Correspondence.

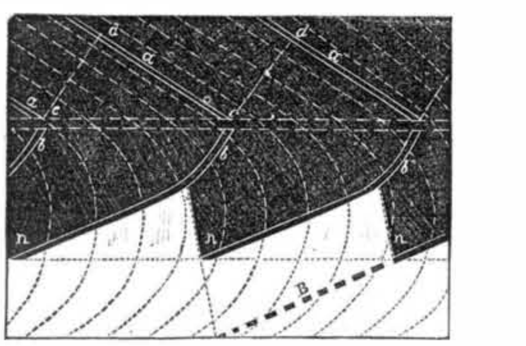
The Editors are not responsible for the opinions expressed by their Correspondents.

Filling the Issues of Turbines.

MESSRS. EDITORS:—It is a well established fact that all good turbines possess the quality of working with filled issues; that is, the veins of water which they discharge are no less than the issues themselves; and it is plain that, if they are not filled, there can be no reaction, as there can be no pressure within a wheel which has the outlet so large that the entering water can escape without even touching all the surface of the issue or exit.

It is difficult to understand how port gate wheels can derive their power from anything but direct action of the water against the buckets, in the same way as the old undershot or flutter wheel gets its power. It is simply impossible that they should derive any power from reaction.

Reaction alone can be shown capable of giving 100 per cent effective power, thus: Suppose that the wheel's issues measure 144 square inches, and that the head is 10 feet, and the velocity through the issues 20 feet per second; now, since the issues are to move only as fast as the water is discharged (which simply means that the issues are to move, and not the water) 20 cubic feet per second will be discharged, and $20 \times 62\frac{1}{2} = 1{,}250$ pounds, falling 10 feet $=$ 22·7-horse power. This is the entire power of the water discharged. The constant pressure on the line of issue is $144 \times 4{\cdot}33$ (the pressure per square inch) $=$ 623·5 pounds moving 20 feet per second $=$ 22·7-horse power as before; consequently the effect is equal to the power applied. This is very evident, and simple enough, but in carrying out this theory there are certain conditions to be complied with, to aid in explaining which, I give the following diagram of a turbine: *a a a* are the guides, and *b b b* the buckets; the lines, *c d* and *m n*, the guide and wheel issues respectively. The numerous broken curved lines show the direction of the water, as it



passes through the wheel, when it (the wheel) is in motion. Now, it will be observed that the four following conditions are essential: 1. A pressure on the plane of issue equal to that due the head. This is approximated by having the inlet larger than the outlet, and is also aided by complying with the third condition. 2. Making the plane or line of issue at right angles to the plane of the wheel's rotation. Thus the first furnishes the propelling force, and the second gives it the right direction. 3. There must be no retarding force, consequently the buckets must be so shaped as to enter and pass, through the column of water, from the guides, "endwise," or without obstructing the water or being obstructed or retarded thereby; thus allowing the water to pass in a solid column downwards, with the mere thickness of the buckets separating one vein from another. This is easily accomplished when the relative velocities of water and buckets are considered. Also, all that part of the outside of the buckets from *m* to *n* must not be touched by the water, or, at least, no pressure must be exerted against it. This is accomplished by making a rather short turn or angle at *m*, and drawing that part of the buckets above it, so as to require a slightly faster downward motion of the water to this point than after passing it. This bend also locates the plane of issue nearer the desired position, as it is thus made nearer at right angles to that of the wheel's rotation.

Thus far we have secured the propelling force, and avoided retarding forces; and it only remains to see that the water is discharged no faster than the issues move. This is the fourth condition, and one that has been the cause of a vast deal of trouble and disappointment. Yet it is accomplished by the very simple expedient of locating the relative position, or distance asunder, of the guide and wheel issues, as is required by the natural motion of the water in passing from one to the other.

The simple fact is: That as the water issues from the guides, it has a certain intensity of force in a direct forward line, but is also, from the instant of leaving the guide issue, opposed and deflected from that course towards the wheel issues, by virtue of the law, that fluids under pressure tend towards the issue or outlet. The resultant is a certain curve, of uniform and quite short radius, so much so that it has been found necessary to limit the distance apart of guide and wheel issues to about four inches, as it has been determined that, in this distance, the direction of the water will have been changed so much as to then be passing directly across the plane of the wheel's rotation, or parallel with that of the issues, which, it is obvious, must be the case in order to fulfil this condition.

I have thus briefly stated the requirements of a successful turbine, but I do not mean to be understood as saying that any of these conditions, except the last, can be exactly complied with; but they can be very closely approximated. For instance, it is scarcely possible that the pressure within the wheel, and consequently on the plane of issue, can equal that due the head, but it is very far from being equal to that due one half the head, as has been attempted to be proved by discharging water through two equal orifices, first from one vessel into another, and then into the open air. Such illustrations are not applicable to the turbine, inasmuch as the veins from the guides, being arrested and deflected as they are, would offer apparently an increased resistance rather than otherwise.

As to the direction of the propelling force, very little loss can arise therefrom; and as to retarding forces, the mere thickness of the buckets is about all the resistance. By far the most important point, is "filling the issues and yet discharging water no faster than they move," for without this, all the other conditions must certainly be violated.

