

once ready for any unexpected requirement; whereas a gold leaf electroscope long unused requires to be dried for hours.

4. It works perfectly, whatever the hygrometric state of the atmosphere.

5. It can be employed to show electric phenomena to a numerous auditory. With long, thin fibers and highly electrified bodies, the experiments are very telling.—*Bulletin de l'Association Scientifique de France.*

A Tribute to the Past.

The re-survey of the southern boundary of New York furnishes evidence of most commendable accuracy on the part of Mr. David Rittenhouse, who surveyed the first line nearly a century ago. At the request of the Boundary Commission the new survey was undertaken by two assistants of the United States Coast Survey, Professor Edwin Smith, in charge of the astronomical part, and Mr. J. B. Baylor, in charge of field operations. The exact geographical positions of four points on the line between New York and Pennsylvania were established.

To accomplish this the following observations were made: First, at Station Travis, eastern extremity of the boundary, for latitude, thirty-seven observations of ten pairs of stars on five nights; for longitude, forty-five observations of twenty pairs of stars on four nights; for time, signals were exchanged with Washington on three nights. Second, at Station Clarke, one mile east of the western extremity of the boundary, forty-three observations of ten pairs of stars on five nights were made for latitude; and one set of observations of Polaris for value of micrometer. Third, at Station Burt, south of Wellsburg, New York, for latitude, fifty-one observations of fifteen pairs of stars were made on six nights; for longitude, fifty observations of twenty-three pairs on seven nights. For time, signals were exchanged with Washington on two nights. Fourth, at Station Finn, near Great Bend, Pennsylvania, forty-seven observations of twelve pairs of stars on five nights were made for latitude; one set of observations of Polaris for value of micrometer; for longitude, fifty observations of thirty-four stars on five nights. For time, signals were exchanged with Washington on four nights.

The reduction of these observations was made in the Office of the Coast Survey. The results showed the 42d parallel to be about 300 feet south of the present boundary at Station Travis; about 125 feet south, at Station Clarke; about 800 feet south, at Station Burt; and about 350 feet north of the present boundary at Station Finn.

Award of Prizes.—Paris Academy of Sciences.

The Academy at its annual meeting, January 28, 1878, made the following awards:

The two great prizes in mathematics and physics were not awarded this year.

In mechanics, the Poncelet prize was awarded to M. Laguerre for his mathematical works; the Montyon prize to M. Caspari for his work on chronometers; the Plumey prize to M. Freminville for his improvements in steam engines; the Fourneyron prize to M. Mallet for his tramway engine.

In astronomy, the Lalande prize was given to Professor Asaph Hall, of Washington, D. C., the discoverer of the satellites of Mars; the Vaillant prize to M. Schuloff for his method of detecting the small planets; the Valz prizes to MM. Paul and Prosper Henry for their star maps.

In physics, the Lacaze prize was awarded to M. A. Cornu for his researches on the determination of the rate of light.

In botany, the Barbier prize was divided between M. Galippe for his toxicological studies on cantharides, MM. Le-page and Patrouillard for their services to medicine and pharmacy, and M. Manouvriez for various physiological researches. The Desmazières prize was divided in part between Dr. Quélet for his work on the fungi of the Jura and the Vosges, and M. Bagnis for his memoir on the puccinia. From the Bordin prize an encouragement of 1,000 francs was awarded to M. Charles Eugène Bertram for his work on the lycopodiaceæ; another Bordin prize was awarded to the same botanist for his work in connection with angiosperms and gymnosperms.

In chemistry, the Jecker prize was awarded to M. A. Houzeau for his researches on the production of ozone; the Lacaze prize to M. Troost for his many valuable chemical researches.

In anatomy and physiology, the Shore prize was awarded to M. Jousset de Bellesme for his researches on the physiology of insects.

