—*Dingler's Polytechnisches Journal*, 249, 86; *Amer. Chem. Jour.*

New Test for Oxygen Eliminated by Plants and Animals.

Engelmann has devised the following ingenious test for oxygen, which is described in *Wiedemann's Annalen.* It depends on the fact that the bacteria of putrefaction do not move except where free oxygen is present, and, when the oxygen grows scarce, they collect in those places where there is still some free oxygen, as in air bubbles, etc.

The advantages of the bacterial method employed by Engelmann for investigating plant assimilation consist chiefly in this, that it enables him to detect the smallest trace of oxygen to the trillionth part of a milligramme, and at the same time to determine with microscopic accuracy the places where the oxygen is given off.

He found that only those cells which contain chlorophyl give out oxygen, and that only in the light. The action of light is strictly local; it begins the moment that light strikes it, and seems to cease instantly when darkness comes on.

BUTTER BOX.

The butter box herewith illustrated is of the knock down class, adapted for the economical transportation of food products and other merchandise. The ends of the box are of the same length as the bottom, and the sides have a length equal to that of the bottom and the thickness of the two ends. The parts are hinged so that the ends and sides fold up against the edges of the bottom into vertical positions. The ends and sides are made narrower than the full outside height of the body of the box, so that the staples and screw eyes which hinge the parts together may have a secure fastening

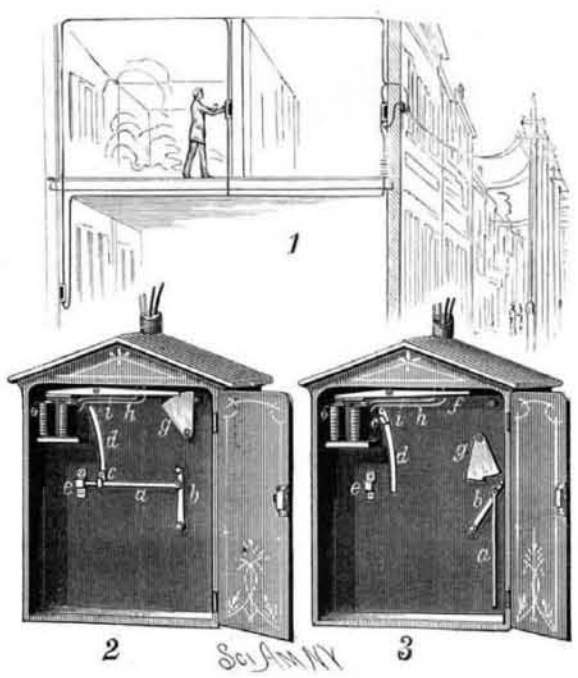
SWEATT'S BUTTER BOX.

in the edges. By this arrangement the boxes may be packed closely upon and against each other. The cover is large enough to fully overlap the upper edges of the sides, a thin strip of metal overlapping the sides and ends, as shown in Fig. 2, thus holding the parts of the box firmly against the butter. In using the box it is set in a suitable square frame whose upper edges are provided with turn buttons, which press against the sides and ends of the box and resist the outward thrust of packing. Before removing from the frame the cover is placed on.

This invention has been patented by Mr. Atherton Sweatt, of Webster, N. H.

ELECTRIC FIRE ALARM.

The method of sending an alarm of fire by means of the ordinary fire alarm telegraph consists in unlocking the door of the alarm box and pulling down the hook against the pressure of an opposing spring, so that when the hook is released it is carried upward and the mechanism connected with it sends the box number to the stations. The alarm box represented in the engravings is of the usual well known construction, and is provided with the hook, *c*, projecting through the slot, *d*, in the front plate, which conceals the mechanism and supports the several parts. Fig. 2 represents the apparatus before the alarm is given, and Fig. 3 the position of the parts after. The hook, *c*, is held down by the bolt, *a*, in readiness to rise at any time when released by the



FINCH'S ELECTRIC FIRE ALARM.

withdrawal of the bolt. One end of the bolt is joined to an arm, *b*, pivoted to the plate, and having its upper end within the path of the pivoted drop weight, *g*. The free end of the bolt passes above the hook, *c*, into a socket secured to the plate. The free end of the drop weight, *g*, is notched to engage a detent lever, *f*, pivoted to the plate, and carrying at one end an armature which is within the influence of an electro magnet placed in the circuit, *i h*, which also includes a battery and push buttons located at convenient points in the building. By preference the push buttons are in locked boxes, the keys being accessible to persons authorized to use them. The passage of an electric current draws the armature of the lever down, relieving the weight, *g*, which swings down, striking the bar, *b*, pulling out the bolt, *a*, thus allowing the hook, *c*, to rise. The alarm may be sent by withdrawing the bolt, *a*, by hand.