I have shown in the diagram a deep and improper bucket, B, in which the issue is so far removed from the guide issues that the water has, as shown, commenced to move in a backward direction; consequently the issues would not be filled without discharging water faster than they moved, and consequently not at all, unless the area of guides were very much the largest.

It will be observed that the whole foundation of the principle which I have attempted to explain, rests upon the question: What time and distance traversed will be occupied in changing the direction of matter when acted upon in different directions (constantly or continuously) by forces), the direction and relative intensity of which is known? A particle of water moving in any direction cannot change that direction in "no time" and "no distance."

I have stated the distance which I find it to be, in the case of a turbine, and now leave the mathematical solution of this solution of this question to abler minds.

Boyd, Mo. J. B. REYMAN.

The Coming Steam Plow.

MESSRS. EDITORS:—After plowing all day, I took up the SCIENTIFIC AMERICAN, and as my eye glanced over the pages, it fastened on your notice of Mr. Greeley's book dedicated to the first man who will make a steam plow, etc.

First. The coming steam plow will not really be a plow, but, as Mr. Greeley says, a machine to pulverize the ground; and I think inventors have been mistaken in confining their attention so rigidly to improving simply an engine to draw plows. Why? A traction engine must have so much weight that it can but leave the ground in a poor condition through the pressure of the wheels, and I cannot see how a stationary engine can finish its work by plowing the ground it occupies.

Secondly. It is a very unwieldy, costly piece of machinery, which last is true of all steam plows yet made, though not the strongest objection. Yet the price, even if they worked to satisfaction, would place the steam plow beyond the means of any but a prince.

Thirdly. We do not want two feet of soil turned upside down, but we want it broken up, pulverized; the coming machine must do this to meet the want. I have an idea of what this machine must be, but as I am no mechanic, I shall not be likely to realize it. The principal parts of it are, a moderately light traction engine, and a system of pointed daggers or arms behind said engine, and operated by it, striking into the ground, and throwing the earth backwards, which, by reaction, will move the machine on to another stroke. By this means, the action of the machine will move it on, instead of drawing it back, as formerly; consequently, it will need much less traction, and less weight of machine. Being portable, it will be convenient.

Hoping that the coming steam plow will soon be on hand, I subscribe myself, A. W. JOHNSON.

Lower Providence, Pa.

Coal as a Building Material.

MESSRS. EDITORS:—In a late number of your paper you have a very instructive article on artificial stone, known as *béton*, showing not only the way of making it, but the uses to which it has been and can be applied as a building material, with a well grounded opinion that it will be used as the best substitute for the ordinary stone for building purposes. You have not mentioned the modern or recent rival of both stone and *béton*, found in the admixture of coal dust, or small particles of coal, and silicate of soda (water glass), treated in the same way, or nearly so, as you have described the treatment of *béton*, to make it fit for building purposes. In it we have not only a building material equal to *béton*, but an excellent article of fuel, which burns without smoke or smell, and leaves neither clinker nor ash. In the neighborhood of the coal mines, where lumber is scarce, and bricks too costly, blocks or bricks of this coal dust, now worthless, could be made, and houses equally as strong and lasting as those built of stone or *béton* could be erected for a mere trifle. By another article in the same number, it appears that one half of the coal mined is waste or worthless, but this material could be made use of, far more cheaply than the *béton* you so favorably describe. W. J. DERMODY.

Washington, D. C.

[If this building material will burn as stated, it would scarcely do for city building.—EDS.

Popular Errors Regarding the Watch.

MESSRS. EDITORS:—I am very glad Mr. Alvin Lawrence and myself are not likely to have any controversy on the subject of "popular errors regarding the compensation balance." His own statement of facts in answer to my communication on that subject, leaves the matter just as I stated it to be. Unadjusted compensation balances, solid (uncut) or cut open, are good for nothing in compensating for variation by changes of temperature, or, as his friend quaintly expresses, "ar'n't worth shucks"; and Mr. L. naively confesses, that when he buys them unadjusted, he is obliged to cut them and adjust them in his testing apparatus. With the adjusted ones I find no fault, and Mr. Lawrence's certificate of adjustment, accompanying a watch, should be as much respected as any manufacturer's, for he can adjust a balance, undoubtedly.

What I complain of is the flooding the market with unadjusted balances and imitations, that dishonest—no, I mean ignorant—dealers palm off on the credulous public, to the serious detriment of those who desire honorable and honest treatment.

Mr. L. says he has found watches, guaranteed by responsible and respectable makers as adjusted, that are not so. Very likely; but does he know how many "bunglers" have had the handling of them since these certificates were given? So he may have found many not professedly adjusted that were so by accident; for expansion balances that are designed to be capable of adjustment are at first constructed as near perfect as it is possible to make them; and many such happen to be just right without further attention; but those that are just wrong must go through the "freeze and thaw" process.

I must say in conclusion, that the whole tenor of Mr. Lawrence's answer corroborates my former statement, that all expansion balances not adjusted are useless, except as a snare to catch ignorant customers. R. COWLES.

Cleveland, Ohio.

A Voice from Texas on Temperance.

MESSRS. EDITORS:—Your valuable journal has had for many years, in this city, a number of constant readers and subscribers. Besides matters of most important scientific information, other subjects, no less interesting, are found in every issue.