Among prizes in medicine and surgery, one of 2,500 francs was given to Professor Hannover, of Copenhagen, for his work on the retina of man and the vertebrates; and 1,500 francs to Dr. Topinard for his work on anthropology.

In physiology, the Montyon prize was divided between Professor Ferrier and MM. Carville and Duret. The Lacaze prize was given to M. Dareste for his researches on the artificial production of monstrosities.

CHESTNUTS.—The chestnut forms the chief food of the poor population of the central plateau of France and Corsica. The production in 1874 amounted to over 14,000,000 lbs. Improved by cultivation, rendered larger and regularly round by its solitary development in the involucre, it is known as the marron, of which there are a great number of varieties, which are obtained by grafting on the common chestnut.

THE EYES OF REPTILES AND FISHES.

In examining the eyes of reptiles, the first thing that strikes us is their fixidity. The muscles which, in the higher vertebrates, direct the eye-ball and give it its wonderful mobility, are but little developed in the majority of reptiles. Their eyelids, too, are slow of movement. Crocodiles and tortoises, like birds, have three. In frogs and toads, the first two eyelids are but slightly developed; the third (which is the one called the "winking membrane" in birds) is the only one of any real use to the animal.

Lizards have, so to speak, but a single eyelid, pierced through its center by a slit, which the animal can enlarge at pleasure. In the eye of the chameleon this slit is so small that only the pupil can be seen. Serpents have no eyelids at all; their eyes are simply covered with a dry, transparent

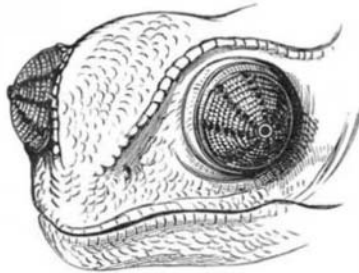


Fig. 1.—Eyes of Chameleon.

skin. In the majority of cases the iris of the reptilian eye is of a beautiful golden yellow. In the eyes of the crocodile the pupil is linear, as in those of the cat; in frogs it is lozenge-shaped; in tortoises, lizards, and the chameleon it is round. The eyes of the last mentioned animal are worthy of a moment's attention. They consist of large globes protruding from beneath a skin which covers them entirely, up to the edge of the pupil (Fig. 1). These reptiles possess the singular faculty of directing their eyes in different directions at the same time; one eye, for instance, looking upwards while the other is looking downwards.

It is a well known fact that chameleons change their color to assume, very often, that of the object upon which they may chance to be resting. This extraordinary power (like-wise the property of some other reptiles and a few fishes, but in a lesser degree) was known as long ago as the time of Aristotle. Some experiments made not very long ago by M. Pouchet show that the eyes are the prime mover in this change of color. The experimenter, having removed the eyes from chameleons, and also from certain fishes that shared with them the faculty of changing color, found that the animals became entirely black, and did not again quit this hue. More recently still, an eminent young scientist, M. Paul Bert, has by his investigations rendered those of M. Pouchet more complete in demonstrating that, although the eyes are the first inciters to the change of color, yet the nervous system is also an essential agent of this phenomenon. M. Bert having severed the nerves that vitalized certain members of the chameleon, these parts of the animal became black and remained so. In the eyes of fishes, as in those of serpents, the eyelids are replaced by a transparent skin, which hangs down in front of the cornea and adheres to it. This absence of eyelids, however, is not common to all fishes, for the shark possesses them, and the ray displays the rudiments of a "winking membrane."

The pupil of a fish's eye is nearly contractile; its crystalline lens is spherical, a form which we know to be necessary to permit of perfect sight in water. The transparent ball which constitutes this lens (Fig. 2, *f*) is applied directly against the iris in front, and is separated by a small space only from the retina. The result is that the eyes of these animals, instead of being spherical, as in the mammalia, have a flattened form; and they are often retained in this shape by a circle, either cartilaginous or bony, contained in the sclerotic coat.

