The Missouri Tornado of April 14, 1879.

Dr. J. L. R. Wadsworth and Francis E. Nipher, Secretary of the St. Louis Academy of Science, have made and published a careful study of the tornado which wrecked a portion of Collinsville, Mo., last April. The storm reached St. Louis at 2 P. M. From this point it pursued an even course with the same velocity, reaching Collinsville, 10½ miles east, at 2:35; Lebanon, 21 miles east, at 3; and Highland, 29 miles east, at 3:30 (St. Louis time). It would seem that the necessary elementary conditions for the development of the tornado were found over the American Bottom, and that this development was purely local and did not extend much over ten miles, and had no apparent influence upon the general storm that was passing at a higher altitude to the eastward. The tornado consisted of a principal vortex, of very considerable power, accompanied by six collateral vortices, of much less power, that seemed to possess more than an incidental relationship to the principal; and a second principal vortex apparently independent in time and direction. The direction of the principal vortex was 15° north of east, and, while there was a probable swaying to the one side or the other, the paths of the vortices were in straight lines. The first four collateral vortices were *convergent* upon the path of the principal vortex, and the two last were *divergent*. The principal vortex was in contact with the surface while it was receiving the first four, and had left the surface before it gave off the last two collateral vortices. The height of the principal vortex was about 500 feet; the heights of the collaterals were comparatively small. The rotary spiral motion was in the direction opposed to the movement of the hands of a watch and of great velocity. The progressive motion was about one mile a minute. It had also a vertical or lifting motion, which was often quite abrupt. The path was narrow on the approach to Collinsville—about 100 feet, gradually widening—the vortex at the same time exhibiting less force. At the zinc works it was 600 feet wide. Its lifting power was sufficient to carry large roofs at least 600 feet high; this, with a power equal to the momentum of a body moving sixty miles an hour, would carry heavy *débris* some distance. The effect of these motions was to break up every object the whirl carried up with it; even lumber, taken up free from all contact with anything else, would come down, in many instances, in kindling wood.

In about half an hour after the vortex passed there was a return current from the north, accompanied with severe rain and hail and terrific electrical discharges. There was no thunder and lightning with the vortex, and very little if any rain.

The difficulty in obtaining exact and comprehensive information, from eyewitnesses, of what goes on in a storm of this nature is aptly illustrated by the following incident: A clear-headed and observant citizen of Collinsville, perceiving the approach of the storm, although some blocks distant, ran from a very dangerous position, and found himself only across the street, holding on to a loose stump, when the tornado passed over him. Afterward, while detailing the predicament he was found in, a bystander called attention to a large tree which had just escaped falling upon him. Looking at it for a moment, he quaintly remarked, "I never knew that tree fell there."

A New Weather Theory.

The Rev. Henry Roe, F.R.A.S. (Eng.), sends to the London *Times* a new theory of the weather. He claims to have determined by careful observations, covering nearly thirty years, that dry and wet periods succeed one another in alternate waves of nearly equal length. Not that this equality of duration is quite absolute, or that the wave of one period is exactly the same *facsimile* of that of a corresponding period at an earlier or a later time; but there is enough of regularity and uniformity about the waves to make the family likeness clearly discernible to any eye that looks for it.

These periods extend over three whole years for each, and the following simple rules will enable any one to work out the several cycles of years for himself:

