

latter is then reamed out until about one quarter inch less in diameter than it is intended to be ultimately. The gun being firmly secured, a series of conical plugs of hard steel are forced through it by hydraulic pressure, compressing the metal about the bore and rendering it, as proved by extended experiment, stronger, harder, and much more elastic. General Uchatius of the Austrian Army, the reputed inventor of this process, has been experimenting upon it since September, 1873, but his claims as to origination are opposed by those of Colonel Rosset of the Italian, and Colonel Narroff of the Russian, army, both of whom state that they also separately conceived the idea of thus treating bronze guns as early as the year above mentioned.

The results which have been reached in testing guns of steel bronze, some of which have withstood the firing of 3,000 rounds without any diminution of accuracy of fire or deterioration in any other respect, prove the invention to be of more than ordinary importance. This fact is certainly well recognized by the Austrian government, which, as already stated in a previous article, has ordered a large number of batteries to be made of the improved metal. Consequently it is all the more gratifying to Americans to learn that the so-called steel bronze is neither an Austrian, an Italian, nor a Russian invention, but one created by Samuel B. Dean, of Boston, Mass., and patented by him in this country and in England in 1869. Mr. Dean's claim is, "as a new manufacture, a bronze gun in which the metal immediately surrounding the bore is put in the condition by the process of condensation set forth," which process we need not here recapitulate, since it is identically the same as that described in the first paragraph of this article, and now asserted to be theirs by Uchatius, Rosset, and Narroff.

It appears further, and the fact may not be so gratifying to Americans as that just mentioned, that Mr. Dean patented his invention in Austria in 1869. Three years later a general in the Austrian army comes out with precisely the same idea, and is backed up in its ownership by Austrian authorities, who reward his alleged discovery by permitting him to sell out rights for certain countries, other than the great powers of Europe.

Colonel Laidley of the U. S. Ordnance, to whose suggestion we are indebted for reference to Mr. Dean's patent, states that the records of the U. S. Ordnance Office show that an order was given in July, 1870, for a number of these guns, but that, through lack of funds, the same was countermanded. We agree with the above named officer in the hope that the next Congress will make a suitable appropriation for the introduction of Mr. Dean's invention into our service.

DEATH IN THE NURSING BOTTLE.

In a city like ours where the death rate at the present season averages seven to eight hundred per week, mostly children, every humane person feels the necessity of increased vigilance to combat every evil which tends to increase "the slaughter of the innocents." High temperature is one of the causes which we are powerless to combat. Dirty streets and filthy houses we must leave to the Board of Health. Poverty of the parents, which prevents their providing suitable food and medicine for their little ones, is another cause of our great infantile mortality, against which we can and ought to do something. But ignorance is another cause, too often overlooked, against which we are not powerless if we organize for action. The daily papers warn old and young against the dangers of unripe fruit and stale watermelons; but people will indulge, and we must allow the American citizen, however young, to exercise his inalienable right to take his own life in this way.

But there is another prolific source of infant mortality to which we wish now to direct special attention, namely, the patent nursing bottle. It consists of a rubber tube, one end of which is held in the child's mouth; the other end, passing through a cork, is attached to a glass rod which descends to the bottom of a bottle of so-called milk. We might write a column on the dangers that reside in the milk, unless special care has been taken to obtain it fresh or by suitably diluting pure condensed milk. But this danger is well known, and our business at present is with the bottle, or rather its dirty tube, which should never be used more than once, then thrown away and a new one bought.

Even when new, these white tubes, impregnated as they are with oxide of zinc, are not unobjectionable; far worse are they when saturated with sour milk, germs of putrefaction, decay, and disease. Some of these child-murdering Yankee inventions have reached Berlin, and have called forth the following from a practising physician of that city:

"The supposed advantage of these bottles consists in this, that they can be placed beside the infant in bed, while other bottles must be held in the hand all the time. What sensible mother or nurse would leave a child with a bottle with out watching it? The danger of the bottle consists in this, that it is absolutely impossible to cleanse it. When sucked on, little particles of milk become attached to the tube and cork; these curdle and soon turn sour. If some of this deposit be placed under a microscope, we see innumerable bacteria, organic beings which indicate decomposition and decay. At every meal the child draws in thousands of these germs. The decomposing process acts upon what it finds in the mouth, cesophagus, and stomach; and the result is diarrhea, cholera infantum, etc. I will here expressly remark that the usual method of placing the apparatus in water, or merely rinsing it out with a stream of water, is in no way sufficient. Some dealers sell a suitable little wire brush with the bottle, but even this does not answer the purpose, for the apparatus is not clean by a long way after drawing

