After having been examined as to its exterior appearance, the ingot is taken without delay into a heating furnace, heated to a uniform good yellow heat, and hammered or rolled out to a rectangular or quadrangular bar of not over a square inch in section. This bar is cut instantaneously in pieces of one and a half or two feet in length, and the pieces are brought over to a small forge, there to be tested by a blacksmith. If there is no bar mill nor steam hammer at the works, the ingot, being made of a smaller size, is to be treated at the small forge exclusively.

The fuel used in the small forge for the following operations should be charcoal. If mineral coal is used it must be carefully selected so as to be free from pyrites and other minerals or compounds containing sulphur.

TESTING.

Testing has for its object to discover if the metal is of a good or bad quality in general as well as to investigate its special qualities and aptitude. It is done by forging, hardening and welding: to which three kinds of manipulations there may afterwards be added experiments in relation to the tensile strength and the chemical composition of the metal. The three first-named simple operations will be sufficient, however, for the ordinary and regular testing and classifying of the metal produced by each charge.

FORGING.

Forging is done by heating one or several pieces of the metal in a smith's fire to a good yellow heat, and by hammering, working and distorting it in different ways to show the malleability, the toughness and the equality of structure in the metal. This can be done by all the ordinary kinds of blackmith operations. A very good way to show the two last-named qualities of the metal, I consider to be the following forging operation: Forge a bar about one-eighth inch thick and one-half inch broad. Cut one end straight off, and split the bar in this place and in the middle of its width to a length of one inch or more; bend the two separated parts around on both sides, and make a large round hole to the middle of the intact part of the bar, very near the end of the split, so as to present the succession of shapes, C, D, E, as shown in Fig. 3. If the metal at *e*, in the top of E, gets very thin by extending the hole, without cracking through to the split, the metal is proved to have a high degree of toughness and a very uniform structure, equal in different directions. An ordinary and well-known testing operation, which should never be omitted, is to bend a bar similar to the one above described in several different places, and to hammer the bent parts close together, to see if the metal is liable to crack by bending. The shape of the bar, produced by this operation, is represented at F, Fig. 3.

Every good kind of metal should withstand these two trials without injury. If not, it is not blown enough, or two much, or it contains chemical impurities. In all these or similar operations, at first to be made, great care has to be taken that the temperature of the metal never exceeds a good yellow and never decreases below a dark yellow heat. For in both these instances the metal, being steel-like and perhaps of an excellent quality for many purposes, may crack, owing to the improper temperature. If the bar cracks more or less easily at the yellow heat, it has to be tried afterwards at a white welding heat, and if it keeps good in this state, it shows that the metal is a kind of inferior wrought iron. In all cases the metal has to be tested by simply hammering it at a red heat to see if it is inclined to be red-short.

HARDENING.

Hardening, considered as a testing operation, is chiefly employed to discover if the metal is of a steely nature, because steel is capable of being hardened and tempered and wrought iron is not, or but very slightly. A bar half an inch square is prepared, heated in the smith's fire to a light red, and dipped in water till it is cold enough to be held in the hand. The bar is then laid across an anvil, and strokes are applied with a hand hammer on its free end till it bends or breaks. If the bar so treated does not bend at all, only giving way for a moment to the blow, instantly returning to its former shape by reason of its elasticity, and breaks at once by a harder blow, exhibiting an even or conchoidal fracture, fine-grained structure and bluish gray color, we have a hard kind of steel before us. If, on the contrary, the bar does not show any degree of hardness or elasticity after having been suddenly cooled in water, but gives way to each stroke applied to its end without returning to its original shape, and is so bent gradually to a right angle or further, showing, when finally broken, an uneven and fibrous structure and pretty dark color, the metal is wrought iron, and the results obtained in forging will show whether it is a good or a poor kind of iron. But most of the products of the Bessemer process are of a quality between the first mentioned and the last kind. Nevertheless these products, when free from chemical and mechanical impurities, prove useful and very excellent for certain purposes, and therefore a well-determined classification of these different kinds of metal, as proposed hereafter, will doubtless be exceedingly valuable.

WELDING.

Welding, when tried with the metal, will serve to complete the tests of the qualities and the degree of usefulness of our Bessemer products.