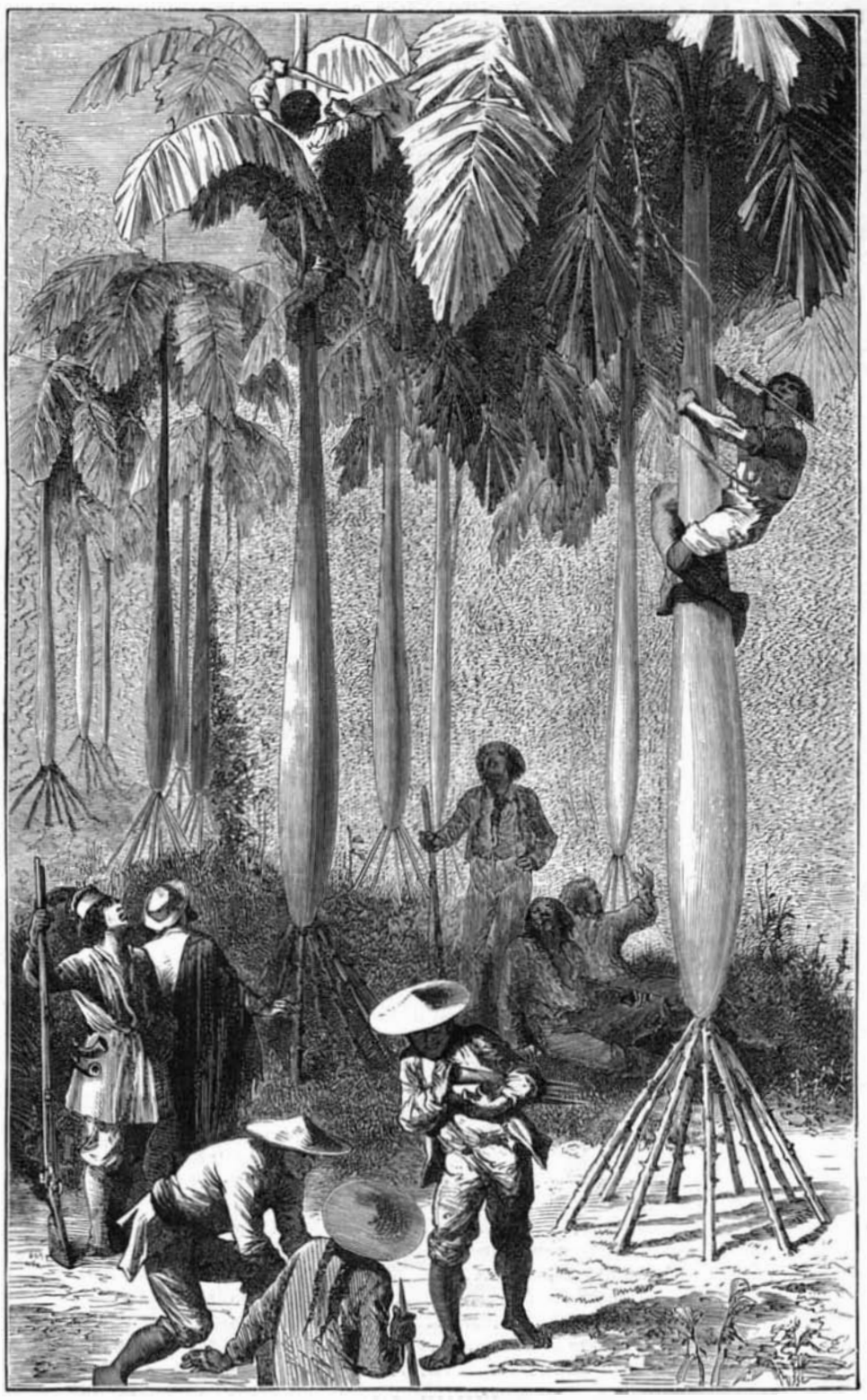
1. When the number representing any given year is even and exactly divisible by three, that year is the middle one of three cold and wet summers.

2. When the number representing the year is odd and divisible by three, then that year is the middle one of a triad of dry and hot summers.

After testing by these rules the successive seasons of the past twenty-seven years, and finding fact to conform to theory, Mr. Roe predicts that 1881 will be the middle one in a triad of hot and dry summers. What relations these dry and wet periods have (if any) to the recognized cycles of sun spots he has not made out; nor does an examination of recent seasons confirm the alleged harmony of theory with fact.

THE SWELLED TRUNK PALM.

The lower part of the trunk of this peculiar palm tree is swelled and supported from seven to nine feet above the ground by a number of radiating and inclined roots. These roots shoot out from the tree during the rainy season, and support it without aid from the main root, which finally disappears. The leaves are from 10 to 14 feet long. This tree is found on the banks of the Amazon. The illustration is copied from *La Vie Végétale*.



THE SWELLED TRUNK PALM.—*Iriartea Ventricosa Mart.*

An Explosion of Starch.

Nearly two years ago a violent explosion occurred in a candy factory in this city, causing the death of thirteen persons. The cause of the explosion was never clearly known, though the evidence pointed strongly to the starch room as the source of the disaster. A similar, but fortunately less fatal, accident occurred in another candy factory in Elm street, August 7, under conditions which leave no doubt that starch dust was the explosive material.

The explosion took place in a drying room on the second floor, where the temperature ranges from 140° to 180°. The drying rooms are 5 feet by 6 and 6 feet by 8 respectively, and are 12 feet high. In each is a furnace kept constantly red hot. The walls are built strongly of brick incased in wood. In the rooms are arranged slides for starch boxes, in which the candies enveloped in powdered starch are placed to dry. The small room has slides for 2,000 boxes, and the large room slides for 3,000. Four men were at work in the drying room taking the candies from the racks. One was on a step-ladder to hand down the trays to the others, who stood around the furnace. He had five trays in his hands, and was about to hand them down when his foot slipped on the step-ladder, the trays fell, and in falling turned over so that a heavy cloud of heated starch dust was thrown against the red hot furnace. The sharp explosion that followed shook the building and filled the room with a sudden flame. The intensely dried woodwork of the drying room caught fire instantly, and the apartment was swept by flames which threatened the entire building. The hands of the factory, however, attacked the flames and extinguished them before any serious damage had been done. The four workmen were severely but not fatally burned.