This invention has been patented by Mr. R. S. Finch, of 572 W. Seventh Street, Cincinnati, Ohio, and at the Eleventh Industrial Exposition in the above city was awarded first premium medal and a certificate for conspicuous merit.

Wasteful Use of Water.

Mr. Thomas J. Bell, Assistant Superintendent of the Cincinnati (Ohio) Water Works, in the course of a paper written by him upon "The Wastage of Water," gives the following table as representing the daily per capita consumption in five American cities, and claims, with perfect truth, that the great increase of rate is to be charged directly to waste instead of necessity:

Boston, per capita rate in 1850, 30 gallons; in 1881, 92 gallons.

Brooklyn, per capita rate in 1866, 17 gallons; in 1880, 54 gallons.

Chicago, per capita rate in 1867, 43 gallons; in 1880, 114 gallons.

New York, per capita rate in 1867, 62 gallons; in 1876, 100 gallons.

Philadelphia, per capita rate in 1867, 56 gallons; in 1880, 67 gallons.

Cincinnati, per capita rate in 1845, 21 gallons; in 1881, 87 gallons.

New Process Steel.

The *Bulletin du Comité des Forges de France* gives the following statistics of the production of steel by the Thomas-Gilchrist process, during the first six months of the present year:

	Number of furnaces.	Product, tons.
England	1	57,900
France	2	5,960
Belgium	1	12,786
Germany	9	152,479
Austria	3	37,476
Russia	1	12,786
Total	17	279,387

In 1882, 6,500,000 tons of ingots were produced in the whole manufacturing world. As will be seen from the above figures, this process has met with the greatest favor in Austria and Germany; in the former country it prevails in 28 per cent of the steel works, and in the latter in 25 per cent, while it is only adopted in 5 per cent in England.

Another Electric Railway.

On the electric railway lately opened by Lord Spencer, with a large number of eminent scientists, between Portrush and Bushmills, England, the electricity, generated at a waterfall on the river Bush, and conveyed to the end of the line by an underground cable, is carried along through a conducting rail, which is supported on insulators at some distance above the ground. An arm with a brush or pad at the end of it stretches out from the train and keeps contact with this conductor. But on the day when the Lord-Lieutenant came to "inaugurate" the line it was suddenly found that there was a serious hitch. The engine declined to draw the car. The machinery was in perfect order; the connection with the conductor was all right, and yet there was no motion. Horror filled the souls of the public spirited promoters of the first electric line in the United Kingdom. It was discovered, happily before much time had been lost, that somebody had rendered progress impossible by the simple expedient of driving a piece of iron from the electric rail into the bank at the side, so that the current was being absorbed into the earth as fast as it was transmitted from the Bush. The iron being removed, the invited party made a successful trip.

Uninflammable Paper and Wood.

Dr. Winkelmann, of Augsburg, impregnates wood and articles made of paper with a solution of 33 parts of chloride of manganese, 20 parts of orthophosphoric acid, 12 parts of magnesium carbonate, 10 parts of boracic acid, and 25 parts of chloride of ammonium in 1,000 parts of water.

Wood must be exposed to the solution for six or eight hours at the temperature of boiling water, or have the solution forced into it under pneumatic pressure. A solution of the above composition is easily distributed through the mass of the wood, and incrusts the cells with pyrophosphate of manganese and magnesium, and borate of magnesium, which are insoluble double salts. The chloride of ammonium serves as vehicle to keep the phosphates in solution.

Articles made of paper, like paper hangings, are coated with or soaked in the solution after it has been boiled.

Wood and paper saturated with these salts are uninflammable even when exposed to an intense heat.—*Chem. Zeit.*

CHURN.

The churn which the accompanying engraving illustrates has been patented by Mr. Henry Hays, of Bridgeport, California. The cream box is cylindrical, and has its inner surface serrated or grooved longitudinally as shown in the sectional drawing, and at one end is provided with a projecting pintle fitting in an aperture in a standard secured to a base. The other end of the cylinder is furnished with an aperture that can be closed by a flanged cover. The pintle at this end is threaded, and passing through the cover is secured to a cross piece resting against the inner surface of the head from which two clips project in opposite directions, and under the clips the cross piece passes as shown in the small engraving. The cover is pressed against the outer surface by the winged nut of the pintle, a packing strip having been inserted between the head and cover. The threaded end of the pintle is adapted to be screwed into the end of a shaft which is journaled in a standard, and is provided with a pulley when

HAYS' IMPROVED CHURN.

power is to be applied, and with a crank for hand work. A supporting frame, having its upper edges recessed so that the cream box fits against them, rests upon the base. After the pintle has been screwed into position, a latch arm on the standard drops into an annular groove on the shaft, thus preventing further longitudinal movement. When the cream box has been filled, the supporting frame is moved one side, when it is lowered and freed from the box, as it is provided on its bottom with beveled tenons sliding in longitudinal grooves in the top of the base.

A washing machine can be constructed according to the same principle.