A bar about half an inch broad and a quarter of an inch thick, is heated in the smith's fire, bent in the middle and hammered down, so that the two parts come together closely. It is then put back into the fire to be heated to a regular white welding heat, using some pure sand or powdered puddling cinders, hammered, cooled in water and broken. If the metal has the welding property in a high degree, as pure Bessemer metal generally has, the seam should not be at all visible in the surface of the fracture.

The result of this operation, however, very much depends on the skill and good will of the operating workman, and a good and reliable smith has therefore to be chosen for the purpose. If the metal is of the harder kinds, hammering has to be done with care and caution.

Welding of Bessemer metal is, in general, one of the most interesting and yet least understood points in this new branch of industry. Ordinary wrought iron welds better than ordinary steel, and corresponding with this fact it may be said that the softer kinds of Bessemer metal weld better generally than the harder ones. But even the hardest Bessemer product very seldom offers in welding so great difficulties as ordinary cast steel, and all steel-like kinds of it are, when compared with the corresponding kinds of steel made in the ordinary way, good welding materials. It occurs, however, not as a rare but a very strange fact, that metal of some one other Bessemer charge, independent of its other qualities, proves entirely unfit for perfect and reliable welding. I shall, perhaps, on some other occasion, communicate some observations on this subject. Remelting the pig iron used in the process, with the mode of doing it, seems to affect this property of the metal.

The three simple testing operations just explained are generally sufficient to determine very nearly the kind and the aptitude of the material produced by a Bessemer charge. However, the trial of the tensile strength and the chemical analysis of the metal are often of great importance too, and every Bessemer works should have the apparatus necessary for ascertaining them. But they require a longer time and may be done after the tests just described. The modes of conducting them are similar to those employed for other kinds of steel and iron.

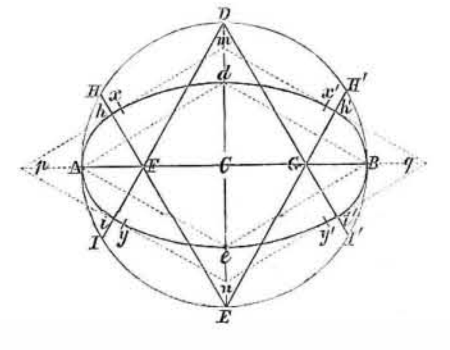
It is also useful to carefully observe the color and qualities of the resulting slags. There will always be found a more or less visible connection between their appearance and the qualities of the metal, if one and the same kind of pig iron is used.

Science Familiarly Illustrated.

How to Draw an Ellipse in Isometric Projections.

J. Konvalinka, of Astoria, L. I., gives the following method for drawing an ellipse such as is required in perspective drawing for the representation of a circle; where the three principal planes are viewed at equal angles and the side horizontals drawn at an inclination of 30°.

First, draw the two diagonals, A B, D E. Then with the radius of the circle, which is to be represented in perspective, describe the circle, A D B E. From the points, D and E, and with the radius of the circle mark on it the sextant and points, H H' I I'. Then draw the lines, D I, D I', E H, E H'. From the crossing points of these lines, F and G, describe the arcs, *i* A *h*, and *h'* B *i'*, which form the ends of the ellipse. These are then united by the arcs, *h d h'* and *i e i'*, from the centers, E and D.



This will more closely and correctly represent an ellipse for the above-mentioned purpose than that shown in Fig. 2 on page 21 of the present volume of your journal. It will coincide in eight points with a true ellipse. Suppose A *d* B *e* A is a square, inscribed within, and *p m q n p* a square, circumscribed around the circle and represented in perspective. A *d* B *e* are four points. *x x' y y'*, are other four points. These are the centers of the sides of the outer square, which at these points touch the ellipse as tangents. This will show how little the curve herewith represented differs from a true ellipse, and it also affords an easy means for correction by hand, if something more exact is required.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

Action and Reaction---The Proper Unit of Measure for Force.

MESSRS EDITORS:—The interesting and instructive article in a recent number of your paper, by Prof. Seely, on the "Recoil of Guns," shows a great intimacy with the subject, and is practically valuable. I wish, however, to object to the doctrine therein advocated, that action and reaction are not always equal, and to the concomitant doctrine, which was advocated by the celebrated Leibnitz, that the force of a moving body is proportioned to the mass into the *square* of the velocity instead of the simple velocity.