MECHANICAL INVENTIONS.

An improvement on what is known as the "slow" or bark tanning process has been patented by Mr. George King, of Washington, D. C. Its chief feature consists in alternately subjecting the skins or hides to the action of fresh tanning liquor, then raising them out of it and allowing the liquor to drip or drain off, and, lastly, conducting that portion of the drained liquor which was last in contact with the hides back into the leach to be again passed through the bark, and thus strengthened by taking up an additional quantity of the astringent principle or tanning agent. The apparatus consists of a rotating drum, in whose several compartments the hides are placed, and into which the tanning liquor is constantly fed, and from which it is being constantly withdrawn when its strength has become partly exhausted.

Mr. William H. Watson, of Cheshire, Ohio, has patented an improvement in hay presses which embodies several novel features that cannot be clearly described without an engraving.

Mr. James A. Webster, of South Boston, Va., has patented improved attachments for sawing machines, for converting a sawing machine into a planing machine at a small expense, so that the timber may be sawed or resawed and dressed upon the same machine.

An improvement in the class of wooden axle-skeins provided with a tapering extension for receiving the ends of the axle, has been patented by Mr. Philip Neder, of Stockton, Utah Ter. The improvement consists in hooks, by which the skein is secured to the axle, so as to prevent its endwise movement thereon.

Mr. Joseph V. Morton, of Winchester, Ky., has patented a door fastener that is adjustable to doors of different thicknesses. The invention consists of two handles pivoted to a common connection that extends through the door and connected at the top with a wedge piece that operates the latch. The handle on one side of the door is pushed to open the door; the handle on the other side is pulled.

An improved device for feeding paper to ruling machines has been patented by Mr. John S. Young, of Philadelphia, Pa. It is simple and reliable, and is capable of feeding the paper to the machines one sheet at a time or continuously. It may readily be adjusted to feed thicker or thinner paper, as may be required.

An improved machine for forming dovetailed veneer boxes, so constructed as to form the boxes out of seasoned veneer, has been patented by Mr. David F. Noyes, of Lewiston, Me. The machine, although very simple, cannot be explained without an engraving.

Mr. Harvey Smoot, of Maurertown, Va., has patented a washing machine that is an improvement upon the washing machine constituting the subject of letters patent No. 127,075. In that machine a reciprocating dasher or plunger alternately exerts mechanical pressure on the clothes, and changes their position by the force of the reactive flow of water. The improvement pertains to a trough-like support, receptacle, or holder for the clothes while being soaped, and after having been washed.

Improvements in the buckets of turbine water wheels and the devices for operating the gate ring and governing its movement, have been patented by Mr. Isaac Mallery, of Dryden, N. Y. The object of the invention is to increase the power and durability of the wheel and simplify its construction.

Farm Wages and the Cost of Living.

The Department of Agriculture has been gathering information in every county in the United States, with regard to the wages paid to farm laborers and the average cost of living, for a chapter in the forthcoming report of the Commissioner.

The returns disclose the fact that in all quarters of the Union (with the exception of Minnesota, California, Colorado, Oregon, New Mexico, and Washington Territory) the average monthly rate of pay for farm laborers declined during the year ending last April from 3 to 15 per cent. At the same time, the expense of living in the majority of States declined in equal or greater proportion, so that the relative condition of the laborer really improved during the year.

The average rate of pay in New England for farm laborers on yearly engagements, without board, averages $20.31 per month, against $22.60 at the beginning of the year, a decline of 10 per cent. The average cost of living has fallen from $9.13 to $8.02 per month, a decline of more than 13 per cent. In the Middle States the conditions were reversed, the ruling monthly pay of the farm laborer being $19.69, a decline of 7 per cent, while the average cost of living had declined only 4 per cent In New York alone farm laborers receive 8¾ per cent less than they did a year earlier, and pay 10 per cent less for their living. The South Atlantic States reduced labor 15 per cent and subsistence 16 per cent, and in the Gulf States labor fell 5 per cent and subsistence only 3 per cent, the average pay in the former being $11 19, and in the latter $14.80 per month In the nine inland States east of the Mississippi, the monthly pay varies from $15.50 per month south of the Ohio, to $20.90 in the north, the rate of decline in wages being a fraction less than that of the cost of living; while in the six States west of the Mississippi the present average pay for farm labor is $23.81 per month, a slight increase over that of a year earlier, and the price of subsistence falls off about 2 per cent.

