weight, and furthermore prescribed that a daily fine of two piasters should be levied upon each peasant who should fail to fulfill the duty thus imposed upon him in the general interest of the province. The practical results of this wise and prudent decretal were as follows: During the first day or two of the period appointed for the collection of the ova, a few rustics brought in their quota of eggs, but the large majority of the peasantry, far too indolent to take the trouble of digging them up, compounded with the powers that be by privily purchasing the necessary quantity of eggs from the officials at one piaster per kilogramme, and then making public delivery of the quantity to the employes empowered to receive it. Thus the two or three hundred kilogrammes of eggs really collected and delivered by law-abiding peasants were sold over and over again to the malingerers. These tricksters saved half the amount of their fines, the officials pocketed a piaster by each transaction, and the crop of locusts for the coming season will, in all probability, turn out even finer than that which all but ruined the Angora vilayet last year.—*London Telegraph.*

Dyestuffs from Salicylic Acid.

We are not surprised to learn that salicylic acid, now so cheaply prepared from carbolic acid, has been called upon to yield a dye, which will no doubt give a fresh impulse to its manufacture, as hitherto the consumption has been limited to medicinal and antiseptic purposes. A so-called salicylic-acid-yellow can be made from it, which is distinguished by its resistance to weak alkalies, and threatens to replace picric acid, which latter is known to be explosive and easily washed off from the fiber. According to the process employed in Schering's works sulphosalicylic acid is nitrated by treatment with nitric acid, sp. gr. 1·35, for a long time at 40° to 50° C. (100° to 120° Fah.). Or a mixture of sulpho acid and barium nitrate is treated with concentrated sulphuric acid. The nitrosulphosalicylic acid, as well as its salts of the alkalies and alkaline earths, is very solnble in water. The solution dyes silk and wool yellow without any mordant. If the nitric acid acts very energetically on the sulphosalicylic acid the sulpho group will be split off entirely. Bromine can also be introduced into it, forming either a mono or dibromo nitrosalicylic acid, which dyes still more intensely yellow. We should suppose that it would be advantageous to introduce the bromine first directly into the salicylic acid and afterward nitrating with care, since it is said that *hot* nitric acid converts bromosalicylic acid into picric acid.

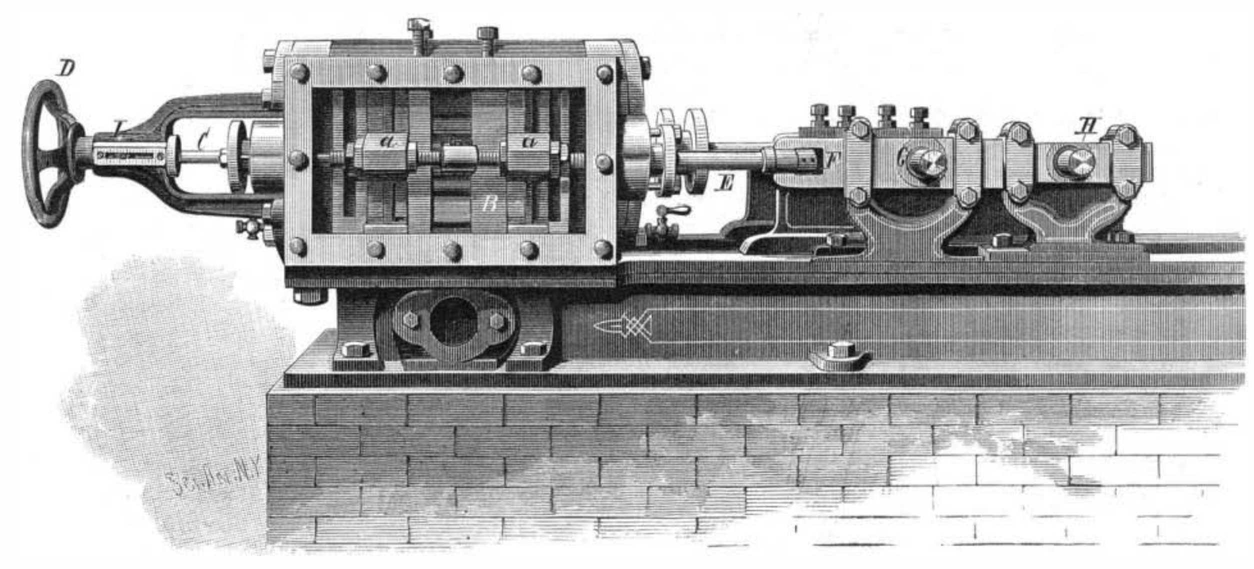
Sulphosalicylic acid also forms dyes with the phenols; thus resorcine produces a bronze red, strongly fluorescent when in alkaline solution. With diamidobenzole it yields a Bordeaux red, with diazometaxylidine a fuchsine red, and with diazoamidonaphthaline a violet dye. P. N.

IMPROVED PLOW.