That advertisement of "A Friend to Humanity," relative to the extirpation of a fruitful source of evil, crime, and general demoralization—the parent of 90 per cent of all the trouble in the civilized world, to wit, the legalizing of a retail traffic in intoxicating liquors—has attracted attention. The invention of a practical plan—call it machine or engine—to accomplish the desired result, would overshadow, in real value, all the inventions, ever illustrated in your publications, put together.

How would this do for the specifications of a plan? namely: Educate the girls to a horror and detestation of, and never-ending opposition to, the liquor traffic and habitual use of intoxicating drinks. Let this principle be inculcated in every public and private school, and at the lap of every mother in the land. Good results would, although slow, be effective and permanent. HUMANITY.

San Antonio, Texas.

Effect of Cold upon Iron and Steel.

MESSRS. EDITORS:—In relation to articles with the above heading, before the experimenter establishes as a fact that cold cannot cause tires on wheels to break, allow me to say that that will never do!

I admit that iron will endure as much (if not more) steady pressure, without breaking or bending, when frozen as it will when in moderate temperature, but it will not stand a sudden shock as well, for this very simple reason, namely: Iron will break when forced to stretch more, or quicker, than its capacity (bending a bar of iron is evidently stretching one side of it, and pressing the other side closer) and it must be just as true that the more frozen iron is, the less it is capable of expanding, and of expanding quickly, as it is indisputable that, the warmer it is, the more and the quicker it can be made to expand. Who can deny that FACT?

A Suggestion Regarding Lamps.

MESSRS. EDITORS:—I noticed in a recent number of the SCIENTIFIC AMERICAN, two or three communications on the subject of the explosion of lamps, and the shortness of the tube was noticed as one cause. I have been using for some time a "student lamp" burner on a common glass lamp. As the burner is over two inches long, there is no danger of the flame running down into the lamp; and the wick itself does not have to be moved, except when it is trimmed. As the flame is circular, it gives a much stronger light than the common flat flames. F. P. MANN.

Princeton, N. J.

Seed Drill.

MESSRS. EDITORS:—I noticed, in the SCIENTIFIC AMERICAN, April 1, 1871, that an Englishman claims to have invented a seed drill that will drop a given or desired number of seeds, at such distances as are required. If he has, he has conferred a great boon on his countrymen, as well as a fortune on himself. And, in fact, the greatest objection to raising root crops in this country is the labor of thinning, and the expense attending it. Why can't an American invent one? In view of the coming cultivation of the sugar beet, and the great increase of root crops consequent to such an invention, there is a fortune in it to the inventor, who will, moreover, be a public benefactor. C. R. M.

Johnson Town P. O., Va.

A NEW CITY RAILWAY has lately been opened in Brooklyn, N. Y., five miles in length, from Fulton Ferry to Greenwood. Each car carries fourteen passengers, and is constructed in the most approved manner. The driver acts as conductor, the fares being deposited in a patent cash box; the car door is opened and closed by the driver, by means of cords.

THE Boston *Post* is authority for the report that the New Jersey watering places are rapidly filling up with mosquitoes, and never before were they so thoroughly organized and confident of success.

New Zealand Flax (Phormium Tenax.)

The plant grows, says Mr. A. M. Southworth, in the *Rural South Carolinian*, in almost every variety of soil, from the rich mud and clay along the banks and at the mouths of rivers and lagoons, in the soil of the valleys and plains, on the tops and sides of many of the hills, and all along the seashore close to high water mark, among clean white sand. I think that the soil along the banks of our Southern rivers is admirably adapted for its growth, and that it would flourish among the low lands and islands along the coast.

It grows in bunches, two leaves starting first; and when about a foot high, they are about an inch wide, double, and one clasping the other; these spread apart and two more come up inside, and so they keep increasing and side shoots starting, and get to be a large bunch from four to six feet across, with leaves from six to nine feet long and even longer.

There is a quantity of gum in the leaves, and some free gum in the fold of the two halves toward the bottom. This gum is now used in England to make "safety envelopes," as no steaming or soaking will open them. There is a large quantity of honey in the blossoms. The stalks are very light and pithy, and are used by the natives to make their canoes more buoyant, by binding bundles along the sides.

These stalks, split or chopped fine, if used in stuffing the furniture of vessels and steamers, would make each piece a life buoy. The leaves, cut green from the bush and split to the proper size, serve a great variety of purposes, as strings and small ropes; they are woven into sacks and baskets, nets and mats; the latter are stronger and more durable than those brought from China. A few pieces of a leaf steeped in hot water will raise yeast like hops; and it has been suggested, by Dr. Hector, that the latter principle in the leaf can be applied to the manufacture of beer.