West of the Mississippi the increase in the rate of wages is chiefly due to the extension of mining operations. In this region a large number of artisans have appropriated public lands and seek to pay for their claims by working a part of the time at their trades. Quite a number of farm laborers have done likewise, and they work part of the time for wages on the farms of others. The large immigration has enlarged the stock of labor, but it is to a great extent somewhat inefficient in character. All who desire work can get it. No surplus is reported from any county in Colorado. In the two Pacific States the average monthly pay of farm laborers is $38.22 against $36.62 one year earlier, an increase of 4⅓ per cent, while the cost of living has increased fully 18 per cent. In New Mexico, Dakota, and Washington Territory there is a demand for skilled and unskilled American labor at remunerative wages. In Utah laborers receive $28.87 per month, a decline of 7 per cent during the year, and a surplus of labor is reported.

In the New England and Middle States there seems to be a surplus of labor in certain localities and a deficiency in others, which should render the average demand about equal to the supply. The general rate of pay for skilled labor—shoemakers, blacksmiths, carpenters, etc.—is slowly rising, and is believed to mark the return of better times for the farm laborers.

A statement of the average rate of wages paid to agricultural labor in several countries in Europe will be of interest as affording a basis of comparison between the condition of the American and the European farm laborer From the tables prepared for the report of Secretary Evarts upon this subject the following information is gathered, the figures referring to the year 1878: Agricultural laborers in England receive, without board or lodging, an average per month of $15.60; in Ireland, $14.73; in Scotland, $19.42; in Normandy, $12.44; in Italy, $15.19, in Spain, $14.95; in France, $13.65.

Wages and Prices in France.

In an official review of the consular reports from France, Secretary Evarts says that "the French working people have, more truly than any other working people, illustrated that commendable phase of political economy—getting the greatest possible result out of the most limited means. They look squarely and sensibly at their capital, and then limit their requirements within that capital; make the most and best of their lot, and fling a halo of sentiment about their lives of toil. For these reasons the work-people of France, with as little remuneration and as scanty fare as those of almost any other country—much less than many of their neighbors—are the happiest and most contented labor population in Europe." Agriculture is the greatest industry of France. There are 10,000,000 land-owners, and 18,000,000 persons are engaged in that pursuit. The weekly wages paid to agricultural laborers throughout the republic are set down as follows: Men, without board or lodging, $3.15; with board and lodging, $1.36; women, without board or lodging, $1.10. Notwithstanding these low wages, it is stated that the French farm laborer not only supports himself and family upon them, but in many cases saves enough to become a landed proprietor. The Consul at Bordeaux writes that "farm laborers are frequently economical to avariciousness, and many of them, in the course of time, become quite wealthy proprietors." The Consul at La Rochelle, where the French peasant still preserves his primitive manners and rural virtues, says: "Upon these wages the agricultural laborer not only supports himself and family, but saves money. The country is free from tramps. The laborer thrown out of employment, yet always willing to work, at once starts out, with his loaf of bread under his arm and his gourd of sour wine swung over his shoulder, confident of finding employment promptly." The Consul at Lyons writes "I regard the condition of the agricultural classes of the United States as much superior to that of those in France, yet from the systematic and economic habits of the farmers of France, as a general rule, the French farmer, small as well as large, is better off than his brother agriculturist in the United States." In many districts in France the laborers supplement their agricultural earnings by secondary employment, such as weaving, wood-cutting, sawing, wooden shoe-making, etc. The Consul at Lyons says that from 8 to 10 per cent of the agricultural laborers in his district are engaged in these secondary employments, which yield to each laborer about $40 per annum. Not only must the husband labor for the support of his family, but the wife and children must also labor for the general fund in order to make ends meet. The married farm laborer, who supports and lodges himself, may earn in the Lyons district $150 per annum, divided as follows: husband's wages, $80; wife's wages, $30; children's wages, $40. The cost of living to such a family, per annum, is calculated as follows:

Rent	$10 50	Milk	$5 25
Bread	55 00	Clothing	25 00
Meat	10 00	Groceries	10 00
Vegetables	8 25	Fuel	8 00
Wine, beer, and cider.	7 00	Taxes	2 00
Total			$141 00

In view of the facts shown by the foregoing figures, viz., that the French farm laborer, when assisted by his wife and children, can earn only $150 per year, while the cost of his living expenses is $141, the Consul at Lyons makes a large demand upon American credulity in asking Americans to believe that "the French farmer, small as well as large, is better off than his brother agriculturist in the United States."

Wages and Prices in Belgium.

