Correspondence

Frictional Gearing.

MESSRS. EDITORS:—You ask for information concerning frictional gearing. Perhaps what little I can say may contain something new. I am now using a machine that has a pair of friction gears to operate it, viz., a wheel 36 inches in diameter, driven by a pinion only 3½ inches in diameter. The pinion shaft revolves fifty times per minute; it requires and is driven with a 3-inch rubber belt. Though revolving so slowly and being so unequal in size, the gears carry perfectly. The pinion has its face formed like an A; the large wheel has a corresponding V, ¾ inch deep. This, I should say, is the frictional gearing proper, and is calculated to carry much more in proportion to the surfaces impinging than the flat peripheries, which are not frictional but tractional gears, seeing that the surfaces roll while operating. On the other hand there is constant friction on the A and V surfaces; but, in my opinion, not more than there is in toothed gearing—probably not so much, unless the teeth are of the most approved form and finish. If the wheels are merely in motion, without being at work, it would appear and it really does take more power to revolve them in that condition than toothed gears, because the pressure of the surfaces is constant; while in the common gear, under the same circumstances, there is often considerable of noise and frivolity [?], designated "backlash" &c. Undoubtedly the amount of frictional surface may be so disproportionate to the power to be transmitted as to require an injurious degree of pressure on the gears to make them do their work; hence, perhaps, the notion of their great absorption of power, particularly when running without work.

W. CLEMSON.

Middletown, N. Y., May 11, 1863.

[This is the kind of information that we desire, and we hope that our mechanics throughout the country will favor us with their experience on the subject. As we have often remarked in the SCIENTIFIC AMERICAN, it is high time that the noisy, jarring, unequally-balanced toothed wheels were driven from the workshop to the scrap heap, and their places supplied by the silent and efficient friction wheels. Who will institute a series of experiments between the apparent and actual results of the economical working of friction gears against toothed gears? We will publish the results of the experiments with pleasure.—EDS.

MESSRS. EDITORS:—Seeing communications from different persons about frictional gearing, I have thought that my experience might be interesting. I have used iron and iron friction gears together, iron and wood (endwise), wood and wood, leather and iron, and also the grooved friction gearing. I find iron and iron work very well in slow motion, where the shafts are kept in line. Wood and wood work very well, but they are not durable. Iron working on wood endwise works well, but if there is any spring to the shafts holding the gears, they are apt to wear uneven in course of time, by wearing deeper at the joint. But I find that cast-iron wheels with leather on the pinion, work the best; they are less liable to slip, wear true and are cheapest in the end. In making the leather pinions I pack the leather up edgewise, screwing it tight between a couple of flanges while wet and soft, turning off when dry and hard. [A most excellent plan.—EDS.] For large pinions I use segments or strips cut off straight and bent edgewise, then clamped the same as small ones, having a projection on the flange to prevent the wheel crowding the leather toward the center and body. The same face and diameter are equal to a belt of same width and diameter of pulley. As to the grooved gearing of the English pattern, the point or outer end has to travel over more space than the part nearer the center, consequently there is a slip at the point and root of each, and where there is slip there is also wear—a useless consumption of power. My experience with them is small, however, compared with the others described. I have seen a good set of grooved gears (of cast iron) wear out in three or four weeks, when leather and iron, in the same place, will last three years on the same work. I find there is nothing equal to friction gearing where there is a constant throwing in and out of gear, such as hoisting or running back, and feed in mills, &c.

A. S. W.

May 9, 1863.

[Our readers will see that all the testimony we have published is conclusive on the main point, that is, the friction wheels are reliable and work satisfactorily in general. In view of such facts it is extraordinary that so many toothed gears should be manufactured.—EDS.

Constituents of Corn in Fermentation.

