

guard, made in the form of a sleeve, that slips over the barrel and forms a non-heat-conducting cover. By the use of this guard the gun barrel may be firmly held in the hand even after it has become scorching hot under rapid firing.

Samples of these devices are furnished by Mr. Joseph Dixon, 7 Bloom Grove, Lower Norwood, London.

Professor Loomis' New Meteorological Deductions.

Professor Elias Loomis of Yale College, after examining the immense number of weather observations collected by the United States Signal Service, deduces the following generalizations. The seven papers wherein the detailed discussion has been embodied have appeared in the *American Journal of Science and Arts* whence the summarized conclusions below given are extracted:

1. Areas of low barometer result from a general movement of the atmosphere towards a central area, and this movement is accompanied by a deflection of the wind to the right, which causes a tendency to circulate around the center with a motion spirally inward.

2. This deflection to the right, which results from the earth's rotation, causes a diminished pressure within the area of this inward movement, and the pressure is still further diminished by the centrifugal force resulting from the circulation about a center.

3. The amount of the barometric depression depends upon the force of the wind, and the geographical extent of the revolving atmosphere. The effect of centrifugal force is not considerable except when the velocity of the wind approaches that of a hurricane. With a velocity of 100 miles per hour, the depression due to centrifugal force may amount to about two inches; but in the winter storms of the middle latitudes, with a velocity not exceeding forty miles per hour, the depression due to centrifugal force seldom exceeds one or two tenths of an inch. In these storms, three quarters of the observed depression of the barometer is usually the effect of the earth's rotation: but in order that the depression at the center may amount to as much as one inch, it is generally necessary that this system of circulating winds should prevail over an area nearly 2,000 miles in diameter.

4. In North America, south of latitude 35°, areas of low pressure are less frequent and generally exhibit a less depression than near latitude 45°, because the area over which a cyclonic movement of the winds prevails is small; and this area is small because, if a cyclonic area could be formed having a radius of 1,000 miles with its center in latitude 30°, its circumference must extend southward to latitude 16°, where the trade winds are steady and seldom interrupted. Such a diversion of the winds toward the north, even if it could be produced, could not be long maintained; so that a large cyclonic area with its center in latitude 30° is well nigh impossible; and it is impossible that there should be a great depression of the barometer in latitude 30°, except with a wind having a hurricane velocity. This is believed to be the reason why in North America the centers of great storms are generally found north of latitude 40°.

5. The causes which may produce a general movement of the atmosphere toward a central area are (A) unequal pressure as shown by the barometer; (B) unequal temperature; and (C) unequal amount of aqueous vapor. Of these three causes the effect of the first is generally so decided that the influence of the other two causes can only be detected by careful observation; but when the pressure of the air is nearly uniform over a large extent of country, the influence of the other two causes is sometimes very palpable, and their influence is generally seen in a slight deflection of the winds from the direction they would have if wholly controlled by the first cause.

6. A cyclonic movement of a large mass of air is generally attended by an upward motion in certain localities, chiefly on the eastern side of the center of low pressure, and this upward movement results in rainfall. The rainfall is then not generally the original cause of the barometric depression, but rather an incident of the cycloidal movement of the atmosphere. The fall of the barometer during a rain storm cannot be ascribed to the simple condensation of the vapor of the atmosphere, as some have supposed, since a rainfall of one or two inches prevailing over an area 300 miles in diameter near latitude 30° produces scarcely an appreciable effect upon the barometer.

7. The progress of areas of low barometer in all latitudes is determined mainly by the same causes which determine the general system of circulation of the atmosphere; and their normal direction is changed by whatever causes may change the direction of the winds.

8. The heat which is liberated in the condensation of a large amount of aqueous vapor must exert an influence upon the movements of the air, so that while the rain is generally to be regarded not as the original cause but rather as one of the incidents of extensive cycloidal movement, if the rain area has great geographical extent, it may have a decided influence upon the amount of the barometric depression and upon the velocity with which the storm advances; sometimes accelerating its motion, sometimes retarding it, and sometimes holding it nearly stationary in position for two or three days.

The Electric Light.

The Russian Government, it appears, is turning its attention to the electric light as an illuminator for military purposes. In some experiments recently made at St. Petersburg, with the special object of increasing the distance to which the light produced by electricity may be thrown, it

was found that the power of the light is greatly augmented by covering the carbon burner with a thin sheet of copper. The augmented light was sufficiently powerful to render objects visible at night at a distance of upwards of 3,000 yards.

Professor Langley's Apparatus for Eliminating Personal Equations.