The review, by Secretary Evarts, of the consular reports received from Belgium, shows that the working people of that country are happy and contented, notwithstanding their lives are continual struggles for a meager subsistence; that they are frugal and industrious, and live within their means; and that a feeling of reciprocity exists between the employer and the employed. It is thought that this reciprocity of feeling is made necessary in order to enable Belgium to compete with English, French, and German manufacturers in foreign markets, and thus secure employment for their own working men. A few years of misunderstandings between capitalists and laborers, such as periodically convulse England, would paralyze Belgium and ruin both employers and employes. Such is the reciprocity of feeling between capitalist and labor, that manufactories or workshops are scarcely ever closed; the employers, in the dullest of times, preferring to run them even at a loss rather than throw their employes out of work, and the latter, under such circumstances, cheerfully complying with a reduction in hours and wages, cutting down their already bare necessaries of life to tide over the dark hour, confident that when better times return the full time and wages will be again restored. Were it not for this reciprocal feeling which unites labor and capital, Belgium would be scarcely known as a commercial or manufacturing country. The following table will show the weekly wages paid in Belgium, compared with those paid in New York.

	Brussels.	New York.
Bricklayers	$6.00	$12 to $15
Masons	6.00	12 to 18
Carpenters and joiners	5.40	9 to 12
Gas-fitters	5.40	10 to 14
Painters	4.20	10 to 16
Plasterers	5.40	10 to 15
Plumbers	6.00	12 to 18
Blacksmiths	4.40	10 to 14
Bakers	4.40	5 to 8
Cabinet-makers	4.80	9 to 13
Saddlers and harness-makers	4.80	12 to 15
Tinsmiths	4.80	10 to 14
Laborers	3.00	6 to 9

Following are the prices of the necessaries of life:

	Brussels. Per pound. Cents.	New York. Per pound. Cents.
Bread	4 to 5	4½
Beef	16 to 20	8 to 16
Veal	16 to 20	8 to 24
Mutton	16 to 20	9 to 16
Pork	16 to 20	8 to 16
Lard	20	10 to 12
Butter	20 to 50	25 to 32
Cheese	20 to 25	12 to 15
Coffee	30 to 40	20 to 30
Sugar	15 to 20	8 to 10

The consul at Ghent says the rates of wages paid to agricultural laborers are from 17 to 20 cents per day to men, and from 15 to 17 cents per day to women, and their food. When hired as servants, with food and lodging, they are paid $1.75 to $2.00 per month. The consul at Brussels calls attention to the fact that during the years 1874 and 1875 over 12,992,611 francs value of United States gold coin was demonetized and converted at the Mint at Brussels into Belgian coin. How much of our money was thus converted into Belgian money previous to 1874 the consul had no means of knowing; how much, if any, has been so converted since 1875 the consul does not say.

Blushing and Blanching.

Blushing is occasioned by sudden dilatation of the small bloodvessels, which form a fine network beneath the skin, and when they admit an increased volume of red blood cause the surface to appear suffused with color. Blanching is the opposite state, in which the vessels contract and squeeze out their blood, so that the skin is seen of its bloodless hue. The change effected in the size of the vessels is brought about by an instantaneous action of the nervous system. This action may be induced by a thought, or, unconsciously, by the operation of impressions producing the phenomenon habitually. In a word, blushing may become a *habit*, and it is then beyond the control of the will, except in so far as the will can generally, if not always, conquer any habit. It is almost always useless, and certainly seldom worth while, to strive to cure a habit of this class *directly*.

The most promising course is to try to establish a new habit, which shall destroy the one it is desired to remedy. For example, if blushing is, as generally happens, associated with *self*-consciousness, we must establish the sway of the will over that part of the nervous system which controls the size of the vessels, by calling up a feeling opposed to *self*-consciousness. It is through the mind these nerves are influenced. Then influence them in a contrary direction by antagonizing the emotion associated with blanching. Thus, if the feeling which causes the blushing be expressible by the thought, "Here am *I* in a false and humiliating position," oppose, or still better, anticipate and prevent, that thought by thinking, "There are *you* daring to pity or feel contempt for another." Avoid going on to think who that "other" is, because the aim must be to eliminate self. Constitute yourself the champion of some one, any one, and everybody, who may be pitied, and the ever-zealous and indignant foe of those who presume to pity. Most persons who blush with self-consciousness blanch with anger, and this artificial state of mock anger will soon blanch the face enough to prevent the blush. It only requires practice in the control of the emotions and the production of particular states at will—the sort of expertness acquired by actors and actresses—to secure control of these surface phenomena. Blushing and blanching are antagonistic states, and may be employed to counteract each other, control of the physical state of the bloodvessels being obtained through the emotions with which they are associated.—*Lancet.*

Practical Co-operation.