Since the velocity of the gun is clearly shown to be to that of the ball, inversely in proportion to their respective weights it undoubtedly follows that if we admit the Leibnitzian measure of force to be correct, i. e, the mass into the square of the velocity, the force of the powder will, under this supposition, be expended *unequally* between the gun and the ball, that acquired by the latter being as many times greater as it is lighter than the former. But the truth of this supposition is the real point at issue, and it was for many years the subject of a violent controversy between Newton and Leibnitz and between their respective followers. It was at last generally admitted that the dispute was one of definitions rather than facts, either party being in the right providing his definition of force, and of its mode of increase or *diminution*, could be admitted as true. Since that time the Newtonian measure, the mass into the velocity, has been generally adopted as the measure of the *quantity* of a force or a motion. Some attempts have been made to revive the Leibnitzian view of the subject, and Prof. Treadwell read an ingenious paper for that purpose before the American Academy at Boston, some years ago. The eminent mathematician, Prof. Peirce of this country, and the distinguished Dr. Mayer of Germany have also, though somewhat less decidedly, expressed themselves in favor of this revival. The difference in the two ways of estimating the quantity of force associated with a given body in motion, depends upon whether the *time* which elapses, or the *space* which is passed over, while the entire force of the moving body is imparted or overcome by a uniformly accelerating or retarding force, is made the coefficient of the unit of measure.

The Newtonian, and it seems to me, the true conception of the subject is this:—a uniformly acting force, like gravity at the earth's surface, for instance, will add equal increments of force to a body upon which it acts freely, in equal periods of time, and its entire force, since its velocity increases uniformly, is simply as its velocity, and not as the square of its velocity, for if unequal increments are added in equal times, then the cause must act variably, which is contrary to the supposition. The passage of a body through space is not an evidence of the *expenditure* of force, since a moving body, if unopposed, will traverse an infinite distance. A certain portion of the space traversed, then, has no relation to the expenditure of force, and it accordingly follows that the entire space is not a proper co-efficient of the force expended.

Suppose a person to walk with a certain uniform speed upon the deck of a steamboat. He will perceive no difference in the amount of effort required, whether the boat be stationary or in motion, or whether the direction in which he walks is the same as, or opposite to that of the boat's motion. But if the Leibnitzian measure of the entire quantity of force be correct, the force expended under the different circumstances must be widely different. If we suppose the boat's velocity to be 12 miles an hour, while the person walks at the rate of four miles in the same direction, the additional velocity thus attained will impart an increased amount of force beyond that attained by walking on a stationary boat in the proportion of 112 to 16, or 7 to 1. For the square of the walking velocity on a stationary boat is 4×4=16, while the force required to walk forward at the same rate of speed while the boat is in motion would be determined thus: The square of the velocity unincreased by walking would be 12×12=144, increased by walking, 16×16=256, the excess being 112 which is the Leibnitzian value of the different amounts of force in the two conditions. This discrepancy of theory with fact, is greatly increased when we consider the immense velocity of the earth in its motions around its axis and around the sun. The reasoning by which the attempt is made to overthrow the almost self-evident axiom of the equality of action and re-action also leads to the fallacy of applying a measure of one kind to estimate the quantity of something of an entirely different kind. While the product of the mass into the square of the velocity or the equivalent product of the uniform or average intensity of force into the *effective space* is a proper measure of other space products or space effects of the same kind, it does not follow that it is a measure of simple and absolute force.