The people of New Zealand have long been aware of the plant growing wild so abundantly around them, but it is only within the last few years that machinery has been invented to work it to advantage. The principle in the several machines used is the same. The leaves are cut green and fed to the dresser, which consists of two rollers, one smooth and one grooved. These are about two inches in diameter, and feed the leaves to the beater, a cast iron cylinder a foot in diameter and six inches across, with steel bars half-square, set diagonally across its surface. This drum revolves very rapidly and the bars strike the leaf and knock the fleshy substance from it and leave the fibers hanging below. This is washed and bleached and then scutched, when it brings in the English market from two hundred to three hundred dollars per ton. It is estimated that an acre of good flax land will yield from twelve to fifteen tons of green leaves and two tons of dressed fiber There is no particular season in which it must be harvested, but in New Zealand the mills run the year round. In England, there is machinery which still further improves the value of the fiber. I have seen ropes made from it aboard several American vessels, and the captains expressed a very high opinion of it, and wished to see it introduced into the United States. Capt. Friend, of the Barkentine Adele, of San Francisco, informed me he had some canvas made from it, which he obtained in Melbourne, Aus. Once successfully growing in the country, and with American enterprise and ingenuity bearing upon the manufacture, I think there is no plant that will so add to the wealth and prosperity of the country.

Vision of 1900.

Can any one realize the exceedingly probable fact that in 1900—only twenty-nine years from now—the population of the United States will number 75,000,000 of, we trust, free and independent citizens? Yet, says the *Evening Mail*, Mr. Samuel F. Ruggles proves that this will be the case, without making allowance for annexations, North and South, that will certainly come about, Mr. Sumner and all others to the contrary notwithstanding. He shows the reasons for his prophecy in figures, and although the old saw that "figures won't lie" is the most unveracious of proverbs, Mr. Ruggles' figures have acquired a reputation of their own, and a good one at that. For the past thirty or forty years, he has been figuring about our internal and domestic commerce; and although he has often been accused of romancing in figures, the facts have always sustained his predictions. When, therefore, the ablest, most experienced and most trust worthy statistician now living, tells us that we shall have a population of 75,000,000 in 1900, the younger part of the present generation may as well consider what awaits them in their maturity and old age.

Seventy-five millions of people in the United States implies the settlement of the entire South and West by as dense a population as that of Massachusetts; the reclamation of the arid wastes of the great Plains by irrigation; the development of states as strong as Ohio, Indiana and Illinois along the Rocky mountains; the settlement of the Utah Basin by four or five millions of agricultural and pastoral people; the development of a tier of agricultural states along our northern border, from Lake Superior to the Pacific, as populous and prosperous as Missouri and Minnesota; the growth of of the Pacific states into commonwealths as rich and populous as New York and Pennsylvania. It means that New York will cover the whole of Manhattan Island with a population of at least two millions, to say nothing of the outlying suburbs in New Jersey and across the East River; that Chicago and St. Louis will each become as large cities in fact, as they are now in their own estimation, and that San Francisco will have half a million of inhabitants. The national debt will have become a tradition, and it will be difficult to understand how it was ever hard to raise three or four hundred millions a year by taxation. Such are the glowing visions which are excited by the prosaic and careful figures of Mr. Ruggles. If any of our readers are unduly "Bearish" in their tendencies and inclined to get the blues over our future, we advise them to indulge in the line of speculation suggested by his striking statistics, and carry our predictions more into details.

Facts in the Natural History of the Honey Bee.

There are three classes of bees in a hive, the Worker Queen and Drone.

Queens are raised by peculiar food and treatment from eggs that would otherwise produce workers.

The worker is an undeveloped female. Workers in the the absence of a queen sometimes lay eggs. These invariably produce drones.

The queen lives from two to five years. The worker lives two or three months in the working season, and from six to eight during the season of rest.

The queen is perfected in fifteen or sixteen days from the egg, the worker in twenty to twenty-one, and the drone in twenty-four.

The queen usually commences laying from seven to twelve days after leaving the cell, and is capable of laying from two to three thousand eggs in a day.

The impregnation of the queen always takes place outside the hive, on the wing, and generally the fourth or fifth day after leaving the cell. Excepting in rare cases, one impregnation answers for life. The drone she has mated with dies immediately.

The eggs of an unimpregnated queen produce nothing but drones; and it is generally conceded that impregnation does not affect her progeny; consequently, the male progeny of a pure Italian queen is pure, without regard to the drone she has mated with.

The queen and worker are provided with stings; but while the latter will use it upon any provocation, the former will only use it upon her own rank. The drones have no stings.

One queen, as a rule, is all that is tolerated in a hive; but previous to throwing off "after swarms," two or more queens are permitted in the same hive for a short time; but the extra ones are soon disposed of. In case of superseding a queen, the old one is preserved until the new one is fitted to take her place. Queens have a deadly hatred for each other and will destroy, if permitted, all queen larvæ or cells in the hive, and will fight each other until there is but one living one left.

A frightened bee, or one filled with honey, is not disposed to sting.

A good swarm contains about twenty thousand bees.

A strong or medium hive, with a good laying queen, is never seriously troubled with the moth worm; but a hive without a queen or the means of raising one is sure to be taken by th m.

Bees recognize each other by their scent.

The first one or two weeks of the young bee's life is spent inside the hive, as nurse or wax worker.

The range of a bee's flight for food is generally within two or three miles; much greater range is of but little benefit to them.

Manufacture of Pig Iron in Europe.