A Swiss colony settled on Cumberland Mountain, Tennessee, in 1873. This colony of 115 families, about 700 people, purchased 10,000 acres of mountain land at $1 per acre, and now, after four years each head of a family has a comfortable home, an orchard, and garden with a profusion of mountain flowers. There is a large store that is managed for the colony, members of which get goods at wholesale cost; the colony has its own school, church, doctors, etc., and their own candidates govern. The colonists already have dairies and cheese factories in successful operation, and their products find ready sale at fancy prices. They have splendid herds of cattle, and their barns are built as carefully as their houses. There is also a colony of Swiss near Greenville, S. C., about as large as the Tennessee colony, and it is prospering finely.

A Specific for the Coffee Pest.

A correspondent of the London *Times*, writing from Colombo, Ceylon, announces the discovery of a certain cure for that most destructive pest, *Hemeleia vastatrix*. The discovery was made by the assistant director of the botanical gardens at Colombo, Mr. Morris, and consists in a mixture of sulphur and lime applied in a state of powder to the leaves and branches of the trees. One application suffices to destroy the filaments and spores in a few hours, and it now only remains for planters to resort to this most effectual remedy on an extensive scale, as the materials are to be had in abundance and the cost of application is trifling.

The Adirondack Survey.

Mr. Verplanck Colvin, Superintendent of the Adirondack Survey, began the survey of the Raquette River district at Potsdam, St. Lawrence Co., early in August. Arrangements had been made to occupy an astronomical station at that place, and to set up a substantial monument there recording the exact geographical position. It was proposed also to locate accurately all the important land lines, township corners, etc., in the Raquette River district, and mark them by stone monuments carrying nickel plated copper bolts.

Antiseptic Action of Acids.

According to Sieber a relatively small proportion of acid, 0·5 per cent, prevents putrefaction. This property is conspicuous in the mineral acid, and in acetic acid. Lactic and boric acids are much less effective.—*Journ. Prakt. Chemie.*

MR. FRIEDRICH WEGMANN, of Zurich, has recently patented in Germany the "application in roller mills of rollers whose coating shall consist of a homogeneous mass of porcelain, china, or glass, containing as much silica as shall be requisite to obtain the necessary degree of hardness for the process of grinding."

Snowballing in July.

A very novel spectacle was witnessed in New York city, last month, at Morrisania, where people were snowballing each other with genuine fresh snow, pressing it into big round balls, pelting each other with it, and slapping their half-frozen fingers on their thighs to restore circulation to the benumbed members. It was, of course, artificial snow, and made by the working of an ice machine just set going in J. & L. F. Kuntz's brewery.

The machinery, as usual in all ice machines of this class, consists of three parts—a compressing pump, a condenser, and a refrigerator. Aqua ammonia of the highest procurable strength, is poured into a small still and heated until the ammoniacal gas is all driven off into the condenser. There, by the compressing pump, it is liquefied, at a pressure of six and a half atmospheres in a temperature of 50° Fah. The liquid gas is passed thence, through small tubing, into the refrigerator, which is a separate close chamber about 14 feet square; this chamber is the freezing box for the whole brewery. The refrigerator itself is a voluminous machine, consisting of eight coils, each 300 feet in length of continuous welded pipe, the whole forming a large cylinder 9½ feet in diameter. In these coils of pipe the gas, liquefied under pressure, reassumes its gaseous form, and in so doing takes up all heat about it. The cylinder is kept whirling swiftly, partly to promote the spread and expansion of the liquid, but more to enable a lot of huge brushes to sweep off constantly the snow which is continually forming from the atmosphere upon these pipes. A cart load of snow is thus swept off every day. But it is not nice snow. It is good enough for snowballs, but there its use stops, for the air from which it has been formed has been sucked up by a powerful draught from the depths of the lowest cellars, and every sour smell or taint in the atmosphere is transferred to this snow. The air driven down to replace that thus drawn up is not only freezingly cold, but is dry and pure, so that through all the vaults the atmosphere seems like that of the country on a winter's morning. After going through this great mass of tubing, the gas returns to the outer chamber, bearing with it all the heat it has taken up; and to get rid of this it is sent through 1,200 feet of piping, upon which water falls in a spray, and a great fan keeps up a constant cooling current of air. After that it is fit to pass into the condenser, and so around again. None is wasted; none escapes. Yet it maintains a temperature of 3° Reaumur (say about 38° Fah.) throughout three vaults, each 80 by 50 feet, with an average height of 11 feet, and even greater cold could readily be obtained were it desirable. The use of this apparatus enables the actual storage at one time of 50,000 barrels of beer.

It is claimed for the invention that it will save brewers a vast sum by diminishing the consumption of ice, and doing away with the necessity of constructing underground vaults of large dimensions.—*Manufacturer and Builder.*

LACE FAN.