The proper definition of force seems to me to be,—*that which when associated with water causes it to move.* No mode is known by which we can determine the *absoluteness* of rest or motion and no *practical* error, is found to arise in assuming that the motion of any given body is merely *relative*, or in considering the body as at rest, when referred to another body moving with the same velocity, and in the same direction. The above definition of force thus becomes sufficiently comprehensive to include all that causes *change* of motion whether by acceleration, retardation or change of direction. Since no error ensues from the assumption of the *relativity* of motion it follows that equal increments of force are added or subtracted, in equal units of time, when the velocity of a body is uniformly accelerated or retarded, and consequently that the measure of force in the body is found by multiplying the *mass by the velocity.*

I am, however, quite ready to admit that, while it is not the measure of absolute force, the product of the mass into the *square* of the velocity is the measure of *practical results.* All the operations of mechanics, and even of every-day life, consist in *overcoming resistances*, by which is meant, changing the positions or relative positions of bodies or parts of bodies where *effort* is required. This is called the *performance of work*, and is measured by the product of the resistance into the space through which it acts, or, what amounts to the same thing, the mass into the square of the velocity of the body doing the work. It includes what is called the penetration of bodies, and the overcoming of friction, or, in general, of any kind of resistance. The force acquired by a body falling one hundred feet in vacuum, will lift another body, if thus expended, to a height of one hundred feet or it will lift ten similar bodies to the height of ten feet, or one hundred similar bodies one foot, etc. Since the velocities attained by falling bodies must be squared to make them proportional to the distance fallen, it follows, that these *space effects* are proportional to the squares of the velocities of the gun and ball, are proved to be inversely as the masses, we readily perceive that equal quantities of force are acquired by the two, and that "action and reaction are equal and opposite," as was propounded and demonstrated by the immortal Newton. We also perceive that the *space effects*, the *penetrative power* or the power of *performing work*, are *unequal* being in inverse proportion to the weights or in direct proportion to the products of the masses into the squares of the velocities.

HENRY F. WALLING.

New York, Feb., 1867.

Patent Law Amendment.

MESSRS. EDITORS:—I am at a loss to know why Congress repealed section 6th of the patent law of 1842. It was certainly not done in the interest of inventors. The way the law stood, as I understand it, parties unauthorized by patentees or their assignees could not stamp a patented article nor use it unless stamped, without making themselves liable to a penalty of not less than $100 and costs. As it stands now, no one is required to stamp a patented article. For anything I can see in section 5th, persons may use patented articles provided they are not stamped. If patented articles are not stamped there is no very great inducement to stamp unpatented ones.

The two sections together are a protection to inventors to the extent of the penalty attached. As the law is now it amounts to very little. If you take the same view of the matter I do you will use your influence to have section 6th re-enacted, but I am no lawyer.

You may be pleased to know that I am doing very well, for a poor man, with my patent obtained through your Agency. I made a trip this month with my bee hive, and in four days I cleared $150, and I have done better in less time.

JAS. S. MARSHALL.

Greenville, Pa., Jan. 29, 1867.

[We think the amendment to which our correspondent refers is a very good one. If patentees fail to stamp the date of their patents on the articles offered for sale, or upon the packages so as to give public notice of the existence of the patent, they cannot recover from infringers.—EDS.

Proving Guns by Measurement.

MESSRS. EDITORS:—In the London *Mechanics' Magazine* of Dec. 21, 1866, appears an account illustrated by engravings of an instrument for "proving guns by measurement," by Mr. Joseph Whitworth. This instrument is identical, both in form and principle, with the star gage, which, for at least a quarter of a century, has been used in this country by the Ordnance officers of the Army and Navy for proving guns by measurement, but it is described by Mr. Whitworth as designed by him.

The star gage is believed to be of French origin, though it has been much improved since its introduction into service in this country, but the "Calibre Star," described by Tousard, and referred to in an order of the Duc de Choiseuil, dated March 31, 1766, in relation to the inspection and proof of French cannon, is undoubtedly the original of the present instrument.

As the star gage is fully described both in the Army "Ordnance Manual" and the "Instructions for the Inspection and Proof of Cannon," for the Navy, as well as in various works on Ordnance and Gunnery published in this country, it is not necessary to describe it here; but any person who will take the trouble to compare any one of the above cited descriptions with that of Mr. Whitworth, will see at once that the instruments are the same.

~~How then can Mr. Whitworth claim this instrument~~ as having been designed by himself? Can it be possible that so distinguished a mechanician and artillerist as he, could be ignorant of the existence of an instrument that has, for so long a time, been considered as almost absolutely essential for the measurement of guns? Or has he really made an invention which is already a hundred years old! U. S. N.

Washington, D. C. Feb. 7, 1867.