A well known source of error in astronomical observations is that due to the deficiencies of the observer himself in the shape of defects in vision, perceptive power, etc. In order to eliminate this, astronomers have adopted two courses; either to find the amount of personal error in each case and apply a subsequent correction, or to diminish or eliminate the same by suitable devices during the act of observation. Professor S. P. Langley describes, in the *American Journal of Science and Arts*, and new and very ingenious apparatus for eliminating the "personal equation" on the star itself. It is constructed and operated as follows:

On the transit pier (or in any other convenient locality) is a small clock, with a conical pendulum, whose bob slides freely up and down the graduated rod, retaining its position where left. A small horizontal wheel in the clock is controlled by the pendulum, and turns once for a certain constant number of its revolutions. This wheel revolves once for each equatorial interval of the transit wires, when the bob is set at a mark near the top of the rod, and by sliding the bob sufficiently downward; with the use of a readily constructed table, we can, given the declination of any star between the limits 0° and ± 60°, set the pendulum, so that this wheel shall make exactly one revolution while the star passes from wire to wire. This wheel carries near its periphery a mercury drop or other contact piece, which once in a revolution is carried past a point fixed near the periphery of a stationary horizontal wheel, concentric with the first, and immediately above it, but insulated and entirely detached from it.

This upper wheel, while thus related to the lower, is entirely disconnected from the machinery of the clock, and is thus far stationary; but it can be revolved by cords passing from a groove in its circumference to the hand of the observer at the transit. As the upper, or ordinarily fixed, and the lower or constantly moving, wheels have a common vertical axis of revolution, and as the radial distance of the point in the upper from this axis is the same as that of the contact piece on the lower, it will be seen, while the upper wheel remains motionless, electric contact accompanied by a simultaneous flash, if we desire it, at the transit lantern or elsewhere, will be made at equal and uniformly recurrent epochs, the interval between which depends only on the adjustment of the pendulum. If the upper wheel be rotated forward by hand, through a small distance, and then left, the next contact will still occur, but at a later epoch, owing to the lower wheel's having to complete more than one revolution to make contact, but after this the contact and simultaneous flash will recur at the same intervals, and with the same regularity as before. If the upper wheel be moved backward, the flash will occur once, earlier, and thereafter with regularity. Moving the upper wheel, then, changes the epoch from which any series of such flashes dates, and adjusting the pendulum bob fixes the interval between subsequent flashes. In practice the lamp is removed from the transit lantern, and the two terminals of a battery or induction coil in its place cause the flash to be thrown upon the wires, whenever the mercury drop is in contact with the point, and at the same instant a mark is made automatically on the chronograph and interpolated in the regular record of the beats of the sidereal clock, which go on in the usual way quite independently of any reference to the apparatus just described.

The mode of observation will be anticipated. Before the transit of any star the observer adjusts the conical pendulum beside him (this is the work of but a few seconds), and then seats himself at the instrument holding the cords in one hand like the "reins" of an equatorial. If a flash occur just as a star is crossing the first wire (which is most unlikely) he has nothing to do, except possibly to note which was the middle wire, for each records itself on the chronograph without any intervention of his. But if the star be, for instance, two thirds of the way from the first to the second wire at the first flash, he will draw one of the cords, accelerating the flash and thus causing the star to appear nearly coincident with the second wire when the next spark comes, and repeat the adjustment by the light of subsequent flashes, till the bisection is perfect. Three or four trials are in practice found to yield a bisection which will satisfy a fastidious eye, and when a satisfactory one has been once made, the effect is automatically repeated.

Under the general conception, then, of the possibility of diminishing to any limit personal error, by employing brief views of the star or wire and utilizing the phenomena of persistence of vision, the particularly described device assumes to dispense with the observer's record upon the chronograph altogether, and to substitute a purely automatic one giving the same virtual result as though the image of the star were a tangible object, itself making electric contact with each wire. The share of personality in any observation is relegated to the prior act of bisecting a star, virtually motionless with relation to the bisecting wire, so that if (as seems to be the case) this act is independent of quickness or slowness of perception, of the time of cognition, or of the speed of nerve transmission; personality, in the technical sense, appears not to intervene at all.

Recent American and Foreign Patents.

Notice to Patentees.

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NEW HOUSEHOLD INVENTIONS.

IMPROVED SAD IRON AND FLUTING IRON COMBINED.

Christopher C. Burke, Cuthbert, Ga.—This improvement consists in forming the iron in box form with four smoothing faces, two large ones and two smaller ones, and combining it with a handle in such a manner as to be reversible, and with a heating plug or block to be inserted in the hollow iron which has four faces, corresponding to the four faces of the iron. It also consists in the particular means for connecting and disconnecting a plate carrying one of the ironing faces, to admit the insertion or removal of the plug or block, and the adjustment of a fluter.

IMPROVED RECIPROCATING CHURN.