the brush through it several times; and who will take the trouble to clean it so thoroughly 8 or 10 times a day? How much time it would require! Another disadvantage is that the bottle is airtight, and a partial vacuum is formed, which renders sucking so difficult as to exhaust the child, and it stops before its hunger is satisfied. Hence, parents, ye who are compelled to feed your children with a bottle, throw away this apparatus, which can only bring destruction upon your children, and either select a bottle with glass mouthpiece, which is filled from below, or take a large rubber mouth-piece, which is perforated by a small hole and can be drawn directly over the neck of the glass bottle. This large mouth-piece or nipple can readily be turned inside out and thoroughly cleaned and rubbed with dry salt."

CLOUDS AS STORM SIGNALS.

It is commonly believed that the barometer is an infallible indicator of weather changes. Practical meteorologists know that its merits fall far short of its popular reputation, though as an indicator of variations of atmospheric pressure it is the main dependence of isolated observers—especially mariners and travelers—in estimating the probabilities of wind and weather.

In his newly published work on storms, Blasius questions even this limited usefulness of the barometer, and insists that observers, particularly navigators, will find a far better guide and counsellor for safety in the forms of the clouds, which not only foretell approaching storms much earlier than the barometer, but show at the same time the observer's position in regard to them, and how their dangers can be best escaped.

Mr. Blasius enters the field of meteorological discussion with a theory of his own, and boldly pronounces the accepted theories of storm-formation incorrect, because based on a part only of the facts involved. Both the leading theories of storm development and movement—the rotary or cyclone, and the inblowing or centripetal—are misleading, he claims, for two reasons: first, in that they make an exceptional form, the tornado, the type of all storms; second, because they are based on partial observation even of that. Observations of the same storm are thus made to support two directly contrary theories, the error of both consisting in the taking of part of the storm, and each a different part, as representative of the whole, and holding that the action of storms is of the same nature at its beginning and throughout its entire course.

From the unequal distribution of the temperature of the air, and the varying effect of the sun's heat upon it, there arise, first, currents caused by a tendency to re-establish, in a perpendicular direction from the earth's surface, both upward and downward, an equilibrium which has been disturbed; second, currents caused by a tendency to re-establish, in a horizontal direction from the equator to the poles and from the poles to the equator, an equilibrium which has been disturbed. From the movements and conflicts of these currents, modified by the configuration of the ground in certain cases, storms arise; and according to Mr. Blasius, every sort of storm has its representative cloud formation, which gives timely notice of approaching danger.

In accordance with these views storms are divided into the following classes: (1) Local or vertical storms produced by the rushing in or inblowing of the atmosphere to re-establish in a vertical direction an equilibrium which has been disturbed. In our latitude, the summer shower is an example of this sort of storm. Its characteristic cloud is the *cumulus*.

(2) Progressive or lateral storms in which the equilibrium is re-established in a lateral direction. These storms are of two kinds: (a) Equatorial or northerly winter storms, produced by a warm current displacing a cool one to supply a deficiency toward the pole; temperature, changing from cool to warm; characteristic cloud, *stratus*. (b) Polar or southerly summer storms, produced by a cool current displacing a warm one to supply a deficiency toward the equator; temperature, changing from warm to cool; characteristic cloud, *cumulo-stratus*.

(3) Diagonal storms—tornadoes, hailstorms, sand storms, waterspouts, etc.—produced by an atmospheric effort to re-establish the equilibrium of a polar storm which has been disturbed in the plane of meeting by a peculiar configuration of the ground: direction, the diagonal of the forces of the two opposing currents transversely through the polar storm; characteristic cloud, *conus*, heretofore known simply as the tornado cloud.

It is in the first described storms that the barometer is chiefly of use as a predictor, especially in the torrid zone, where they attain very great dimensions. In the temperate zones they are of less importance, and cannot be long foreseen by the clouds.

In the next class, the barometer is of less advantage, the clouds indicating the approach of such storms from half a day to a whole day before the meteorological instruments begin to show any change. These storms generally come from the northeast, and report themselves in advance by means of hazy stripes of stratus cloud above the southern horizon.

Of still less use is the barometer in foretelling the polar, southeast, and southwest storms of summer; for in those which are most violent and destructive, the worst is over before the barometer begins to fall. It is from these that tornadoes originate. They do not send their warning clouds so far in advance as the northeast storms, but, on the other hand, they do not extend over so large a territory, and travel much more slowly, especially when about to become destructive. Their cloud sign is a long bank of round black clouds along the northern or northwestern horizon. If rightly in-

terpreted, these not only indicate the approach of the storm early enough for safety, but also tell which way to sail to avoid them. They can generally be seen from one to eight hours before the middle of the storm arrives; and the more violent the storm, the slower its approach.