MESSRS. EDITORS:—On pages 134, 150, 166, 197 and 214, current volume of the SCIENTIFIC AMERICAN, under the head of "The Distillery Business," I find a communication containing many valuable hints to distillers on the subject, still there are a few points which I think want some explanation. Having had a good opportunity to examine a great many establishments in the United States from west to east, on account of my patent, and being somewhat acquainted with the business, I embrace this opportunity to make a few remarks on the subject. The last five years have developed the science of this branch to a considerable extent. On page 134, I find it stated that woody fiber, paper, raw cotton, flax, cotton and linen rags, and sawdust, all contain starch. Now this statement might lead some to a wrong view on the subject; those articles contain mostly fibrine or cellulous matter, and will never produce sugar and alcohol by the action of diastase or malt; still when treated with sulphuric or muriatic acid, those substances can be converted into sugar or alcohol. The average quantity of starch in corn (*zea mais*), I think is somewhat overrated. Gorham gives 77 per cent., Vauquelin 75 per cent. of dry corn, Bizio gives 80.9 parts in 102 of corn in his analysis; but no statement of water. Now corn from the field contains 26 per cent. of water, air dried corn generally used in a distillery contains 13 per cent. According to Liebig corn contains 4.25 to 4.66 per cent. of oil; by Dumas and others 6 per cent. The oil can be plainly observed by putting a grain lengthways, taking out the lower center part and pressing it between the nails of the two thumbs. I think that from 38 to 40 per cent. of starch in one bushel of (56 pounds) corn, might produce from 19 to 20 quarts of proof spirits. This quantity only, I obtained by treating corn and cobs together with sulphuric acid. Late experiments have shown that by the influence of malt or diastase only ⅓ of starch is transformed into sugar and ⅔ of it into dextrine; but through the action of yeast and gluten during the fermenting process, another part of dextrine is tranformed into sugar and from this into alcohol. By the application of malt alone as the brewers use the same for making beer, the process of saccharification is checked when ⅓ sugar is formed. The wort before fermentation contains ⅓ sugar and ⅔ dextrine in solution. When it has fermented the proceeds of ⅓ of sugar (partly transformed into alcohol) and ⅔ of dextrine constitute the beer. T. A. HOFFMANN, Chemist.

Beardstown, Ill., April 28, 1863.

Welding Steel.

MESSRS. EDITORS:—I have noticed that when cast steel is welded, it invariably shows a different appearance at the weld, it being more like iron than steel. The question to me arises, can steel be welded? It is reasonable to suppose that if it has a different appearance at the weld, it must be either improved by the process or injured—most likely the latter. It seems probable to me that in welding the surfaces are decarbonized or reduced to iron, and are not united as pure solid steel, but with a film of iron between. I have had some experience in working cast steel, having fitted up nearly all the boring tools used at the Fort Pitt Cannon Foundry for the last two years and a half. I also notice that where there is a weld in a tool it does not harden as well at that point as the rest of the steel, and when the heavy "bottom tools" have to be dressed over, they frequently part at the weld, thus showing that they are not as strong at that point as solid steel.

I would suggest as a reason for the "series of loud reports inside of a boiler" (observed by your correspondent in Philadelphia, Mr. E. Brown), that a portion of the steam is condensed by contact with the cold water from the pump, forming a sudden vacuum, the result of which would naturally be a report like that described. C. W. CRAWFORD.

Fort Pitt Works, Pittsburgh, Pa., May 11, 1863.

Explosion of a Powder Magazine.

A tremendous explosion took place in this city on Monday, the 12th inst., at half past eleven P.M., causing the destruction of the cartridge factory at the foot of Seventy-ninth street, East River. There were (says a daily paper) 140 barrels of blasting powder and 20 barrels of gunpowder stored on the premises, all of which was ignited and destroyed. There were at one time over one million of ball-cartridges in the building, but fortunately the proprietors had shipped them off before the accident occurred. The shock of the explosion was felt for miles around. In New Haven, 78 miles from the scene of the disaster, the people imagined all sorts of things, among others that an earthquake was in progress, that distant cannonading was going on, &c. In Astoria and Ravenswood—small villages adjacent to the site of the magazine—the excitement was very great and the damage done to glass and joiner-work also considerable. The penal institutions on Blackwell's Island, directly opposite the magazine, suffered very much, as did also other tenements in the immediate vicinity. The whole amount of damage is represented as reaching $100,000, and the occurrence will long be remembered by reason of its tremendous effects. No lives were lost—a remarkable feature when we consider the quantities of bullets that were hurled far and wide.

The "Golden City."