The process of improvement in the iron manufacture is rapid and unceasing. New sources for supplies of ore are being diligently sought out, and new processes for cheapening the conversion of the ore into metal, or for improving the quality of the iron are being diligently prosecuted. Already iron ores of superior quality are being brought from Bilboa, in the north of Spain, and from Marabello, near Gibraltar; and during the last month, letters from the north of Ireland announce the energetic prosecution of iron mining in that district, primarily for sale to iron manufacturers in England, but with the intention of eventually erecting blast furnaces on the spot; for, although the coal will require to be imported to work such furnaces, yet, seeing that it requires two tuns of the best ore, to make one tun of iron, and only one tun of coal, it is believed that it will be found more profitable to import the coal than to export the ore. This announced intention corroborates the view already put forth, that the iron manufacture is in a state of transition, which suggests and implies grave issues. For if the coal be henceforth brought to the ore, instead of the ore to the coal, the locality of the manufacture will be changed in many cases, and existing works must in some instances be shut up.

In the north of Ireland there are extensive deposits of iron ores, extending along the shore from Carrickfergus to the Giant's Causeway, and some of these ores are hematites containing 55 per cent of iron. Upwards of 80,000 tuns of ore were shipped to England and Wales during the past year. But this is only a small beginning, and the trade will, no doubt, rapidly expand. In other parts of Ireland there are ferruginous deposits which may be found of still greater eligibility; and in Somersetshire and other parts of the south of England valuable ores are being worked, some of which produce speigeleisen, which is added to the decarbonized pig for the production of Bessemer steel. The existing process for puddling iron is expensive and laborious, and many projects have been propounded for superseding it. But it is the only method yet known whereby phosphorus and sulphur can be removed from the iron, and therefore the only method in use for decarbonizing the pig yielded by the large class of ores contaminated with those substances.

Sherman's method of purifying the iron by the introduction of a small dose of iodine, and Henderson's, by introducing powdered fluor spar, mixed with oxide of iron, as a floor to the puddling furnace, have been favorably spoken of; but their success cannot be said to be assured. By Heaton's plan of making wrought iron from pig, a certain quantity of nitrate of soda was introduced into a vessel, and was covered over with a perforated iron plate. Molten iron was then poured into the vessel, and in a short time the oxygen, expelled from the salt by the heat, boiled up through the metal and decarbonized it, reducing it to the condition of a pasty mass, which was afterwards rolled. Mr. Menelaus, of Dowlais, used a rotating puddling furnace, which, however, did not in all respects answer his expectation; and not one of the plans for superseding puddling has yet been sufficiently successful to come into general use. Nevertheless there appears little reason to doubt that that this great desideratum will be reached in a little time. Just, however, in the proportion in which the operations of the iron manufacture are abbreviated and cheapened by the employment of more compendious methods, and by reducing the present waste of heat, will the relations of the existing ironworks be affected, as the selection of localities which yield cheap coals will cease to be the most prominent necessity of the manufacture. On the whole, it appears probable that the iron trade will shift its localities, as the copper trade has already done; and it will migrate to situations in which cheap and good ores are found, or to seaports which, with cheap coal, combines the advantage of cheap freight for ores from other places.

The iron trade of South Wales has already received a severe shake by the rise of a competing industry in the north of England. Its copper trade, once so profitable, is almost extinct; and it will require great care and circumspection on the part of mineral owners and manufacturers to prevent the iron trade from following a similar course.

Meanwhile the race of improvements in pig iron suggests but one course, and that an imperative one, to consumers, ramely, that they must not localize, but extend their demand all over the producing world, and test by practical experience and pecuniary confirmation which qualities of iron suit them best. The demand for pigs for America never was larger than at this moment, and as they can be laid down in New York and Boston at $25 to $26 gold per tun of 2,240 pounds (all costs and duty paid), that demand is likely to continue.—*Alex. S. Macrae.*

Base Ball.

Some idea of the popularity of this excellent out-door amusement, may be gathered from the following report of the manufacture of base balls and bats, which we find in the New York *Times:*

No less than sixteen kinds of balls are in use, from the regulation ball to the children's or fancy ball, and prices vary from $18 to 85 cents a dozen. Some half dozen regular manufactories of base balls alone, exist in this city, the largest producing just now seventy five dozen balls per diem. The town of Natick, however, in Massachusetts, is the greatest ball manufactory perhaps in the world, many hundreds of people being employed in producing these articles, and it is not uncommon for houses in this line of business to order thence 6,000 balls at a time. Their manufacture entails nothing of very special interest, the inside being of wound rubber, and the wrapping of woolen yarn, save that the winding of the yarn around the ball is principally done by men. One would suppose from the nicely shaped spheres women make when winding up worsted, they would be most adapted to this kind of work, but it seems to require a certain amount of physical strength which the weaker sex is not endowed with. The cover of horse hide is put on entirely by women, who use a saddler's needle and saddler's thread. Dark, the famous English ball maker, is an artist in his way, and, according to the best authorities, employs thirty five workmen all the year round, and uses up one and a half tons of worsted, and covers them with the hides of 500 cows and oxen. The method of securing the cover to the English ball with the triple seam, is superior to the American method. This plan is said to have made the fortune of its inventor, a certain John Small.