A Substitute for Writing Ink.

Messrs. Editors:—Not long since, I read in one of your papers a dissertation relative to the qualities of writing ink. I will simply state to you, that for the last twenty years, I have been doing a large amount of writing, and that during that time, I have used common India ink, simply disolved in water. It being composed of carbon, and little else, it will keep in any climate or place from year to year, perfectly sweet. Even freezing does not injure its good qualities, a simple cover is all that is required to prevent evaporation and keep the dust from falling into it. I have never used any kind of ink that would flow from the pen with that ease and agreable freeness that this *hydrate* of *carbon* does. The stroke of the pen made with it is quite black if desired, and will endure unchanged to all time provided the paper or parchment remain sound, and even papers that have been burned and not fallen to pieces, with this kind of writing upon them, remain quite plain to read. F. S.

[Ordinary writing ink is a modern invention. The ancient ink was such as our correspondent finds best. It is still used by the Chinese and Japanese.—Eds.

Inventions Patented in England by Americans.

[Condensed from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,392.—COATING FOR PAPER AND OTHER MATEPIALS DESIGNED TO RECEIVE LEAD PENCIL MARKS WHICH MAY BE REPEATEDLY EXPUNGED WITH MOISTURE.—Sylvester Schoonmaker, New York City. Dec. 24, 1866.

3.—BENCH PLANING MACHINE.—Joseph Jones, Newark, N. J. Jan. 1, 1867.

36.—WATER DELIVERY NOZZDE, EMPOYED IN THE EXTINCTION OF FIRE.—William Barbour, Lawrence, Mass. Jan. 5, 1866.

46.—AUGER.—Amasa C. Kasson and Nelson C. Gridley, St. Louis, Mo. Jan 7, 1867.

70.—ELLIPTIC OR OTHER ELASTIC SPRINGS.—Edwin M. Chaffee Providence R. I. Jan. 11, 1867.

[Reported for the Scientific American.]

MANUFACTURE OF BEET SUGAR.

BY JOSEPH HIRSH, PH. DR.

THE production of sugar from beets, and the establishment of a branch of industry which has now attained huge proportions, is not, cannot be, traced to a mere accidental discovery, but is the legitimate result of careful and long-continued observation, study and diligence, ever combatted by a cold northerly climate. A detailed account of the advance in the manufacture weuld show progress made step by step against the greatest prejudices, while ridiculed and pronounced hopeless even by such men of science as Liebig. Yet, in spite of almost insurmountable difficulties, the world did move; and while France in 1829 produced 80,000 pounds of beet sugar, the supply in 1858 was increased to 98,452,182 pounds, or 492,260 tuns, made in 600 manufactories.

Only so late as 1747, the German chemist, Markgraf, published the results of his experiments with different roots, especially the beet and sugar beet, in which he proved the presence of crystallizable sugar, unknown or doubted until then. His discovery remained a scientific curiosity merely, without bearing any practical results; and it is to his talented disciple, Francis C. Achard, that the credit belongs of examining anew all the plants which, in the cold northerly zone of Europe could be raised with profit for the production of sugar, and of being the pioneer in the art, by erecting in the year 1796 the first large establishment for the production of beet sugar, situated in the county of Cuneva, in Silesia. In 1799 and 1812 he published his first complete treatise on beet sugar, which was so precise, distinct and plain, and moreover was treated in such a thorough practical manner, that it aroused the attention of the English sugar merchants, and caused them to make him the generous offer of 50,000 Prussian thalers, on condition that he would discontinue his experiments with beet sugar, and so kill this industry at its birth. Nobly refusing this offer, the sum was subsequently quadrupled, in the hopes of inducing him to publish another work setting forth that his enthusiasm for the beet sugar manufacture had carried him too far, and that experiments on a large scale had not realized his expectations. This offer was also declined. The English merchants had now become thoroughly alarmed at the progress the new manufacture was making on the continent, and made one last effort to crush it, by engaging Sir Humphrey Davy to write a work in which he sought to prove that beet sugar was bitter. But even this very learned treatise was of no avail, for all over Europe beet sugar was consumed, and its bitterness was pronounced to exist only in England. Napoleon's continental blockade, at the beginning of the present century, stimulated the new industry; and though the enterprise was encouraged by all the crowned heads of Europe, yet the main practical and successful aid was given by Napoleon I., to whom belongs the honor of being the second founder of the beet sugar industry.