There are also several fishes which have eyes mounted on a bony pedicel, thus giving them great power of resistance against exterior violence, and at the same time great mobility. There is a fish which, at first sight, seems to be endowed with four eyes. It is called *Anableps*, and is found in the river Surinam, in Guiana. Were these four eyes really distinct (Fig. 3), a like anomaly would upset one of

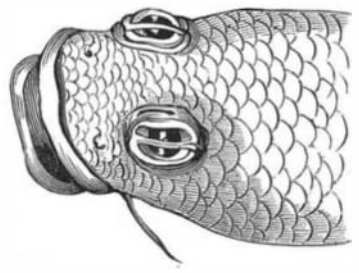


Fig. 3.—Eyes of Anableps.

the most constant laws of zoölogy. But a close examination shows that the two eyes, which are on either side of the head, although exhibiting, each one, distinct corneas and pupils, have but a single crystalline lens and retina in common, and form, in fact, but a single eye with a double pupil and cornea.

It has been remarked that vagrant fishes have keener vision than those which never quit their native shores; and those that inhabit muddy places have eyes that are very imperfect, and sometimes even none at all. Such are the *myxine* and *apterichte*, described by Dumeril. These fishes are absolutely blind, yet they have preserved the rudiments of eyes in the form of black spots hidden under the skin, as if to indicate simply the place where eyes should have been.

New Inventions.

A Pocket Book Frame, patented by Messrs. D. M. Read and Louis Prahar, of New York city, is designed to prevent the escape of small coins. This is effected by the combination of a detachable cap plate with one side of the frame, together with a catch and bolt suitably arranged.

Mr. E. P. Cowan, of Germantown, Pa., has invented a Combined Shawl Strap and Head Rest for travelers' use. The head rest forms the handle of the shawl strap, and the various parts are compactly arranged, so that the combination is convenient for either purpose.

A Tuning Pin for Pianos, invented by Mr. John Lautenschlager, of Ashland, Ky., consists of two parts, a main and an auxiliary pin, to which each string is applied, the auxiliary pin taking up a part of the strain and retaining the main pin rigidly in position.

Mr. J. C. Moss, of New York city, has invented a Ruling Instrument, which consists of a pen and graver guide and support, provided with an adjustable spacing device, so that the pen or graver guided by it produces parallel or converging lines with regular or graduated intervening spaces.

Mr. John Dawson, of Williamsburg, N. Y., has patented an improved Commode Chair, which may also be used as an ordinary chair when required.

An improved Scarf has been invented by Mr. C. W. Lyford, of Brooklyn, N. Y. Its novelty consists in a double shield cover, each part being separately attached, so that when one of the covers becomes worn it may be removed, so as to expose the unused one. Thus the part subject to the greatest wear may be readily renewed.

An improved Fruit Jar has been patented by Mr. G. W. Gomber, of Sybertsville, Pa. The fastening consists of a bail secured by a ring-shaped portion to a neck and button of the glass cover, and fastened by the bent ends or lips of the bails to inclined edges or rims on the neck of the jar. The bail is made of two parts, which encircle the neck of the button, and are soldered together at both sides of it, so as to be retained in connection.

A Duster Coat invented by Mr. A. P. Silva, of Elmira, N. Y., has a covering vest, which may be closed over the common vest and shirt or folded back and attached to interior buttons of the duster. The sleeves are provided with wristbands or guards to protect the cuffs.

Mr. C. C. Kribs, of Trempealeau, Wis., has invented an improved Coffee Pot, which consists in the combination, with a vessel of the usual shape, of a water circulator and a perforated coffee receptacle, the circulator consisting of two or more upright pipes fixed on a base plate or false bottom and bent downward at their upper ends, and the receptacle being suspended between these pipes on hooks attached to them.

A Spring Rocking Chair invented by Mr. John Krapp, of Brooklyn, N. Y., has elliptic springs, and otherwise differs from the many chairs of similar nature lately patented, in the mode of arrangement of the oscillating and stop devices, the design of the inventor being to keep the strain always at right angles to the springs.