The annexed engraving shows an improved device for preventing plows from choking with weeds and stalks in plowing, patented by Mr. Fernando Gautier, of Pascagoula, Jackson county, Miss. In this device the arrangement of stationary cutters and oscillating cutter is such that when the cutters are ground away by sharpening they may be readily adjusted so as to work as at first. The oscillating cutter is connected with an eccentric at its rear end, the eccentric being operated by the toothed driving wheel through gear wheels, which are inclosed in a suitable case to prevent clogging with soil or weeds. When the plow is drawn forward the drive wheel is revolved, and by means of the gear wheels and the cam, the oscillating cutter is moved vertically, passing the stationary cutters and cutting weeds or stalks that would otherwise choke the plow. The plow beam is made of cast metal, and at its forward end has an enlargement containing a vertically flaring recess, of sufficient depth to receive a short T-shaped clevis, which is pivoted in the bottom of the recess by a bolt, and adjusted in a raised or lowered position by a second bolt, which is passed through one of a series of perforations in the beam and a perforation in the clevis. The clevis is simply a T-shaped bar of iron requiring but little material, and can be more easily made than any other clevis. The handles of the plow are so arranged as to be adjusted to the height of the plowman.

Fraudulent Infant Foods.

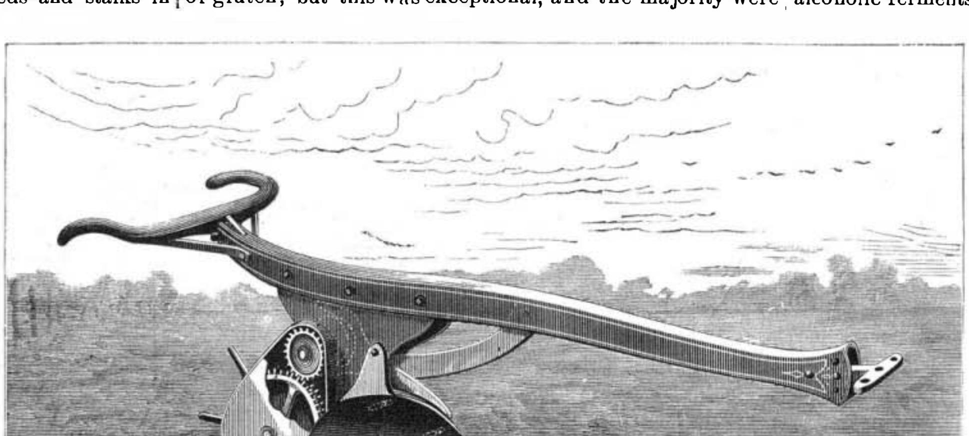
There are about twenty European preparations styled infant foods, beginning with that of Nestle, and at least twice as many American, all of which profess to furnish a complete nutrition for the infant during the first few months of its existence, while yet the conversion of starch into dextrine and sugar is beyond the capacity of the untrained digestive function. The examination of these with the microscope, assisted by such simple tests as iodine, which turns starch cells blue, and gluten (or albuminous) granules yellow, has engaged the careful attention of Dr. Ephraim Cutter, of Cambridge, and his results will startle most mothers who have relied upon the extravagant pretenses set forth in the circulars of manufacturers.



CUT-OFF MECHANISM OF THE TAYLOR MANUFACTURING COMPANY'S ENGINE.—(See opposite page.)

Eliza McDonough, who preceded Dr. Cutter in this field, has been in a measure discredited; but it appears that her assertion—that the starch, so far from being transformed into dextrine, was not sufficiently altered to render the recognition of its source difficult, whether from wheat, rye, corn, or barley—was strictly true, and that these pretentious foods are, without exception, nearly valueless for dietetic purposes. All of them consist of baked flour mainly, either alone or mixed with sugar, milk, or salts. In some cases, the baking has been very inadequately performed, and the doctor found one that consisted merely of wheat and oats whose starch cells were proximately in their natural condition.

The general result of Dr. Cutter's examination may be stated in brief terms as follows: There was scarcely a single one of the so-called infant foods that contained a quantity of gluten as large as that contained in ordinary wheat flour. That is to say, a well-compounded wheat gruel is superior to any of them, particularly when boiled with a little milk; and mothers are in error who place the slightest dependence upon them. As respects one very expensive article, professing to possess 270 parts in every 1,000 of phosphatic salts in connection with gluten, Dr. Cutter was unable to find any gluten at all. The thing was nearly pure starch, sold at an exorbitant price as a nerve and brain food and a great remedy for rickets. So all through the list. Sometimes a trace of gluten was present; more frequently none at all. In one case there were 90 parts of starch to 10 of gluten; but this was exceptional, and the majority were less valuable, ounce for ounce, than ordinary wheat flour. Considering the semi-philanthropic pretensions that have been put forth by the manufacturers of these foods, some of them sustained by the certificates of eminent physicians, the report of Dr. Cutter is one of the dreariest comments upon human nature that has recently fallen under the notice of the journalist. But if the revelations he has made of fraud and pretense on the part of manufacturers in this field shall serve to protect mothers from further betrayal and to rescue infant life from quack articles of nutriment, his work, though giving a tremendous shock to our sensibilities and to our faith in medical certificates, will not have been done in vain.—*N. Y. Times.*



GAUTIER'S IMPROVED PLOW.