The discussion of the beet sugar manufacture should be preceded by that of the beet itself, and its cultivation. The sugar beet cultivated in Europe is known under several varieties, the favorite one being the Silesian. A cross section of this beet exhibits a white, dense structure, in a few of its varieties, having concentric rose-colored rings about three eighths of an inch wide. Its juice has a concentration of 8° to 9° B, and contains but a small proportion of impurities. A second variety of beet is the Burgundy, which grows out of the ground, has a loose porous texture, a great deal of highly diluted juice, and on this account is undesirable for the production of sugar. The properties of a good beet are the following: uniform shape, and if possible without branchings or forks, as these are likely to retain impurities from the field, impart them to the juice, and impede the production of crystallizable sugar. The beets should not weigh less than one pound, nor more than five, smaller ones being washed and ground only with difficulty, while those larger generally have a too diluted juice. The beet should further have a firm, uniform texture, should make a loud cracking noise on breaking, and should sink in water. Those that break readily are easily ground to pulp, a necessary property, while half dried old beets are somewhat elastic, and therefore difficult to be reduced. It is also desirable that the beet should be white, although this is not necessary. The juice should be sweet, concentrated, and contain few impurities, its concentration varying from 4° to 12° B. The beet should not grow above the ground, as that portion has a loose texture, a thick skin, a watery juice, is rich in salt and poor in sugar, and freezes easily during cold winter nights. To obtain these results the ground should be well plowed, manured a year before planting (the best previous crop being wheat, although beets may be grown successively for a number of years without exhausting the ground). Nitrogenous manure is to be avoided, as it increases the nitrogenous protein substances of the beet, consuming its entire vital power while its proportion of sugar remains small. The best time for sowing is between the latter part of March and the first of May. The sowing is made diagonally through the fields, as this uses space more economically than the square way of planting. The seed should be not over one year old, and is to be put in the ground abundantly to insure a full harvest. Rainy seasons are dreaded, as too much moisture produces large beets containing a watery juice, many salts, and but little sugar, while dry seasons commonly produce good beets. The time of harvest lasts from September to October, the latest crop being always the sweetest. When pulled the loose dirt is shaken off, the leaves and side branches are cut off, and remain to act as manure for a future crop. The yield per acre varies from 12,000 to 18,000 pounds, the average being perhaps 15,000, which is equal to about 1,200 pounds of raw sugar.

The thorough cultivation of the beet is the first condition of success, as a poor beet opposes too many difficulties to its economical employment. The best ground for beets is black mold, humus or sandy or limeyloose ground; clayey soil, as it retains too much moisture, is less desirable. The beets, after harvesting, must be preserved from frost, by storing in ditches three feet deep and three feet wide, in which the ground is pounded firmly, covered with straw or boards about four inches, then with a layer of earth about six inches high. At distances of six feet bunches of straw are placed in the ditches, to act as escape tubes for the vapors arising from the beets. These ditches are generally made 60-120 feet long, the piles of beets reaching three feet above ground. Occasionally these piles are made entirely above ground and covered with a layer of earth ten to twelve inches high. Thus preserved the beets will keep until March. In Russia, occasionally, wooden sheds are used, under which, upon strips of wood or in baskets, the beets are piled four to six feet high; this mode of keeping is cheapest in the end, although the first cost is considerable.

The production of juice in a pure state necessitates the thorough washing of the beet, for which purpose a drum is employed, made of wooden strips, about ten feet long and four feet in diameter. The drum lies somewhat inclined to one side, in a tank filled with water, into which it reaches to the depth of a foot. The beets fall from a large hopper into the drum at one end, passing out at the other upon an inclined plane, whence they are conveyed by a large archimedean screw, traveling in an upward direction against a continuous current of fresh water, until the cleansing is completed.