The large new steamship of the Pacific Mail Company, the *Golden City*, is now receiving her machinery at the Novelty Iron Works. The cylinder and its attachments, the steam-chest, side pipes, cut-off, &c., are all in place, as also the circulating and air pumps, and the main shafts. The circulating pump is one of Andrews' pattern, of the same kind that was in use on the *Monitor* when she was lost, and which did such good service on that occasion. It is driven by two independent vertical engines, standing on a bedplate between the air pump and the main shafts, and is connected by suitable pipes with the condenser, which is of the surface variety—Sewall's patent. Mr. Lyman Hall is erecting the engine, and from the vigor with which he is prosecuting the work, his part of the ship (the machinery) will be ready for sea before many weeks. Mr. Hall is familiar with all branches of his business, and erected the engine of the *Constitution*, which performed so well while in the Government service as a transport. The engine of the *Golden City* has a cylinder of 105 inches in diameter, by 12 feet stroke; the *Sacramento*, consort, has an engine whose cylinder is 5 inches less in diameter by the same stroke.

SCIENTIFIC BOOKS.—There is a growing interest among our mechanics for scientific publications, which we are much pleased to notice, and we recommend all who wish to purchase works of this class to send to Henry Carey Baird, of Philadelphia, Pa., for one of his catalogues. Mr. Baird is a reliable publisher and his catalogue embraces some of the best books extant.

FOREIGN IRON CLADS.—The cost of the British iron-clad ships has been enormous. The *Black Prince* cost £373,899; *Resistance*, £257,848; the *Defence*, £252,898. The whole cost of the *Warrior*, before being made ready for sea, was £377,373. Contrast these figures with those of the *Monitors*, about $350,000, and the comparative efficiency of the two classes of ships—the English vessels with their towering bulk, and our own with their submerged hulls, and we need not indulge in much conjecture as to which of the two would come out the victor in a contest.

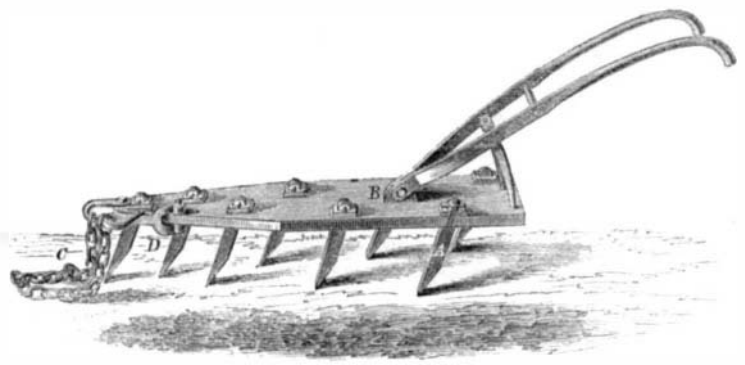
THE largest railway carriage factory in the world is said to be at Berlin, Prussia; it employs 1,500 men and turns out carriages to the value of nearly $1,500,000 per annum.

THE receipts of grain at Buffalo, N. Y., on the 11th and 12th inst., amounted to 2,180,000 bushels—the greatest quantity ever received in the same space of time at that point.

Improved Ditching Machine.

The invention herewith illustrated is intended for a subsoiling and ditching machine, and consists of the steel teeth, A, secured in the frame, B; these teeth have square shoulders below the frame, and are fastened in their places by keys or their equivalent, on top of it. They are so disposed in the frame as to make a wide thoroughly-drilled track or furrow, equal in width to the lateral distance between the teeth on the opposite sides of the frame, and not a number of narrow single drills or furrows. The team, either single or double, as circumstances require, is attached to the draught chain, C; when a side draught is desirable the chain is detached from the central hook and connected with the clevis, D, and the direction of the apparatus is controlled by the laborer from the plow-handles. The whole machine is only four feet long, and weigbs about 270 pounds. The teeth are about 12 inches long below the plate.

The inventor says that this implement is used in subsoiling by following in the furrow of a common plow. It loosens the grounnd 12 inches deep and wide, and leaves it finely pulverized. In the work performed, the inventor states that it is far superior to any similar machine, and is much easier for a team. In ditching it will loosen the soil or hardpan, and in one day it will perform more work than fifty men could in the same time. This invention was patented on March 31, 1863; for further information apply to the inventor, W. D. Strowger, Oswego, N. Y. (where the machine can be seen in operation), or to Eben Mason, 101 Water street, New York.