Copying Drawings.

Tilhet's method of copying drawings in any desired color is thus described in the *Polytechnisches Notizblatt:*

The paper on which the copy is to appear is first dipped in a bath consisting of 30 parts of white soap, 30 parts of alum, 40 parts of English glue, 10 parts of albumen, 2 parts of glacial acetic acid, 10 parts of alcohol of 60°, and 500 parts of water. It is afterward put into a second bath, which contains 50 parts of burnt umber ground in alcohol, 20 parts of lampblack, 10 parts of English glue, and 10 parts of bichromate of potash in 500 parts of water. They are now sensitive to light, and must, therefore, be preserved in the dark. In preparing paper to make the positive print another bath is made just like the first one, except that lampblack is substituted for the burnt umber. To obtain colored positives the black is replaced by some red, blue, or other pigment.

In making the copy the drawing to be copied is put in a photographic printing frame, and the negative paper laid on it, and then exposed in the usual manner. In clear weather an illumination of two minutes will suffice After the exposure the negative is put in water to develop it, and the drawing will appear in white on a dark ground; in other words, it is a negative or reversed picture. The paper is then dried, and a positive made from it by placing it on the glass of a printing frame, and laying the positive paper upon it and exposing as before. After placing the frame in the sun for two minutes the positive is taken out and put in water. The black dissolves off without the necessity of moving back and forth.

Pasteurization of Beer.

In other countries, notably in Germany and America, this system of preserving beer has been extensively adopted, and very favorable results have been obtained. Pasteur's investigations proved that a temperature of 131° Fah. is fatal to diseased ferments, but that yeast cells are capable of withstanding this temperature. In his celebrated work on beer, Pasteur describes the following experiment:

"A number of bottles of beer which had been heated on October 8, 1871, were compared with those of an equal number of bottles of the same beer which had not been heated. The examination took place on July 27, 1872. The beer which had been heated to 131° Fah. was remarkably sound, well flavored, and still in a state of fermentation. As a matter of fact, we have proved by exact experiments that alcoholic ferments, heated in beer, can endure a temperature of 131° Fah. without losing the power of germination; but the action is rendered somewhat more difficult and slower. Diseased ferments, however, existing in the same medium, perish at this temperature, as they do in the case of wine. The beer which had not been heated had undergone changes which had rendered it quite undrinkable; its acidity, due to volatile acids, was higher than that of the other beer in the proportion of five to one; the beer which had been heated contained one half per cent of alcohol more than the other."

So important a result as is here described ought to be extensively applied; there can be no practical difficulties in the way of pasteurization but such as can be easily surmounted. The first objection that was raised to this process was the risk of the bottles bursting during the process, but this might be easily obviated by firmly fixing the corks in the bottles, and by conducting the process in a vessel so constructed that the pressure on the outside of the bottle is about the same as the internal pressure caused by the expansion of the contents of the bottle by heat. Another objection that has been raised to pasteurization is that it causes the beer so heated to become cloudy, but this is the case only to a very slight degree when the beer is raised very gradually to the requisite temperature; sudden heating will render the beer turbid and also endanger the bottles, but by gradually raising the temperature these two drawbacks are greatly obviated. It has also been urged in opposition to pasteurization that the process develops a peculiar and unpleasant flavor in beer, but this objection is not supported by any well-established facts, and we think if the process be conducted gradually no objectionable flavor will be developed. The *Brewers' Guardian* says that this system of preserving beer appears to offer many advantages, and no difficulties but such as enterprise ought easily to surmount, and we are therefore surprised that English brewers have made no real attempt to practically apply it.

Alloys.

From a recent work on "Metal Alloys," published in Germany, the author, Mr. Guetlier, gives a few suggestions on the subject of fusing the metals, with which the *Jewelers' Journal* prefaces the recipes selected.

1. The melting pot should be redhot (a white heat is better), and those metals first placed in it which require the most heat to fuse them.

2. Put the metals in the melting pot in strict order, following exactly the different fusing points from the highest degree of temperature required down to the lowest, in regular sequence, and being especially careful to refrain from adding the next metal until those already in the pot are completely melted.

3. When the metals fused together in the crucible require very different temperatures to melt them a layer of charcoal should be placed upon them, or if there is much tin in the alloy a layer of sand should be used.

4. The molten mass should be vigorously stirred with a stick, and even while pouring it into another vessel the stirring should not be relaxed.

5. Another hint is to use a little old alloy in making new, if there is any on hand, and the concluding word of caution is to make sure that the melting pots are absolutely clean and free from any traces of former operations.