After washing, the decayed portions, beet tops and rootlets, parts containing juice poor in sugar and rich in salts, are removed by revolving knives, and what remains is thence conveyed to the crusher or rasping cylinder, revolving six hundred times per minute, and is rapidly reduced by it to pulp, and in this condition is removed to the presses. The rapidity with which this operation is completed corresponds to the the acuteness of the angle between the direction of pressure of the beet, and the tangent of the cylinder at that point; for if that angle is a blunt one, the saws will simply scratch and not cut the beet, hence the pressure must always be directed against the lower side of the cylinder. During the operation of crushing, a continuous current of water cleanses the cylinder, dilutes the juice, and facilitates its removal from the pulp. The latter contains now forty per cent. in volume, or about one per cent. of its weight, of air. The cylinder and pulp box are cleaned every six hours, to prevent oxidation of the juice.

The pulp, as fast as made, is spread on cloths made of raw silk, the whole being supported by perforated plates of sheet iron. These charges, to the number of thirty or more, are placed under a dydraulic press, and a pressure is applied at first of from fifteen to twenty atmospheres to the square inch, gradually increasing to one hundred and twenty to two hundred atmospheres.

The pressing surface is generally twenty-four inches, and each press cloth is charged with sixteen pounds of pulp. The pressure is regularly increased for from eight to fifteen minutes, remains thus for some five minutes, and is then released; the juice expressed during this operation ranges from eighty to eighty-four per cent. of the weight of the beets.

Beside silk, wool, horsehair and hemp, are used for press cloths. Frequent washing of these is necessary, ammonia commonly being added to the water to neutralize acidity, and dissolve slime; soda and lime were formerly used for this purpose, but it was found that these soon weakened the fiber of the cloth. The pressed cakes are used as cattle feed.

Another method of separating the saccharine juice from the pulp, first introduced by Schöttler, is by placing it in a metallic cylinder finely perforated and caused to revolve at the rate of one thousand revolutions per minute. The centrifugal force causes the juice to be expressed, but a great amount of fine pulp is driven out with it through the meshes, causing trouble in the subsequent operation of defecation. By this method, also, an immense amount of froth is produced, which has to be run separately into a vat, and condensed with steam. A charge for a centrifuge is two hundred pounds, and this is exhausted in fifteen minutes, or thirty charges can be made easily in an hour. Among other methods which have been used may be mentioned ordinary rollers, pressure with compressed air or gases, there have been tried, though with but little success. The method of maceration lately come into use, recommends itself for its completeness and simplicity, also in that it does away with expensive pumps and presses. In the cells of beet pulp, in contact with water for some time, an endosmotic process is carried on, the water entering the cells and giving out the saccharine juice, until the liquid within and without possesses an equal density. If, then, one hundred pounds of beets, reduced to pulp containing ninety-six pounds of juice, are mixed with an equal weight of water, endosmosis will produce a juice of half the original strength, but double the quantity. If this be withdrawn, and the same proportion of fresh water be again added, the juice contained in the cell of half the original strength is again reduced, possessing then one quarter of the original strength. If a juice contains eighteen per cent. of sugar, which is a fair average sample, the progress of this reducing process for six consecutive times leaves a juice in the pulp of but one quarter per cent. of sugar, or one almost free of saccharine matter. The juice obtained by all these dilutions is too watery for economical evaporation, and must be concentrated by the same process by which it was diluted.

The juice obtained from the first dilution of the original juice of sixteen per cent., contained eight per cent of sugar. If this now be brought in contact with its weight of fresh juice of sixteen per cent., a mixture will be the result containing twelve per cent. Continuing this process six times as before, the final resulting liquid will contain 15.875 per cent. of sugar, or almost its original concentration. These results, however, are not always to be obtained completely in practice.

The process of maceration now chiefly employed on a large scale is that introduced by Schuetzenback, and consists in placing the beet pulp in vats provided with an agitator, to keep it constantly in motion. The vats have a false perforated bottom, for the complete removal of the liquid, and a corresponding perforated top, the holes of which serve as distributors of the exhausting medium. Twelve tubs form a battery, and the transmission of exhausting liquor between the different exhausters is effected by means of a rotary pump. The motion of the agitator should be about twenty-two turns a minute, neither fast enough to make much froth, nor so slow that the pulp will float. This process furnishes eighty-nine per cent. of beet juice.