In a Lantern devised by Mr. C. W. Colony, of Sandy Creek, N. Y., the globe is raised and retained by a notched bail, and is held closed by a spiral spring when the bail is unlocked.

Mr. John Fox, of New York city, has invented a Postage Stamp which is applied to letters and canceled in the same way as ordinary stamps, but which, it is claimed, cannot be removed, cleaned, and used again after being canceled. The paper of the stamp is cut entirely through, so as to form several distinct pieces, and these parts are united by a backing of tissue paper or some other delicate substance.

A new Sash Fastener has been invented by Messrs. I. N. Wood and Alexander Morton, of Wilmington, Del. The sash has a rack at one side, in connection with an intermeshing pinion upon the casing. The pinion may be locked, engaged, or cleared by a fulcrumed spring pawl, actuated by a cam lever or other means.

An improved Lid for Car Axle Boxes has been recently patented by Messrs. J. E. Meth and W. Lindemann, of Grand Island, Neb. The lid or cap is hinged at the upper edge to the inside of the box, and is acted upon by a spring, to close tightly the opening of the face plate.

Mr. J. N. Coffin, of Biddeford, Me., has invented an improved Bearer for Harness Collars and Breeching. The bearer is formed of a plate and a loop or keeper, cast in one piece, and having a buckle and fastener cast upon the ends of the plate. The fastener is made with a shoulder recessed to receive the end of the sweat leather, and with a slot to receive a piece of leather for the stitches to pass through in sewing the fastener in place.

An invention intended to lessen the dangers of mining has been made by Mr. George Hayes, of Girardville, Pa. It is

an improvement on the ordinary form of Squib used in blasting, and consists in an interior explosive alarm device, which indicates that the squib is doing its work, and thus gives warning that the charge is about to explode.

Mr. James Forsyth, of New York city, has made some improvements in Roller Skates, by which the latter may be guided forward, backward, or diagonally in any direction by tipping the foot, without rocking or oscillating.

A Process of Manufacturing Oil from Organic Substances, such as pitch pine, cotton seed, sassafras, etc., which consists in injecting steam and carbonic acid gas into the retort containing the material and heated to a high temperature, has been invented by Mr. D. M. Buie, of Wilmington, N. C.

A Combination Fuse for Projectiles has been patented by MM. Eduard Rubin and August Fornerod-Stadler, of Thun, Switzerland. The invention consists in the combination of a percussion fuse, which is ignited by the sudden force imparted to the shell at the moment of firing, with a double-graduated ring fuse and a powder chamber. There is also a second percussion fuse which is thrown into action when the shell strikes an object.

Mr. John Cottner, of New York city, has patented an improved Trunk, the lid of which has a hinged receptacle divided by a horizontal partition, a drawer, hat box space, looking glass (hinged and protected by a cushion), a secret jewel receptacle, and a hinged desk, all arranged compactly.

In a new Fire Escape, the invention of Mr. Geo. Kenyon, of Springfield, Ill., the new features are essentially as follows: A hand device is added for operating the brake band of a pulley, upon which the escape rope is reeled, and it consists of a fixed handle, spring, and movable handle, the latter receiving the rings of the brake band. The pulley and brake descend with the person, the upper end of the rope being secured by a spring snap hook to a staple or other support.

A Torpedo for use in oil wells has been invented by Mr. J. J. Boyer, of Lamartine, Pa. It is so constructed as to be capable of being exploded at any desired depth, but not under fluid; and it consists of a torpedo shell or case, with bottom socket for inserting an anchor, solid anvil, and interior guide tube for a weighted drop wire, which is also guided in a top guard of supporting balls. The anvil forms a support for percussion caps, which are exploded by lowering the drop wire.

Mr. S. O. Parker, of Littleton, N. H., has invented a Glove, in which each finger is made in one piece, with the seam on the back.