Soft Alloy.—This alloy will adhere so firmly to metallic, glass, and porcelain surfaces that it can be used as a solder, and is invaluable when the articles to be soldered are of such a nature that they cannot bear a high degree of temperature. It consists of finely pulverized copper or copper dust, and is obtained by resolving copper sulphate, or vitriol of copper, into its original elements, by means of metallic zinc. Twenty, 30, or 36 parts of this copper dust, according to the hardness desired, are placed in a cast iron or porcelain-lined mortar, and well mixed with some sulphuric acid having a specific gravity of 1·85. Add to the paste thus formed 70 parts (by weight) of mercury, constantly stirring. When thoroughly mixed the amalgam must be carefully rinsed in warm water to remove the acid, and then laid aside to cool. In ten or twelve hours it will be hard enough to scratch tin. When it is to be used it should be heated to a temperature of 375° C., when it becomes as soft as wax by kneading it in an iron mortar. In this ductile state it can be spread upon any surface, to which, as it cools and hardens, it adheres very tenaciously.

Alloy for Small Articles.—This alloy melts at a lower degree of temperature than the one just described, and is very hard without being brittle. Bismuth 6 parts, zinc 3 parts, and lead 13 parts. The three metals, after having been well melted and stirred together, should be poured into another melting pot and melted again. This alloy cools with remarkably clear-cut edges, and if the articles made of it are dipped in diluted nitric acid, then rinsed in clear water, and polished with a woolen rag, the raised parts of the surface will have a fine polish, while the sunken parts will have a dark-gray, antique appearance, which forms a pretty contrast. The proportions of the different metals, dividing the alloy into 100 parts, are: bismuth 27·27, lead 59·09, zinc 13·64.

Alloy for Small Castings.—Bismuth 6 parts, tin 3 parts, lead 13 parts. This alloy should be melted, run into bars, and laid aside till wanted, when it should be remelted.

Bismuth 3 parts, tin 1 part, lead 1 part. This second alloy for small castings is harder, and yet it is not brittle. It can be finished with a contrasting surface of bright polish and dark-gray, if it is washed in nitric acid, well diluted, rinsed, and polished with a woolen rag, as described in the alloy for small articles, given above.

Hard Solder for Gold.—Gold 18 c. (0·750 fine), silver 10, pure copper 10.

Hard Solder for Silver.—Silver 66 parts, copper 23 parts, zinc 16.

Solder for Platina.—Pure gold, with one-half per cent of platinum and iridium added.

Hard Solder for Aluminum Bronze.—Gold 88·88, silver 4·68, copper 6·44.

Another Hard Solder for Aluminum Bronze.—Gold 54·4, silver 27, copper 18·6.

White Alloy.—This amalgam can be turned, filed, and bored; does not adhere to the mould, and will retain its polish a long time after exposure to the air. Cast iron 10, copper 10, zinc 80.

Solder for Iron and Brass, which Contracts and Expands at the Same Degree of Temperature as the Latter Metal.—Tin 3 parts, copper 39½, zinc 7½.

Solder for German Silver.—German silver 5 parts, tin 4 parts.

Alloys for Medals, Coins, etc.—Kraft's alloy, melting point 104° C. Bismuth 5, lead 2, tin 1.

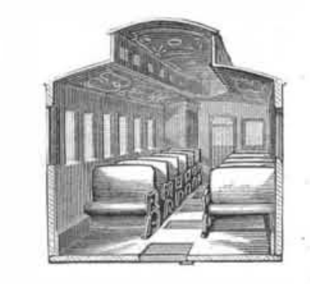
Homberg's alloy, melting point 122° C. Bismuth 3, lead 3, tin 3.

Rose's alloy, melting point 93° C. Bismuth 2, lead 2, tin 2.

Amalgam for Coating Plastic Castings.—Tin 1 part, quicksilver 1 part, bismuth 1 part. The quicksilver is to be mixed with the white of an egg, and added to the tin and bismuth when they are thoroughly melted and blended. The alloy while still hot forms a pasty liquid, which should be applied with a brush.

Safety Car.

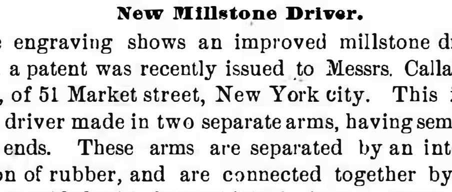
The many lamentable accidents which have occurred by reason of the inability of passengers and others in railroad cars to extricate themselves, or to be rescued, in cases of collisions, derailing, or other accidents, make it highly desirable that better means than are at present afforded should be furnished to meet this difficulty. The ordinary doors and windows of a car are generally blocked, or are otherwise inaccessible. And the object of the invention that is shown in the annexed cut, and is patented by Mr. Alfred A. Starr, of Westfield, Union county, N. J., is to provide an improved means of escape in case of accidents. The invention consists in constructing railroad passenger coaches with trap-doors in their floors within the aisles of the car, and so arranged that they open inward and toward opposite sides. Each of these doors may be nearly the whole width of the aisle, and of any desired length, and when closed are preferably flush on their upper surfaces with the floor of the car, so as to offer no obstruction to walking in the aisle. It is also desirable to hinge them in close proximity to the seats, so that the hinges shall offer no obstruction.