Allen D. Ferris, Blakeley, Minn.—This invention relates to oscillating churns; and the nature of the invention consists in combining, with a semi-circular cylindrical oscillating churn box, a removable rectangular frame, having slats arranged in it in such manner that when the box is rocked rapidly the milk in it will be violently agitated, the currents being directed upward and downward by reason of the position of the dashers or slats. The slats on one side of the frame are inclined in an opposite direction to those on the other side of the frame, and the angle of inclination of the slats is such that the milk is directed both upward and downward by the same slats at each oscillation of the churn box. The currents are thus opposed to each other, and a violent agitation is produced which greatly shortens the operation of churning. The slats also serve to gather the butter when it comes.

IMPROVED COMBINED LAMP REST AND SHADE HOLDER.

Patrick J. Clark and Joseph Kintz, West Meriden, Conn.—This invention relates to an improved lamp rest and shade holder combined, by which the shade may be readily swung out of the way, and securely retained in raised position while the fount is taken off for refilling and other purposes, the fount being securely applied to the fount plate or basket, and any danger of upsetting or dropping the lamp effectually prevented. The invention consists in the connection of the lamp fount, having a central cavity, with a spring wire holder or clamp that screws the fount or basket tightly to the bracket or chandelier; and it also consists in the connection of a fount plate or basket with an adjustable rod carrying the swinging shade holder. The fount when placed on the spring wire holder is rigidly retained on the plate or basket without danger of being thrown off or detached from the same in accidental manner. The wire holder admits at the same time the ready sliding of the fount when lifted in vertical direction, for clearing, refilling, etc., and the instant replacing by pressing the fount down on the holding device. The shade or chimney is swung back on the fount as soon as the same is placed in position on the holder, being securely supported in raised position as to remove and replace the fount and light the lamp in convenient manner.

IMPROVED BROILER AND TOASTER.

Andrew C. Bolton, Greenport, N. Y.—This invention consists of two light wire frames hinged together, and provided with a spring fastening and with a wooden handle. The object of the invention is to provide a simple and efficient device for holding meat or bread over the fire while broiling or toasting. The frame is formed by bending a wire into a rectangular form, and twisting it together at the center of one of the sides of the frame. This frame is stiffened and supported by two wires which pass through the first twist of the wire that forms the frame. The wires that diverge from this point and pass under the transverse wires which are fastened to the frame, and are attached to the end of the frame opposite that in which the twist is formed. The wires and the ends of the wire that forms the frame are parallel outside of the twist, and are placed in a wooden or non-conducting handle.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED THILL COUPLING.

Francis E. Justice, Marysville, O.—The object of this invention is to provide a simple means for preventing the detachment of the thilliron except when the thills are raised to a vertical position, and also for supporting the thill ends off the ground when the carriage is not in use. The said means consists of a horizontal bar attached to the under side of the eye of the thill iron, so as to come in contact with an elastic block which is secured in the socket of the clip in such position as to act as a buffer for the said bar when the thills are lowered.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED SCROLL-SAWING MACHINE.

William Hinchliffe, Nashville, Tenn.—The object of this invention is to provide a simple easy-running scroll saw, that maintains an even tension on the blade at every portion of the stroke. The table, similar to an ordinary sawing machine table, in which the shaft of the driving wheel is journaled, and in the lower part of which is pivoted the treadle which is connected by a pitman with the crank formed in the shaft of the wheel. The saw blade is clamped to the bars by means of the clamping screws, and the position of the saw in the clamping device is determined by a pin that projects from the side of each head. The machine is operated by working the treadle, and more or less tension is given the saw by turning a screw, and by turning another screw the table may be pitched or inclined. The arrangement of the spring is such that the tension on the saw is always the same in all parts of the stroke.

IMPROVED DEVICE FOR SUPPLYING LOCOMOTIVE TENDERS WITH FUEL.

Will C. Hamner, Water Valley, Miss.—The object of this invention is to furnish an improved device for supplying locomotive tenders with coal or which shall be so constructed as to discharge the required supply into the tender at once, so as to avoid the delay which is unavoidable when the tenders are supplied in the usual way. The invention consists in the employment of a pivoted or tilting box for supplying locomotive tenders with fuel. To the platform of the railroad track are attached two posts, to the upper ends of which is pivoted a box. The box is made of such a size as to contain the quantity of coal or wood to be supplied to a tender at a time. To the side of the box is pivoted a hook latch to catch upon a pin attached to a post secured to the platform. The latch is held forward by a spring attached to the box, and its forward movement is limited by a stop pin also attached to said box, so that the latch will always be in position to catch upon the pin automatically when the box is swung back into place after being tilted to discharge its contents.