STROWGER'S PATENT DITCHING MACHINE.

Naval On-dit.

The Navy Department has received the following proposals from responsible ship-builders for the construction of the new ocean iron-clad navy. The plans, however, will not be ready for months to come, and some three years will have to elapse before the vessels can be fit for use, thus rendering it certain that 1866 will come before the formidable craft can be ready for service. Although the bids were to close on the 13th of April they are still open, and will be so for some days. The parties who are willing to build are:—Messrs. Merritt & Sons, Philadelphia, one vessel; Archibald and Reany, Chester, one vessel; Thomas F. Rowland, Greenpoint, one vessel; Romeo Underhill, New York, one vessel; the Atlantic Works, Boston, one or two vessels; H. M. Figaro, Philadelphia, one vessel. A Mr. Tufts offered to build one on his own plan. The price put in for these vessels ranges from four millions one hundred thousand to four millions four hundred thousand dollars; the estimate of Mr. Underhill, of New York, being the highest. If ten of these vessels were built, at two and a quarter millions each, they would cost nearly a year's navy estimate—over sixty millions—before their armament and general wants could be supplied. The dimensions of this fleet proposed for will be greater than those of any iron-clad yet conceived. It was learned in the engagement with the Charleston forts and that with Fort McAllister that the chief danger caused to the *Monitors* in both those fights arose from the bolts, which secured the iron plates, being driven inward by the force of the impact, thus occasioning the serious wounding of the inmates. Aside from these defects the *Monitors* have been proved invulnerable to the heaviest metal yet thrown against them. The remedy for this defect has already been discovered, is patented, and has received the approval of many scientific men. Mr. Maxmilian Wappich is the inventor of a method of fastening iron plates upon vessels, turrets or forts, by a process which entirely obviates the use of bolts extending through the outer plate of the armor. Each corner of the outside plate is turned at an acute angle, and forms a bolt of length sufficient to extend to the interior of the vessel or turret, where it is secured by a key. In the center of the plate are two similar bolts, which secure the middle of the plate. The iron forming the inner sheathing is secured by means of those bolts, and thus the external surface is unbroken and not weakened by bolt holes. The joints of the plate are made to fit perfectly, and when all are keyed together, the union is more perfect and stronger than could be effected by riveted bolts.—*Philadelphia Inquirer.*

Photographic Paper at High Altitudes.

Mr. Glaisher and Mr. Cox, aeronauts, made another ascent lately in England, reaching the bight of four miles and a half. They were nearly carried out to sea, and only saved themselves by a rapid descent—falling the last two miles in four minutes. The most curious fact elicited by this ascent is, that the action of the sun's rays upon "sensitized" photographic paper is much less at great altitudes than near the earth's surface! Mr. Glaisher took with him slips of such paper, and arranged that similar slips should be exposed at Greenwich Observatory, and the amount of coloration noted simultaneously every five minutes. The report tells that the paper in the balloon was exposed to the full rays of the sun, with this extraordinary result—that, at three miles high, the paper did not color so much in half an hour as in the grounds of the Royal Observatory in one minute! This would seem to indicate that the chemical effects of light are largely due to its passage through the atmosphere, or at least to the density of the atmosphere through which it has recently passed.

MISCELLANEOUS SUMMARY.

The New Orleans *Picayune* states that 14,151 sacks of rice were sent from Plaquemine parish to New Orleans in 1862 and 1863, against 13,864 in 1861 and 1862. A sack holds 100 pounds of clean rice. A bushel weighs from 45 to 58 pounds of clean rice. The weight of a barrel of rough rice is 160 pounds. An acre of land planted with rice, on a general average, yields about fifteen barrels of rough rice. Two barrels of rough rice make one barrel of clean rice, weighing 200 pounds, net. For the last three or four months the consumption of creole rice in New Orleans has averaged 500 sacks per week. April prices—6½ @ 8c. for No. 1; 5½ @ 6c. for No. 2; and 2½ @ 3c. for No. 3.

We learn from the *Mining Gazette* (Houghton, L. S.) that several rich lodes of copper have recently been discovered in the Portage district. The editor says: "At every point where it has been uncovered, the rock broken out is well filled with shot copper, and in fragments of the outcrop pieces of barrel-work weighing ten and twenty-five pounds have been found. Experienced men, who examined the vein, pronounced it the richest show they have ever seen in the district, not even excepting the splendid appearance of the Pewabic lode, when first opened."