It is proposed to hinge the doors alternately on the opposite sides of the aisle, and it is preferred not to secure them by bolts or fastenings, so that they will be free to open of their own weight, not only when the car is inverted, but also when it falls upon its side. To facilitate the opening of the doors, they are made beveling downward on their opposite sides, and their corresponding seats are made beveling in a reversed direction, so that if violent end pressure is brought to bear upon the car the seats will act as wedges on the sides of the trap-doors to ease and open them. A car thus constructed with trap-doors that are self-opening, or may be conveniently opened either by the passengers in the car or by others from the outside in case of an accident, combines in an eminent degree the elements of safety and simplicity. Should this improvement be adopted by railroads many lives would be saved that are otherwise needlessly sacrificed.

New Millstone Driver.

The engraving shows an improved millstone driver for which a patent was recently issued to Messrs. Callahan and Davis, of 51 Market street, New York city. This is a sectional driver made in two separate arms, having semicircular inner ends. These arms are separated by an intervening cushion of rubber, and are connected together by circular plates provided with lugs which fit into corresponding recesses in the arms.



By this construction a self-adjusting and elastic bearing is provided for both arms of the sectional driver, and all jar and back-lash common to the rigid bearings are avoided. This driver adjusts the stones perfectly and insures uniform grinding, either high or low, and removes a number of difficulties that are met with in the use of the ordinary driver.

Pompeian Surgery.

An interesting sketch of the surgical instruments collected at Pompeii, aud preserved in the museum at Naples, has been given in a recent number of the *Revue Médicale* by M. Jouin. At the museum they are arbitrarily divided into surgical and obstetrical instruments, but there is little in the latter to suggest that they were intended for obstetrical purposes. A pair of forceps, for instance, classed among the obstetrical instruments, does not appear to have been ever intended for such use. The blades are twenty-one centimeters long, they cross one another, and are articulated by a pivot; the handles are curved; they are apparently similar to the instruments now used to remove sequestra, etc. There is, however, a tube clearly intended for injections into the vagina. It is twelve centimeters long; one extremity is manifestly designed to receive the nozzle of a syringe, while the other is perforated with holes, one terminal and the others arranged in two circles, so that the jet may be broken and spread, just as in the similar tubes in use at the present day. There is also a very ingenious trivalve speculum, evidently intended for the vagina, so made that the three blades can be opened or closed simultaneously. There is a rectal speculum, fifteen centimeters long, composed of two blades which can be closed or opened by means of a pivot placed in the center of the instrument, and presenting the type according to which all similar specula are made at the present day.

There are catheters for women, straight, made of silver. A curious instrument, which consists of an iron rod, at the extremity of which is a small rectangular plate of iron, two centimeters long and three wide, fixed to the rod at an angle of 135 degrees, is exhibited as a cautery for wounds, the Italian surgeons believing that it is intended to cauterize deep structures, such as the uterus or pharynx. The perfect resemblance in form to the laryngeal mirrors now in use suggested to M. Jouin that it may really have been intended for a similar use, to examine deep structures, if not the larynx. Catheters for men have also been found; they are twenty-seven centimeters long, and have a very peculiar double curve like a very long S. M. Jouin thinks that this form shows a very imperfect knowledge of the real curves of the urethra; but under ordinary circumstances this is nearly the form of the urethral canal, and although the introduction of such an instrument may have been a matter of some difficulty, its shape would facilitate the emptying of the bladder.

Among the other instruments are a metallic trocar in two pieces, similar to those in use at the present day, bistouries, very large lancets, various forms of stylets, curved and straight, some probably intended for the examination of carious teeth, curette spatulas, small forceps, and various needles and hooks. There are also some surgical cases with instruments, and cases for pills, ointments, etc. All these instruments were found in one house, and in number they will certainly bear comparison with those possessed by an average practitioner in a provincial town at the present day.—*Lancet.*

Electric Photo Shutter.

At a recent meeting of the South London Photographic Society, Mr. G. F. Williams exhibited an instantaneous shutter with an electrical liberating attachment, being an efficient trigger, which can be applied to almost any known kind of shutter or exposing valve. It can be converted into either a horizontal or rising shutter by the mere addition of an elastic spring, with a suitable catch or clutch to retain the moving part of the shutter at the end of its travel.

Mr. Williams has improved upon the clever arrangement of Gaiffe, of Paris—who patented the chloride of silver battery—by cramming two elements into one cell. As is known among electricians, this battery depends for its energy upon the reduction to the metallic state of chloride of silver by the passage of the electric current. A small plate of zinc, no larger than the little finger, has a piece of millboard placed upon it; then chloride of silver is melted in a porcelain crucible, and poured into a mould, which may be made of wood—thus casting a plate of similar size to the zinc. This plate of fused silver chloride is wrapped up in muslin and placed so that the millboard separates it from the zinc. A silver wire or thin plate of silver, laid on the plate of fused chloride, completes the "element;" but, as before stated, Mr. Williams has placed two such elements within an ebonite cell of about two ounces capacity. When so arranged the composite battery is dipped into a saturated solution of sal ammoniac and the excess allowed to drain off. No fluid is used in this battery—the elements are merely kept moist. A suitable touch-button and conducting cord completes the arrangement. The shutter being set "full cock," a touch on the button sets the electric current free; this circulates the wire of the electro-magnet, the keeper is attracted, the detent removed, the shutter moves, and the exposure is made.