Mr. G. F. Whitaker, of Hudson, Mass., has invented an improvement in Wagon Tops, which consists in so arranging rear or side doors with spring catches and frames that loss of contents by jarring out, thefts, entrance of insects, dust, etc., may be prevented, at the same time allowing convenient access to the interior, and furnishing a cover for the driver while standing at the door.

A NEW MODE OF DITCHING.

We illustrate herewith a ditching apparatus, which cuts a subterranean flue and also packs the soil around the same so as to convert it into a pipe. Upon the lower end of the branched standard, E, is formed a cylindrical head, through which passes a rod, F. To the forward end of the rod is attached a cutter, G, which is made with wings upon its sides and top, so that it may be drawn easily through the ground. The rear end of this cutter is recessed to receive the cutter, H, which is placed upon the rod, F, between the cutter, G, and the standard, E. The cutter, H, is made slightly conical in form and with spiral corrugations upon its sides, which ribs make about one third of a turn and are formed with sharp edges, so as to cut the soil and press it upward and sidewise as the cutter is revolved by the pressure of the soil. Upon the rod, F, in the rear of the standard, E, is placed the cutter and packer, I. This, for a little more than half its length, is made slightly conical, and is ribbed spirally so as to cut the soil and press it upward and sidewise. The rear part of the cutter and packer, I, is made slightly conical and smooth so as to pack the soil and thus form a flue. To the rear end of the beam, A, is attached a water box, J, from the bottom of which a small tube, K, passes down along the rear edge of the standard, E, and terminates in a sprinkler at the forward end of the cutter and packer, I, to moisten the soil, so as to form an arch or tile out of the soil itself as it is worked and packed.

This device was patented through the Scientific American Patent Agency, April 17, 1877, by Mr. W. W. Snyder, of Martinsville, Ohio.

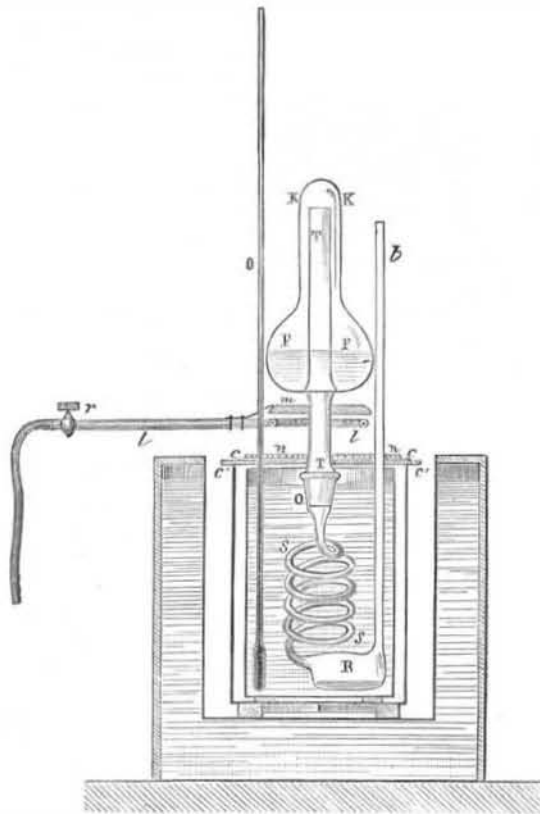
A New Lubricating Material for Belts.

Several correspondents have asked us to name some good material that will serve to prevent belts from slipping, which will be both cheap and efficient. Mr. John D. Parker, agent of the Union Lubricator Manufacturing Company's Lubricator, of No. 6 Haymarket square, Boston, calls our attention to that material, and sends us a testimonial from a

well known millwright, who states that the lubricator renders leather belts soft and pliable and causes them to carry unusual loads without slipping. The writer of this opinion has had large experience, and those of our readers who are troubled with slipping belts may find it to their interest to adopt the same means, which he states he has always used "with complete success."