The fan shown on this page is of French manufacture. The face is made of the finest lace, the pattern being designed and worked expressly for this purpose. Nothing more delicate and fairy-like could be imagined, nor could the most capricious beauty demand anything more exquisite.

Ozokerite, or Mineral Wax.

We make the following extracts from a letter, which appeared in the *Foxburg Gazette*, written by Mr. E. M. Grant, who has recently returned from a visit to the various oil-fields of Europe:

The production of oil in the Eastern Galicia oil fields is very limited at present in amount. The wells are mostly situated near Boryslaw, though there is one well south of Boryslaw about 45 miles, that is doing 8 to 10 barrels per day of nice green oil.

The wax fields of Eastern Galicia attract the most attention. This earth wax, or ozokerite, as it is called, is neither more nor less than oil that has been evaporated, leaving the residuum in a solid state, so that it is dug out with picks and shovels, and is about the consistency of common clay. It is very valuable, being worth from 7 to 8 cents a pound.

The shafts are from 350 to 600 feet deep and very close together, so close that, on the piece of land where this wax is found at Boryslaw, containing not over fifty acres, there are 10,000 shafts.

The walls of these shafts are curbed with timbers, but at the depth to which they go they are very thin, so that scarcely a day passes but the walls cave in, breaking the timbers like pipe stems, and burying several human beings beneath the great mass of earth. This thing occurs so frequently, that from four to six persons per week are killed in this manner.

Great fortunes have been accumulated by a few of the Jews who owned the land where the wax was found. The vein is about 16 inches thick, and the wax is carried out in buckets. Twelve thousand men live on that fifty acres of land, how, nobody knows. The wax is refined and made into candles. This being a great Catholic country, and a holiday occurring nearly every other day, candles are in great demand. Our party, consisting of Jas. H. Clark, John Huntington, James Carrigan, and Worthy Clark, of Cleveland, and Wm. L. Lay, of Oil City, took breakfast with a Polish gentleman at Boboka, and the conversation turning on earth wax, Mr. Lay said that there was a mountain of it in Utah, at which the old Polish gentleman exclaimed, "My God! the Lord is with America again! He gives Poland sixteen inches of earth wax, but He gave America a whole mountain." They all like America and Americans, most of them being republicans at heart. The wax field is fully developed and nearly exhausted, unless they should find something new.

In Hungary there is no oil of any account being produced, but there are surface shows all along the range of mountains on the Hungarian side, and some day it will be developed. The government will assist any one who really means business and desires to develop the country.

ENGINEERING INVENTIONS.

Mr. Cyrus B. Cook, of Cynthiana, Ky., has invented an improved combined governor and self-adjusting cut-off, which combines the governor and slide valve of an engine so as to cause the governor to automatically adjust the range of movement of the valve, and thus shorten or lengthen the cut-off automatically. The invention consists in connecting the valve and the governor by a hollow rock shaft, having a second central shaft within. The two shafts are coupled for independent movement, and are combined with an adjustable crank mechanism and a trip mechanism, operated directly by the governor, so that the governor sets in operation the trip mechanism, and allows the engine to act through the independent shafts to alter the throw of the valve rod.

EXQUISITE LACE FAN.

An improvement in water works has been patented by Mr. Paul B. Perkins, of Geneseo, Ill. The object of this invention is to supply water for domestic, manufacturing, and other purposes in cities and towns, and at the same time to furnish the requisite quantity of water under any desired pressure for extinguishing fires wherever the distribution pipes may be extended, by means of stationary pumping machinery discharging the water from its supply source into and through an air tight compression storage reservoir that is provided with the necessary pipes, valves, and fire hydrants, all connected with the town or city mains.

Mr. McWilliam F. Margach, of Meadville, Pa., has devised an improved balance valve, the object of which is to relieve the balancing device from contact with the top of the steam chest as soon as the steam is shut off, and to prevent the formation of a vacuum in the cylinder. It consists of a disk placed on top of the slide valve, and encircled by a ring, which, by the pressure of the steam underneath it, is forced up against the under side of the top of the steam chest, so as to shut off from the pressure of the steam the area on the upper side of the valve inclosed by it, but which is adapted to fall back from contact with the top as soon as the steam is shut off.

Messrs. Adam Moessinger and William Heathcote, of Glen Rock, Pa., have patented an improved gate for turbine water wheels. The invention consists in an arrangement of a circular or conical cap with slotted flanges operated by a rack and pinion, the flange covering the upper openings of the water course, and of a slotted cylindrical ring operated by an eccentric, which covers the lower openings of the water course.