Fast Railroad Lines.

The innovation of the Pennsylvania Railway in its fast trains between New York and Chicago suggests comparisons with lines abroad. The famous Flying Dutchman on the Great Western Railroad, England, makes the run from London to Exeter, 194 miles, in four hours and fourteen minutes. With four stops it attains a speed of almost 46 miles an hour. A train on the Great Northern Road makes the distance from London to Leeds, 187 miles, in four hours—almost 47 miles an hour, with four stops. The train carrying the Irish mail to Holyhead, over the London and Northwestern line, and dubbed "The Wild Irishman," has now sunk into comparative obscurity with its rate of a little less than 40 miles an hour. The morning express on the Great Northern Road makes only four stops along the line from London to Edinburgh, 395 miles, and flies over the whole distance in nine hours, with an average rate of 44 miles an hour; and on the Midland line the night Scotch express runs the 425 miles to Glasgow with a speed of 40½ miles an hour. These are the four swiftest trains in England, and, as will be seen, the Leeds express, with its rate of 47 miles an hour, is the fleetest of them all. Three out of the four trains probably beat the running time for the same distance on any other roads in the world. They are all, however, far outstripped for a shorter distance by the train on the Pennsylvania Railroad, which leaves Jersey City at 4:10 P.M., and makes the run of about 88 miles to Philadelphia in 100 minutes, with one stop, at Trenton. The 52·8 miles an hour made by this American train is probably without parallel in the schedule time of any railroad company on the globe. On both the American and English railroads it must also be remembered that for short stretches of straight track, with good road bed and favoring grades, a speed of 60 miles an hour is not very uncommon.—*Nat. Car Builder.*

The Acorn-Storing Woodpecker.

BY ROBERT E. C. STEARNS.

The acorn-storing habit of the Californian woodpecker (*Melanerpes formicivorus*) has long been known to the "country folk" and others who frequent the country and take notes by the way. Before the American occupation, the Spanish Californians had observed this curious habit, and gave the bird the appropriate and musical name, "*el carpintero*." No doubt, still further back the aborigines had their name for the *carpintero*, and regarded the bird as invested with superior power, or possessed by some unseen or hidden influence, which placed it above its feathered congeners and proved it to be in some mysterious way a little closer to the heart of nature.

It is highly probable that if we knew the traditions of the former red men of California, we should find some quaint story or curious legend connected with this ingenious and interesting bird. I find no mention of this woodpecker in either Bancroft's * or Powers' † ethnological volumes, relating to the California tribes.

During a recent visit to Napa county, I noticed near the house where I stayed, on Howell Mountain, a fallen pine of the species known to botanists as *Pinus ponderosa*, the yellow pine of the woodsmen, the bark of which was full of acorn holes.

The tree was a noble specimen, and its prostrate position gave me a chance to learn not only its dimensions, but also to ascertain very nearly the number of holes which the woodpeckers had made in its bark.

In falling, the tip of the tree had broken off, and was so hidden in the general *debris* of fragments of branches, cones, and underbrush, as to escape detection. The length was not less than 175 feet, the diameter of the butt just above the ground, five feet ten inches. At ninety feet the diameter was three feet eight inches. Above the ninety foot line the holes continued, but were so scattering that they are not included in the reckoning. Neither are those in the first ten feet of the trunk, as between the ten foot line and the ground they were comparatively few.

Between the ten foot line and the ninety foot line the number of holes to the square foot, with a fair allowance for verification, was from *sixty* to *twelve*. A piece of the bark, sawed from the tree by my own hands, which measures exactly twelve inches by twelve inches, contains sixty holes; this is a much smaller number than could be counted in the same sized piece in a great part of the section of eighty feet, while twelve is a very low minimum.

The two diameters as above given when added make eight feet and eighteen inches, the average diameter being one-half of this, or about four feet nine inches; this multiplied by three, to get the circumference, gives fourteen feet and three inches; and this again multiplied by the length of the section, eighty feet, produces 1,140 square feet.

Now, if we add the maximum and minimum of acorn holes to the square foot (sixty and twelve), we have seventy-two, which divided by two, gives an average of thirty-six to the square foot, and thirty-six times 1,140 gives a product of forty-one thousand and forty (41,040) acorn holes.

The holes are of different sizes, varying with the size of the acorn which each hole is made to receive, for these birds are good workmen, and each acorn is nicely fitted into its special cavity. Making a fair selection of acorns as to size, I find that it takes on an average seven to make an ounce (that is, picked when green); and taking that number for a divisor, it shows the total weight of acorns required to fill the holes in the tree is three hundred and sixty-six pounds seven ounces, avoirdupois. Whether any particular species of acorn is preferred, I am unable to say. The acorns in the tree above described, so far as it was possible to determine them without the cups, which the woodpeckers reject, appeared to belong to the nearest adjacent oaks, *Quercus chrysolepis*. This oak is very abundant all around the mountain, and is itself peculiar in having two forms of leaf on the same twig.