The St. Louis *Republican* states, as one of the facts illustrating the magnitude of the war, that 31,184 horses and 19,727 mules were purchased in that city for the army during the year ending March 31, 1863; they cost $5,911,000. Most of the animals were brought from Illinois and the northern parts of Indiana and Ohio; Missouri having been exhausted early in the commencement of the rebellion.

The gunboat *Penobscot*, Commander De Haven, is now nearly ready for sea again. The propeller of the *Penobscot*, as with some others of her class, has proved too small for her engines. The fact that her fires were out less than ten times, and that her screw made five millions six hundred thousand revolutions, shows the exhausting wear and tear to which our blockaders are subject by the nature of the service.

Counting Chickens before they are hatched.—The Charleston *Courier* is in trouble as to how Charleston can get lumber to rebuild the Palmetto city. The Confederate Government must monopolize all the railroads for many months after peace is declared and independence secured, to get cotton to the seaboard, to send to Europe to pay Confederate loans, says this learned scribe, and in the meantime Charleston must suffer for the want of lumber. If Charleston is not to be rebuilt till the independence of the Southern Confederacy is established, the *Courier* man need not worry about lumber.—*Sunday Dispatch.*

Several more of those machines for removing torpedoes in channel-ways have been despatched South, and Commodore Dupont has now the means at hand for destroying the torpedoes. The length of each machine is about fifty feet.

Incremation.—The human body is, in general, so little prone to combustion, that it requires a very considerable time, with even an abundant supply of fuel, to reduce it to ashes. Dr. Christison (the eminent medical jurist) states that the quantity of wood required to burn the body of an adult is about two cart-loads. The last man burned at the stake in Europe (except one in Spain) was in Normandy, and it required two large cart-loads of faggots, and several hours to effect complete combustion. Among the Romans, so much wood was required to consume a body, that it was too expensive a mode of disposing of the dead to be adopted by the common people.

"We learn from an Eastern exchange that ten thousand cows are required to supply Boston with milk;" so says the *Sunday Atlas*, which also facetiously remarks: "The number of hydrants required to furnish New York with the same material does not seem to be mentioned."

The Lynchburgh *Virginian*, commenting upon the statement that tenpenny nails are passing as currency at five cents each in the upper part of North Carolina, remarks: "We have no such metallic basis for our currency here. Our circulating mediums are grains of corn, representing five cents, and quids of tobacco, representing the decimals."

About 20,000 dozens of spools of "ivory-finished' spool-thread are manufactured weekly by Green & Daniels, Pawtucket, R. I. Their numbers range from 16 to 100. All the fine numbers above 60 are made from Sea Island cotton.

Maple Sugar.

We recently questioned the legality of selling maple sugar as confectionary and taxing it as a necessary article. We find the following item in reference to this subject from the Revenue Office:—

Treas'y Dept., Office Internal Revenue,
Washington, April 11, 1863,

The production of maple sugar is a manufacture, and liable to a duty of three per cent *ad valorem*. Maple sugar, when compounded with other sugars or wrought into confectionary, is liable to the same tax as is imposed by the amendment to Section 75 (see Act of March 3d) upon other confectionary. Edward McPherson.
Deputy Commissioner.

Compliment to Mr. Alban C. Stimers.—Mr. Alban C. Stimers, the naval engineer who was in charge of the *Monitor* at the time of her memorable attack on the rebel steamer *Merrimac*, has been presented with a service of silver in consideration of his efforts on that occasion, by some of the principal men of this city. Many prominent names in the community were subscribed to the fund; among them we notice Wm. H. Aspinwall, John Ericsson, Howard Potter, and others. Mr. Stimers responded to the compliment in a brief note, expressing himself as highly flattered and pleased by the compliment.

The Waterbury Brass Mills.—We have recently made the tour of some of the principal brass-working manufactories in Waterbury, Conn., and shall devote a considerable portion of our space, for some time to come, to the various branches of the business, and the operations by which buttons, lamp-burners, metallic business cards, percussion caps, thimbles, &c., are produced. These articles will be found to contain popular information and will repay perusal.