Recent American and Foreign Patents.

der this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

HYDRAULIC CLOTHES BOILER.—M. W. Staples, Catskill, N.Y.—This invention relates to the manner in which a circulation of water through a clothes boiler is produced in the process of washing clothes.

MARKING ROLLER.—L. R. Witherell, Galesburgh, Ill.—The object of this invention is to provide a simple and expeditious method by which the trade brand of merchants, dealers and manufacturers may be affixed to their goods and wares and boxes, barrels, and packages may be accurately and expeditiously marked without the use of the marking brush or stencil plate as now used.

CORN PLANTER.—John N. Arvin, and Joseph M. Whitmore, Valparaiso, Ind.—This invention relates to an improvement on the arrangement of a machine for planting or dropping indian corn automatically in regular checks without furrowing.

NURSERY PLANTER.—J. Warren Clark, Iowa City, Iowa.—This invention relates to the planting of hedges or any small plants in rows, as practised by nursery men or horticulturists. It consists in providing a box wagon made tight to hold water mixed with earthy matters or compost, forming such a puddling compound as is usually applied to young plants and trees when set out to insure their vitality and growth, having connected with it an apparatus for running a narrow furrow or trench in the earth and conducting the fertilizing compound directly into said trench behind the plow or coulter employed for opening it.

HAMMER.—J. Yerkes, Fox Chase, Pa.—This invention consists of a cast iron hammer with claws which are produced by splitting or sawing in such a manner that the edges of said claws are rendered sharp and capable of taking a firm hold of nails or other articles.

CULTIVATOR.—W. J. Oxer, Williamsport, Ind.—This invention consists in the combination of peculiarly shaped iron bars to form the frame of the cultivator as herein after more fully described.

EVAPORATOR.—H. C. Gilbert, Cambridge, Vt.—This invention has for its object to furnish an improved means by which the evaporating or drying pan may be removed wholly or partially from over the fire.

NURSING COUCH.—James H. Cogshall, Lexington, Mich.—This invention has for its object to assist the mother in nursing her child by compelling her to sit upright, and at the same time giving that support to the muscles of the arm which she required.

GATE LATCH.—W. T. Wells, Decatur, Ill.—This invention has for its object to furnish an improved adjustable gate latch constructed without springs and so arranged that the holt will be thrown quickly into the catch, that it cannot be opened by cows or other cattle, that it may be readily adjusted to accommodate the position of a shrunken or sagged gate or post, that it will not be liable to get out of order, and that it will be easily attached to the gate.

BELT LAP CUTTER.—Charles E. Robinson, Concord, N. H.—This invention consists in attaching the knife to a grooved sliding block working in grooves in the top leaf or upper part and provided with a handle of the machine in the combination of a rubber or other elastic seat with the lower leaf or part of the machine, and in hinging the lower and upper leaves or parts to each other.

HYDRAULIC PUNCH.—Joshua B. Barnes, Fort Wayne, Ind.—This invention has for its object to furnish an improved punch by means of which more work, with less power, and in a less time can be performed than can be done with the ordinary punch; and which can be used upon a boiler, inside or outside whereever it can be got upon a flange.

WHEAT DRILL.—Jacob Slauder, Osborn, Ohio.—This invention relates to an improved machine for sowing wheat and other small grain or seed in drills, and consists in arranging positive gearing in connection with the driving wheels of a truck and an endless screw for feeding the wheat or other grain with certainty and regularity in just the desired quantity from a hopper.

MACHINE FOR BENDING SKELP FOR TUBING.—John Peace, Camden N. J.—This invention relates to the manufacture of metal pipes or flue tubes, and consists in an arrangement of dies for clamping and bending the skelp or iron plate into shape preparatory to welding the edges or laps so formed for making the tubes or flues.

HORSE POWER.—Theophilus Harrison, Belleville, Ill.—This invention is designed to obviate the great loss of power caused by friction, in transmitting the power of the horse or horses to the machinery to be driven. In the single pinion horse powers a great deal of friction is produced by the pressure of the master wheel on its pin or axis; and in the double pinion powers, as well as others designed to obviate the friction above specified, the arrangement of the gearing together with its complexity, produces as much friction as is saved by the relieving of the pressure of the master-wheel on its pin or axis,