At the upper end of Pope Valley, not far beyond Ætna Springs, I noticed a standing pine of the same species as that described and of about the same dimensions as the foregoing, which was full of holes. In Knight's Valley, in August, 1879, I observed woodpecker holes closely set in the bark of a large Douglass spruce (*Tsuga douglassii*); and I have been informed by various parties that these woodpeckers also bore and deposit acorns in the bark of various species of oaks.

Sometimes the acorn holes are made in the *wood*, as I have been informed by a friend, Mr. C. H. Dwinelle, of the University of California, who has seen such holes in a species of white oak in Alexander Valley. He also related an instance of the "carpintero" sticking acorns in a crack between the boards in the porch of a house in Redwood City, San Mateo county.

Mr. J. W. Bice, of the University, has also observed acorns stored in the white oaks near Healdsburg, in Sonoma county, as well as in the cracks between the boards in and round the projecting eaves of barns and houses. Where the projecting rafters are boxed in, sometimes they will find a hole, and at other times make one, and store acorns in large quantities in such places.

In clearing land the trees are girdled, and in about two years the bark drops off, leaving the exposed wood of the trunk in a sappy state, particularly on the side which is usually in the shade, and this side is especially selected by the woodpeckers for their purposes. They not infrequently drop acorns down chimneys, where of course the result of their labor is without any advantage.

Upon turning to the volume on Ornithology in the Geological Survey of (California) publications, in reference to this species of woodpecker, it says: "They are fond of playing together around the branches, uttering their rattling calls, and often darting off to take a short sail in the air, returning to the same spot. They have a habit, peculiar to them, of drilling small holes in the bark of trees, and fitting acorns tightly into them, each one being carefully adapted and driven tight. The bark is often so full of these as to scarcely leave room to crowd in another without destroying the bark entirely. These are generally considered as laid up for a winter supply of food; but while in this climate no such provision is necessary, it is also very improbable that birds of this family would feed on hard nuts or seeds of any kind. The more probable explanation is that they are preserved for the sake of the grubs they contain so frequently, which, being very small when the acorn falls, grow until they eat the whole interior, when they are a welcome delicacy for the bird. Whether they select only those containing grubs, or put away all they meet with, is uncertain; but as they leave great numbers in the tree untouched, it is probable that these are sound acorns, and often become a supply to the squirrels and the jays."

Without questioning the foregoing as to the preference of the woodpecker for animal food, and especially for the larvæ often contained in the acorns, it is undeniable that in common with the jays, they are exceedingly fond of fruit, as many an orchardist can testify; and their predilection for almonds *before these nuts are quite ripe*, is well known to the cost of many almond growers; that they eat other nuts and also acorns to some extent, I have no doubt. The jays and squirrels are quite likely benefited by the acorn-storing habit of this species of woodpecker; and I have been told that the jay sometimes assists the woodpecker by bringing acorns for the carpintero to deposit in the bark; and further that sometimes the jays put pebbles in the acorn holes "to fool the woodpeckers;" but these latter statements, though perhaps true, need confirmation.

As several woodpeckers are engaged in the work at the same time on the same tree, their operations, as may be imagined, are carried on with a good deal of vivacity and noise, in which the jays become interested, and dart about, adding to the tumult in their own peculiar chattering way.

The latter have related singularities in the matter of food-storing, as will be seen below. The friend, Mr. Dwinelle, whom I have already quoted, states that the large thistle, which is abundant in certain places in Alameda county, owes its distribution in part to the jays, who take the seeds, which are of good size, and plant them in the ground. He further states that a friend of his, who fed Indian corn to his chickens, had observed the jays fly down and pick up a kernel and then go off a short distance and plant it; in this way he discovered how it was that stalks of maize came up and were growing where he had never planted.

Mr. Dwinelle has himself seen a jay plant an acorn in the ground of his (Mr. D.'s) house-yard or garden in Oakland. The bird deliberately made a hole, thrust in the acorn, covered it, and then put a chip on the spot, perhaps the latter as a mulch; then flew away, found another acorn, which it accidentally dropped in a growth of periwinkle (myrtle), and after searching for it without finding it, gave up and flew away.

As it is hardly presumable that the jays plant either the corn or the thistle for the purpose of perpetuating those species of plants with the object of obtaining food from future crops, it is likely that being full fed at the time, with appetites satisfied, they simply buried the seed for future need, as a dog buries a bone, and forgot all about it, or not needing the same, the seeds remained where the birds planted them, until they germinated and grew into plants.

The holes made by the woodpeckers in the bark of trees also serve as a lurking place for beetles, ants, and other insects, so that both vegetable and animal food are brought together side by side to furnish a meal in time of need, in which perhaps the jays sometimes participate. Judging by the tree herein described, it would seem as if there were enough for all.

Mr. Bice is of the opinion that the acorns are stored simply for the larvæ, which the *carpintero* eats after the maggot has attained a good size. He also relates the following, which is worthy of note: "On cutting down a hollow oak on his father's place, a woodpecker's nest was discovered after the tree had fallen, and a young bird of the *carpintero* species was found and caught, being unable to fly. It was carefully reared, and became a great pet with the family. After it had reached maturity and was perfectly able to fly, though no restraint was placed upon it, it would come at once in answer to call, leaving its fellows in the trees. Upon one occasion, when the family went several miles from home to visit a friend, the bird followed them, though at the time they were not aware of it, and only learned the fact from the friend whom they had visited, and who caught and kept the bird until an opportunity offered for returning it. Probably if it had not been caught it would have followed the family back."