The loco-progressive or diagonal storm is an offspring of the foregoing, but differs totally from the other kinds of storms in origin, motion, and appearance. Its area is the smallest and its effects the greatest of all. It arises at the culmination of the southeast storm, that is, where the polar current balances the equatorial, and the region of conflict has become nearly or quite stationary. If any local advantage is given to either current by the configuration of the ground at this stage, a whirl or eddy may be produced and a rotary storm generated, traveling in the diagonal of the forces of the two currents through the region of calm between them, its course delineated by a long black bank of cloud. Its first sign is a rotating disk of cloud, darker than ordinary, formed by the sudden and profuse condensation of the moisture contained in the air of the equatorial current, which is suddenly thrown into higher and colder regions.

The art of cloud-reading, Mr. Blasius is good enough to say, is easily learned. The best time to begin the study is in midwinter, when the irregularities of the earth's surface are partially obliterated by the snow, and when the horizontal air currents which produce the progressive storms and their registering clouds are less disturbed by upward currents. "The experience gained in the repeated forward and backward oscillations of these currents will prepare the student for the more complicated influences and effects which the vertically rising currents, the originators of local storms, bring into consideration as the season advances. A year's observation will acquaint him with the cycle of phenomena and make him a reliable weather prophet, at least for everyday purposes"—presuming, of course, that he has taken pains beforehand to learn the significance of elementary cloud changes, as indicators of the direction and character of aerial currents and conflicts.

SCIENTIFIC AND PRACTICAL INFORMATION.

A NEW EMERALD GREEN.

Any pigment which approaches in beauty the fearfully poisonous Paris green certainly deserves attention. One of these is said to be an hydrated oxide of chromium, prepared in a peculiar manner and known as Guignet's green. We doubt the statement that it is not poisonous; but it is, at all events, far more harmless than Paris green, or any other arsenical color. It is prepared on a large scale by fusing together, on the hearth of a suitably constructed flame furnace, at a dark red heat, 8 parts boracic acid to 1 part bichromate of potash. The mass swells up, much oxygen gas is evolved, and the substance is finally converted into a beautiful green double salt, a borate of chromium and potash. By repeated washing with boiling water, it is decomposed with hydrated oxide of chromium and a soluble borate of potash. After suitable washing and very fine grinding, this oxide of chromium has a most beautiful shade of color, covers well, stands the air and light, and is only attacked by boiling concentrated acids. On a small scale, this green pigment may be prepared in a porcelain crucible.

VANILLA AS A WASTE PRODUCT IN THE MANUFACTURE OF PAPER.

We take the following interesting suggestion from a recent number of *Dingler's Journal*: In the preparation of wood pulp for paper, fine wood is treated to a solution of caustic soda under high pressure in iron boilers. After the operation the solution contains the soda salts of resinic acid, humic acid, and carbonic acid, and some other resinous bodies. In this solution the soda salt of vanilla must also be present, if it has not been destroyed by the high pressure and temperature. The presence of this body is indicated by the intense vanilla odor which always appears on treating the above liquor with acids and allowing it to stand a few days. The writer above referred to has not yet succeeded in obtaining crystals of vanillin, and hence does not describe his process in full. If any of our readers possess sufficient quantities of this lye to experiment upon, we have strong hopes that their labors will be rewarded with better success than those of our German friend, and that America will one day boast of a vanillin factory.

ALUMINUM.

According to Winkler there are at present four aluminum manufactories, which produce about 35 cwt. per annum. Of this quantity 20 cwt. goes to France and 15 to England. Aluminum is also made in Berlin. The price for a number of years has been \$12 to \$15 per lb. It is not probable that it will be produced cheaper than that. This fact, with its unchangeability and lightness, being 3 times lighter than copper, 4 times lighter than silver, and 7 or 8 times lighter than gold, render it excellently adapted to coin, especially as it is easily coined.

Kansas City Industrial and Agricultural Fair.

It is intended to hold a fair at Kansas City, Mo., to be open from September 13 to September 18, both inclusive. An unusual interest is being taken in this meeting, as the Kansas State Fair will not be held this year, and the exposition at Kansas City will be the only one held in Missouri, west of St. Louis. Liberal awards of diplomas and gold, and silver, and bronze medals for merit in all classes of articles will be made; and proper arrangements for the care of machinery, etc., have been perfected. Further particulars will be found in our advertising columns.