NEW APPARATUS FOR MEASURING THE VAPORIZING HEAT OF LIQUIDS.

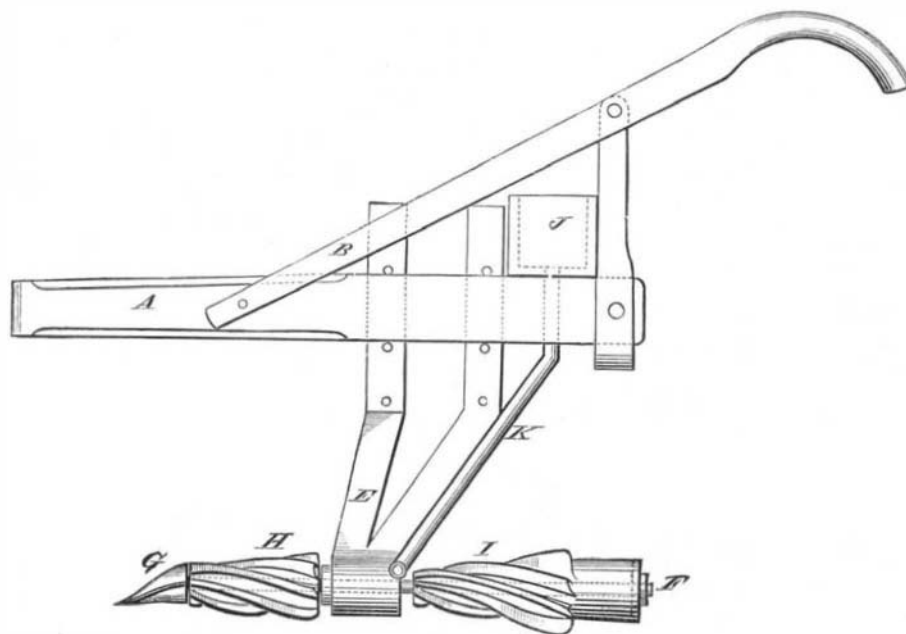
The annexed illustration, from *Les Mondes*, represents a new device by which the total heat given off by a liquid between



LIQUID CALORIMETER.

vaporization and the normal temperature is accurately measured. FF is a flask, the neck, KK, of which is hermetically sealed. Through this passes a vertical tube, T, which extends a few inches below the bottom and connects with a worm, O S S R, which is plunged in a calorimeter. Between the flask and the latter is a thin sheet of pasteboard, c, and a plate of wood, o (serving as screens and pierced for the passage of the tube, T), a piece of wire gauze, n, a circular lamp, l, and the sheet of wire gauze, m.

The flask being previously weighed, first singly and then filled with liquid, and the lamp being lit during the first period of the operation in which the temperature of the liquid is



SNYDER'S DITCHING MACHINE.

elevated, the rise of the calorimetric thermometer, o, is noted. The second period is that of distillation, which lasts from 2 to 4 minutes, determining an elevation of from 3° to 4° C. in the water of the calorimeter. The latter contains some 30 ounces of water, and the weight of liquid volatilized is about 1 ounce. The lamp is then extinguished, the flask removed, cooled, and again weighed, and the exact weight of the vaporized liquid is thus determined.

The movement of the thermometer is meanwhile followed until it becomes regular—that is to say, agreeing with the cooling (previously studied) of the calorimeter, filled simply with the same weight of water at the same temperature. The data are thus obtained for calculating the problem above in-

dicated; the specific heat being known by other trials, the heat of vaporization is readily deduced. Thus, for example, M. Berthelot finds for the total heat ceded by the vapor of water (weight equaling 8.24 grammes, 6.86 grammes, and 7.08 grammes) between 0° and 100° C. (32° and 212° Fah.) the numbers 635.2, 637.2, and 636.2; average, 636.2. Regnault obtains 636.6. The inventor has used this apparatus for measuring the heat of vaporization of anhydrous and monohydrated acetic acids, monohydrated nitric acid, of chloral and its hydrate, and other substances.