The total number of balls made and sold in New York is immense, one manufacturer alone having supplied 162,000 balls last year. Perhaps the United States will bat to pieces half a million of balls this season. Bats form an important business alone. They run through a dozen different varieties. It sounds somewhat preposterous to think of mills running all the year round, turning out bats. As more bats are used than balls, one can form some idea of the enormous quantity of material consumed. Orders for all base ball implements are just now at their hight, and the supply is barely up to the demand.

Improvement in Preserving Wood.

A recent patent to Nathan H. Thomas, of New Orleans, La. He says:

My method is the simple process of saturating the wood in resin oil, warm or cold, or at any required temperature, according to the circumstances. In the event of the wood being of moderate dimensions—thin board, for instance—I apply the oil cold; and for wood of large dimensions I apply the oil hot, in either of the above cases, by immersing the wood in the oil, or by applying the same to the wood with a brush, or in any convenient manner whatever, so that the wood may be thoroughly saturated with the oil.

Claim: The application of resin oil, hot or cold, for the preservation of wood from decay, and from destruction by worms and insects, substantially as described.

[It is proper for us to state that the preservation of wood by boiling the same in resin, under a pressure, is the subject of a prior patent, granted some three years ago to another party, and that it is an effective method of preservation.—EDS.

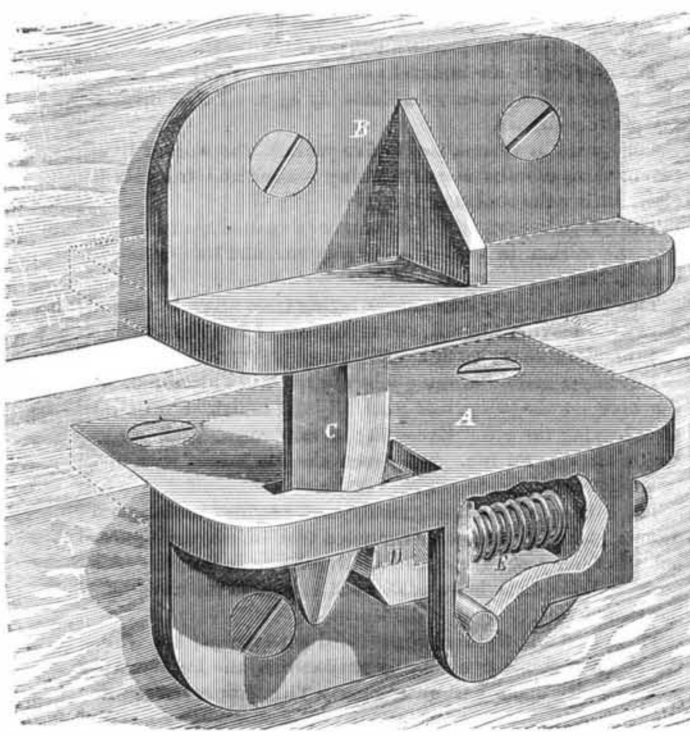
Improved Flask Guide.

All practical molders are aware of the difficulties in making castings as true as the pattern, on account of the looseness of the guide pins of their flasks, as they are ordinarily met with in foundries. If made tight, they stick or bind, and are apt to jar the sand out; and, if loose enough to work with freedom, then it is difficult to avoid lop-sided castings, because the cope cannot generally be replaced in the exact position it occupied before removal for the withdrawal of the pattern.

The accurate replacing of the cope is secured by the improved flask guide herewith illustrated; and as two sides of the pin are straight, except at the point, the cope must ascend or descend vertically, while a spring bolt, pressing against the taper side of the pin, keeps it forced against the straight sides. It is claimed that this arrangement secures a perfect guide, free from any liability to stick, and always working freely and accurately.

The construction and operation of this device will be more fully understood on reference to the engraving, in which A represents the part of the device attached to the lower part of the flask; B, that attached to the upper part of the flask; C, the guide pin, triangular in form, with one side tapering, as shown; D, a spring-bolt bearing against the pin; and E, the spring that exerts the pressure. The guides are made from right and left patterns.

The improvement was patented through the Scientific American Patent Agency, April 5, 1870, by Thos. S. Brown, of Poughkeepsie, N.Y., whom address for further information.



BROWN'S IMPROVED FLASK GUIDE.

Left-Handedness.

Various attempts have been made to account satisfactorily for the use of the left in preference to the right hand in those in whom this peculiarity exists, but, according to the *Lancet*, without success. Dr. Pye-Smith takes up the question, and, disposing of the theories that left-handedness is to be accounted for by transposition of the viscera, as asserted by Von Baer and others, or by an abnormal origin of the primary branches of the aorta, proceeds to argue that right-handedness arose from modes of fighting adopted, from being found to be followed by the least serious consequences. "If a hundred of our fighting ambidexterous ancestors made the step in civilization of inventing a shield, we may suppose that half would carry it on the right arm, and fight with the left; the other half on the left, and fight with the right. The latter would certainly, in the long run, escape mortal wounds better than the former, and thus a race of men who fought with the right hand, would gradually be developed by a process of natural selection." Of course the habit once acquired, of using the right hand more than the left, would be hereditarily transmitted from parent to child.

Frings' New Process for Preparing and Mashing Grain in Distilling.