There is a larger species of woodpecker, with plumage much resembling that of *M. formicivorus*, which sometimes appears in flocks, and helps itself, or tries to do so, to the stores laid up by *el carpintero*, who bravely fights the marauder. I have been unable to learn to what species these depredators belong.—*American Naturalist.*

* "Native Races of the Pacific States."

† "Contributions to Ethnology," U. S. Geog. and Geol. Survey, Powell, vol. iii., 4to.

Dubrunfaut on the Manufacture of Starch-Sugar.

In 1823 Dubrunfaut, whose death occurred last year, laid before the Society of Agriculture in Paris a memorial on the "Saccharification of Starch." In 1825 his celebrated work entitled "Art de fabriquer le sucre de betteraves," appeared. Afterward he discovered osmose, and also an "elegant" method of separating the two constituents of inverted sugar, viz., glucose (maltose, grape, and starch sugar), from lævulose (fruit sugar). A few days before his death, which was caused by the inhalation of illuminating gas, he published the following article:

The success that has attended the technical preparation of crystallized or "block" maltose, as well as the crystal sirup that can be made from it, leaves no doubt of the existence of very decisive results of the laboratory experiments, as well as improvements to be effected on a larger scale for brewers and distillers. It must be confessed that, for very important reasons, we have not been able to carry out these improvements smoothly in practice.

The question is of great interest to our own (the European) sugar makers, because the manufacture of maltose is called to be at once the helpful sister, and perhaps the rival of this industry.

Maltose correctly prepared by our method is perfectly *free* from the impurities which are found in commercial glucose, and the crystal sirups made from it have the properties of refined sugar and its derivatives as a pure substance for sweetening or fermentation. In this respect there can be no doubt that this new sugar, which like starch sugar, for instance, is less severely taxed by the government, can advantageously replace the crystallizable sugar for many industrial purposes, especially for sweetening wine.

These uses unavoidably infringe upon the domain of the wonderful products of the sugar beet (that don't apply in this country—ED.), but it must be remembered that the manufacture of glucose is destined to invade the sugar-boiling establishments themselves, because it makes it possible to keep the whole of the auxiliary apparatus going during the entire year. Then, too, if we recollect that the foundation of this sugar, its raw materials, are *agricultural* products, which, when used in this way, leave nutritious residues, it will be easy to see that the new maltose industry is really an *element* of progress for the interests engaged in the manufacture of sugar comparable with those which would arise from a new use of crystallizable sugar.

Although in our domestic factories the maltose industry would naturally take its place at the close of the sugar campaign, we do not need to postpone our project of introducing this industry until the end of the season, and if, as we do not doubt, our other new process of "making sugar without molasses" ends with the year, the campaign will end in January. Then those factories that use our "no molasses process" will be able to introduce the new maltose manufacture as early as January too.

The editor of the *Chemiker Zeitung*, from which we take the above, expresses the opinion that the distillers who are already converting sugar into starch by *rational* methods, would be better able to undertake the manufacture of maltose than the beet sugar factories referred to by Dubrunfaut.

Effects of Heat on Electrical Conduction.

Prof. F. Guthrie, F.R.S., recently read a paper on the discharge of electricity by heat. He showed by means of a gold leaf electroscope that a red hot iron ball, when highly heated, would neither discharge the positive prime conductor of a glass electrical machine nor the negative one, but on cooling the ball a temperature was found at which the ball discharged the negative conductor, but not the positive one. Lastly, on cooling the ball still further—but not below a glowing temperature—it was found to discharge both positive and negative electricity. A platinum wire rendered red hot by the current also discharged a negatively-charged electroscope more readily than a positively-charged one. When placed between two electroscopes, one having a + and the other a — charge, it discharges neither. When the + one was withdrawn the — was discharged, but when the — was withdrawn the + was not discharged. There therefore seemed a tendency in a hot body to throw out + rather than — electricity. These are interesting experiments, and open a little room for discussion *versus* positive and negative electricity.

Magnetic Properties of Steel and Iron.

MANY investigations upon the relation between the molecular conditions of iron and steel produced by heat, by torsion, and by annealing processes, and the resulting changes in magnetic conditions, have been made. It appears from the paper of Louis M. Cheesman that the effect of mechanical hardening has not been properly investigated, and this paper contains the results of his investigation upon this point. The method of research consisted simply in determining the magnetic moment of the magnetic bar after it had been subjected to well devised mechanical pressures. The result of his investigations is summed up as follows: Iron in a mechanically hard condition can receive more permanent magnetism than in a soft condition. The magnetic moment of a steel magnet in a mechanically hard condition is greater or smaller than in a soft condition, according as the ratio of its diameter to its length is less or greater than a certain limit.—*Ann. der Physik und Chemie.*