New Mechanical Inventions.

Mr. Louis Durand, of Quebec, Canada, has secured a patent for the combination, in a Dough Mixing Machine, of a revolving ring-shaped trough of tapering body, with one or more kneaders revolving in an opposite direction to the trough, and having straight sides corresponding to the inclination of the sides of the trough, and curved intermediate sides for the purpose of thoroughly incorporating the dough.

Mr. G. W. Lewthwaite, of Fort Miller, N. Y., has made an improvement in Felt Washers for Paper Making Machines, which is intended to clean the felt without injuring it, and which consists in the combination of fluted washer rolls and a washer box with the frame and perforated water pipe of a paper making machine.

Mr. Cornelius Young, of Sandy Hill, N. Y., has invented an improved Suction Box for Paper Making Machines. It is a box designed to be arranged in close connection with the wire screen, between the "deckle" and the "dandy roll," and is provided with rollers. The invention further consists in a novel mode of exhausting air from the vacuum box, dispensing with the usual pumps.

Improvements in Adjustable Saw Teeth and Holders are the subject of a patent recently issued to Messrs. S. J. Randall and James O'Brien, of Port Ludlow, W. T. The tooth is arc-shaped, sliding by a grooved edge in a tongued recess of the saw, and retained by a split spring holder, which is grooved on three sides, seated in a recess of the saw, and provided with a projection which enters into recesses of one of the grooved edges of the tooth, so as to lock the latter by means of a pin or rivet.

An improved Steering Propeller is combined with the rudder of a vessel, and connected with the power by a shaft having universal joints, which permits the screw to be moved laterally with the rudder. This is the invention of Mr. T. F. Levens, of Cascades, W. T.

Setting Milk.

The Vermont Dairymen's Association has recently held a meeting, and numerous subjects of practical importance to farmers have been discussed. Among other matters, that of setting milk has received considerable attention. Mr. J. W. Williams, of Glastonbury, Conn., stated that with the Cooley creamer extreme cold was specially desirable only during the first few hours after placing the milk in the water. The cream when gathered should stand a day or two to ripen, as time in churning would thus be saved. Mr. J. F. Ferguson, of Burlington, Vt., exhibited a new pan which is set upon wheels and is large enough to hold one milking. When strained the milk is shoved back into a portable ventilated apartment, fitted with ice chamber, wire screens, convenient doors, and arrangements for skimming the milk and cooling the cream. Mr. E. S. Wood described the following experiments in setting milk at various temperatures. The trials were made in per cent glasses, the morning's milk from the same cow being set at each trial. The range of temperature is that noted during the day, no one sitting up nights to watch the experiments. At the time of making each record, the cream line was clear and distinct. At the first trial the temperature near the glasses was between 80° and 90°. In 3½ hours there was twenty per cent of cream; in 10 hours eighteen per cent, and the same at the end of 24 hours. At the second trial the mercury stood at from 35° to 40°; in 3½ hours there was forty per cent of cream, but at the end of 10 hours it had shrunk to thirty-two per cent. It was then removed to a warm room, where at the end of 24 hours it stood at twenty-two per cent. At the third trial the mercury stood at from 70° to 73°. At the end of 2 hours there was thirty-four per cent of cream, in 10 hours twenty-two per cent, and at the expiration of 24 hours but nineteen per cent.

Neutralizing Poison.

A poison of any conceivable description and degree of potency, which has been intentionally or accidentally swallowed, may, it is said, be rendered almost instantly harmless by simply swallowing two gills of sweet oil. A person with a very strong constitution should take nearly twice the quantity. This oil, it is alleged, will most positively neutralize every form of vegetable, animal, or mineral poison with which physicians and chemists are acquainted.