Mr. Charles H. Frings, of Centreton, Mo., has invented an improvement in preparing and mashing grain, of which the following is a description, derived from his specification:

In this process the grain is first pulverized, or if of a horny consistency, like rice and certain kinds of corn, first steeped in an alkaline solution, containing for every bushel of grain one to one and a quarter ounce of caustic soda, or an equivalent quantity of caustic potash, and water enough to cover the grain.

After having been steeped for several hours, the horny parts will be sufficiently loose, and the grain may, after having been superficially dried, be pulverized. Grain less horny is first pulverized, and is then, in a suitable sieve or apparatus, separated from the larger (horny) parts. These are then separately moistened with an alkaline solution, like that used for the horny grain, and pulverized, after a few hours, when sufficiently dry.

To extract the proteine from the grain, the latter is steeped in another alkaline solution, which contains for every bushel of grain one to one and a quarter ounce of caustic soda, or its equivalent amount of caustic potash, and for every bushel of rice or corn about fifteen, for other grain about twenty, gallons of water.

The grain is stirred in this solution for about fifteen minutes, and then allowed to settle until about five gallons of the liquid above the sediment can be drawn for every bushel of grain. This proteine extract is reserved for fermentation.

To prevent alkaline reaction, which in the mash promotes a disadvantageous formation of lactic acid, the inventor adds to the sediment muriatic acid, in such proportion that the mash will, after addition of proteine extract, show a sour reaction. This aids in completing the disclosure of starch before saccharization, and promotes, in conjunction with the said alkaline bases, the effectivity of the diastase during saccharization, and the action of the proteine during fermentation. It also improves the quality of the alcohol, prevents the formation of acetic acid, and increases, by forming salts, in its combination with the soda or potash, the value of the slop or swill as fodder.

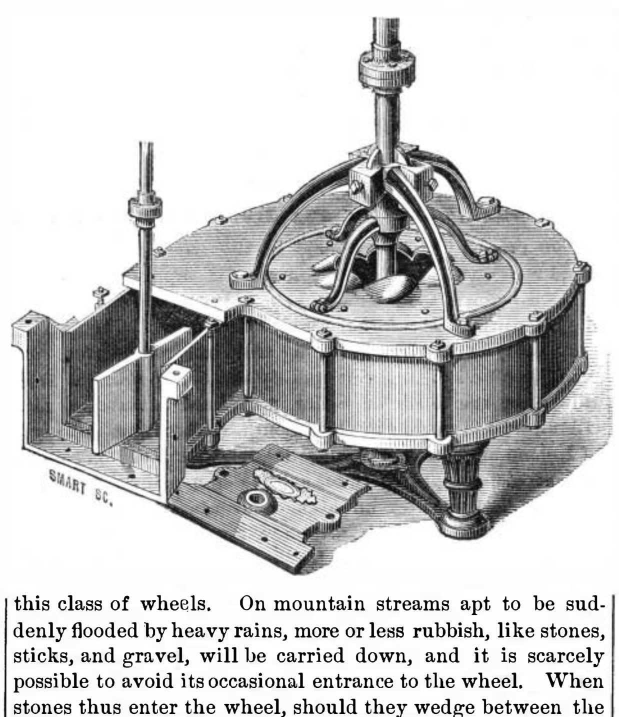
From five to six ounces of muriatic acid for every bushel of grain, diluted in three times its bulk of water, are, while the sediment is being stirred, added to the same. The mixture, after standing about fifteen minutes, is brought to the mash tub. The tub should contain sufficient hot water so that, after the addition of the grain, thirty gallons will be occupied by each bushel.

For rice and corn, the water in the tub should be about 212°, for other grain about 180° Fah. Immediately after the application of the sediment to the tub, which causes a considerable reduction of temperature, one bushel of malt is added to every one hundred bushels of unmalted grain, for the liquefaction of "paste" first formed. The temperature is then gradually raised, for rice and corn to 200°, for other grain to 170° Fah., retained for ten or fifteen minutes, then quickly reduced to about 145°, and the malt required for saccharization is added, whereof five bushels for every one hundred bushels of unmalted grain are required. The temperature is now, for about one hour, kept at 142° to 145°, after which time the process of saccharization is completed.

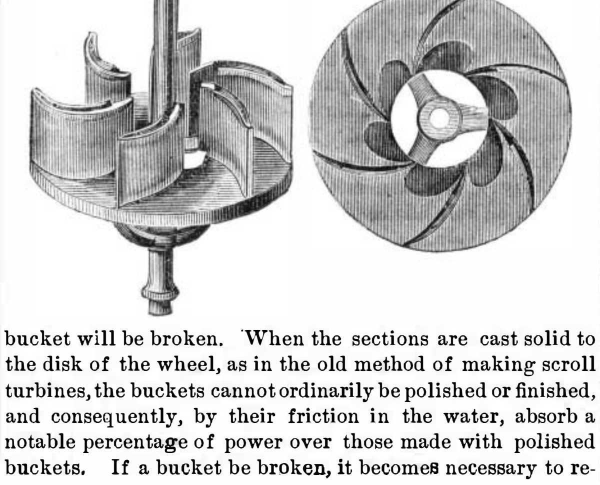
The proteine extract taken from the grain is added to the mash when the same has been cooled to about 120°. Fermentation is finally effected, after further cooling, by the customary addition of yeast, and is completed in about thirty-six or forty hours.