An improved rotary valve and seat has been patented by Mr. Edward L. Watkins, of San Antonio, Texas. The invention consists in combining, with a valve seat having four ports, a rotary valve having a curved opening and recess. When the valve is driven at a uniform speed, the steam will be cut off at about half stroke, but, if desired, it may be so geared as to be driven at a variable speed, and arranged to cut off steam at any desired point of the stroke.

An improved oil well packing, having tapering split clamps and sleeves or thimbles fitting over them, for the purpose of holding an elastic packing, has been patented by Messrs Isaac La Foy and Jesse Siglin, of Bradford, Pa.

Hollway's Process.—The Use of Sulphides as Fuel in Metallurgy.

Mr. John Hollway has prepared the following summarized account of his process for the benefit of those who might not have had time or inclination to read the longer and more technical account given in Mr. Hollway's paper read before the Society of Arts, February 12, 1879.

This process has for its object the utilization of the heat generated by the rapid oxidation of certain mineral substances, which have not hitherto been used as sources of heat for smelting operations. The heat thus obtained is employed in the reduction of the furnace charge, which may be composed partly of sulphides and partly of silicious ores. A current of air is forced through molten sulphides, by which means they are very rapidly oxidized. Great heat is thus developed, rendering the process of smelting a self-supporting operation; therefore no extraneous fuel is required, excepting that employed in raising steam for the blowing engines; where, however, water power is available steam can be dispensed with, in which case all the carbonaceous fuel necessary for the operation is a little coke to start the furnaces, which stands in the same relative position to the ores as wood does to coal in the lighting of an ordinary fire.

It is well known that pyritous minerals are readily combustible, but the best means of utilizing the heat producing property of metallic sulphides is not so apparent as would at first sight appear. Of these sulphides only iron pyrites is sufficiently combustible at a low temperature to burn in the open air, the mass being raised to the temperature at which the oxidation takes place solely by the union of sulphur and iron with atmospheric oxygen. In Spain there are numerous deposits of poor cuprous pyrites, and the Rio Tinto and Tharsis Companies annually treat, at their mines, about one million tons for the extraction of copper only, which does not average 2 per cent. The process employed consists essentially in roasting the pyrites in heaps in the open air, dissolving out the copper from the roasted material, and precipitating it from the solution by means of iron. These operations extend over several months, any gold or silver contained in the ore is lost, and the iron and sulphur are also wasted. The sulphur passes into the air as an obnoxious and annoying gas, desolating the country for miles around the works.

From the earliest ages carbon has been considered a necessity in all metallurgical operations. The first reduction of metal by means of carbon forms a connecting link between the age of stone and the commencement of civilized art. It is well known that carbon burns at widely varying temperatures, as, for example, in our bodies, in a common coal fire, or in a furnace. A great deal of thought has been devoted to the subject of economizing carbonaceous fuel, and great advances have been made in this direction, yet the expenditure of coal or coke necessary, say, to melt a given quantity of metal still far exceeds the theoretical limit. The main causes of this discrepancy may be accounted for as follows:

1. Only part of the oxygen of the air passing into a furnace, acts on the material to be burnt.

2. The oxygen is not brought in contact with the combustible matter with sufficient rapidity to obtain the necessary temperature for the operation.

3. Gases pass off hot and unburnt. These are now, however, frequently utilized.

There is one metallurgical operation in which the first two sources of loss are avoided, viz., "Bessemer's," where, by blowing air through molten crude iron a very high temperature is attained by the combustion of small quantities of carbon and silicon contained in the crude iron; this is, however, not the case in the process of puddling, where the oxidation is spread over a considerable period of time, although the same constituents are frequently burnt in similar proportions. But even in the Bessemer process the carbon is only half burned, and a large amount of heat escapes with the carbonic oxide and nitrogen.

When, however, thin streams of air are forced through molten sulphide of iron lying on a tuyere hearth, a high temperature is produced by the perfect combustion which ensues in the midst of the sulphides, and no unburnt gases, except ing nitrogen and sulphur vapor, escape from the surface of the molten mass. The hot nitrogen and sulphurous acid may be caused to act upon iron pyrites and other mineral matter, and when pyrites are thus heated an atom of sulphur held in feeble combination is in great part expelled, and thus is obtained molten protosulphide of iron, which is subsequently burnt by the oxygen of the air driven in at the lower part of the furnace, thereby producing the heat necessary for continuing the operation. The process may be defined as a system of fractional oxidation, in which the numerous constituents of a complex furnace charge can be separated from each other and concentrated in different parts of the apparatus, the heat necessary for the operation being obtained by the combustion of a portion of the less valuable constituents.

The principal ores of all our ordinary heavy metals, except manganese and tin, are sulphides. Iron, although largely occurring in an oxidized form, is abundantly found in combination with sulphur; and bi-sulphide of iron, or iron