IMPROVED TURBINE WATER WHEEL.

It has long been recognized as desirable to so construct turbines that the buckets and gate might be easily accessible. For many reasons such construction adds to the usefulness of



this class of wheels. On mountain streams apt to be suddenly flooded by heavy rains, more or less rubbish, like stones, sticks, and gravel, will be carried down, and it is scarcely possible to avoid its occasional entrance to the wheel. When stones thus enter the wheel, should they wedge between the buckets and the case, either the wheel will be stopped or the



bucket will be broken. When the sections are cast solid to the disk of the wheel, as in the old method of making scroll turbines, the buckets cannot ordinarily be polished or finished, and consequently, by their friction in the water, absorb a notable percentage of power over those made with polished buckets. If a bucket be broken, it becomes necessary to remove an entire section, and supply its place with a new one, causing delay and expense, especially when the wheel is at a long distance from the factory. The gate cannot be removed without disconnecting the scroll from the flume, and setting the entire wheel out of its usual place.

These difficulties are removed in the construction of the wheel illustrated herewith, and another advantage is gained, namely, the power to adjust the gate so as to compensate for wear, and prevent leakage and other inconveniences attending such wear.

Another object is secured, namely, the continued reaction of the water after it has left the buckets so as to extract as much as possible its available dynamic power before its discharge from the wheel.

These desiderata are secured by making the buckets separate and movable, so that they may be polished for the purpose of lessening friction, or removed without taking the wheel apart; and providing a flange or bead upon each bucket, made in sections or continuous the whole length of the edge of the bucket, the flange fitting into a corresponding groove in the disks of the wheel, and secured by a screw bolt passing through the disks into the flange or the edge of the bucket.

The upper portion of the mouth of the scroll is made so that it can be removed, as shown in the engraving, which gives ready access to the gate, permitting the latter to be re- moved or adjusted without disconnecting the wheel from the flume The gate is also provided with adjustable strips or bars placed on the inside by which compensation for wear is secured and leakage prevented.

The wheel is made without a hub, and the upper and lower disks have formed upon them half domes, as many on each disk as the number of buckets in the wheel. The domes are of the shape shown in the engraving, and their bases receive the water as it leaves the buckets, and by their directing power compel it to react upon the buckets for a longer time than would be the case were they dispensed with.

These improvements were patented April 18, 1871, by Elisha P. H. Capron, of Hudson, New York. For further information address the Capron Water Wheel Company, Lock Box 138, Hudson, N. Y.

Testing for Gold with Iodine and Bromine.

W. Skey, in the *Chemical News*, gives a method for detecting small quantities of gold by the use of iodine and bromine. Two grammes of roasted quartz sand, which contained 2 ounces gold to the tun, was shaken up with an equal volume of a tincture of iodine, and after the sand had settled to the bottom, and the liquid above was clear, a piece of Swedish filter paper was immersed in it, and afterwards burned. The ash was not white, but purple, and the coloring matter was quickly extracted by bromine. One gramme of the same gold-bearing quartz was taken and thoroughly mixed with other rock, so that the gold did not exceed 2 dwts. per tun, and left for two hours with constant stirring, in contact with the iodine tincture. A strip of filter paper was then immersed five times in the liquid and tried each time, then burned and treated with bromine as before, when traces of gold were made evident. Hematite ore was mixed with gold quartz in such proportions that the gold did not exceed 0·5 dwt. to the tun, and yet it was easily detected in this way. By the amalgamation method it is scarcely possible to detect gold, even when 100 grammes are put into test, where the amount does not exceed 2 dwts. to the tun. Mr. Skey's process, being easy of execution, offers many advantages over the old way of testing for gold.

Passivity of Iron, and Electrolysis.

L. Schönn states that, when a piece of iron is tightly fastened to a piece of charcoal, care being taken to make the contact between the charcoal and well polished iron as perfect as possible, and also to immerse both these substances simultaneously into nitric acid, the iron is not dissolved; but as soon as either the metal or the charcoal is touched, under the surface of the acid, with a strongly electropositive metal (for instance, zinc), the iron becomes at once active again, and is dissolved in the acid with a copious evolution of gas. When some very dilute hydrochloric acid, so weak that it hardly acts upon zinc, is poured into a platinum basin, and a piece of zinc placed in that liquid in metallic contact with the platinum, a copious evolution of hydrogen takes place at once, precisely on the spot where the zinc, platinum, and acid are in contact. If, instead of the very weak acid, an aqueous solution of corrosive sublimate be taken, and the experiment repeated, metallic mercury is separated at the point of contact between the zinc, platinum and the solution. The author finally states that, from a series of experiments made by him, he has found that all desired electrochemical actions can be called forth at pleasure by simply placing either two different metals, or charcoal and metals, in contact with a fluid.

REV. WILLIAM SPEER, D. D. (*China and the United States*) says it is amusing to witness the eagerness of the Chinese when, once in many years, a slight snowfalls in the winter, to gather it into bottles, in which they suppose its precious virtues will be preserved after it melts, and be an efficacious remedy for fevers.

THE secrets of Nature are the secrets of God, and man should inquire into them with reverence and without boldness.