VALUABLE RECEIPTS.

TRANSFERRING PRINTS TO GLASS, WOOD, &c.—When it is desired to transfer a steel, copper or lithographic print to glass, the first operation is to coat the glass with dilute lac or clear copal varnish. The print is then moistened with water, and while the varnish remains sticky, the paper is placed on the glass with the print side upon the varnish; it is then pressed gently to make it adhere. Several folds of white paper are now placed upon the back of the print, also a board with a light weight thereon to keep the print and varnish in contact till both are dry. After this the paper is moistened and rubbed off gently with the fingers, when the ink composing the print is left adhering to the glass. The several parts of the print may then be painted with appropriate colors and then finished with a ground coat over all. Prints may be transferred to wood in the same manner. The common mode of transferring prints to wooden blocks, for engraving, is to immerse a print for a short period in a solution of potash, then place it upon the block and press it. The potash softens the ink on the paper of the print, and, when placed upon the block of wood and pressed, the impression is made in the same manner as printing in the usual way. Prints are also transferred thus to stones for lithographic printing; also to plates of zinc for printing in a lithographic press.

STAINING MARBLE.—A solution of the nitrate of silver stains marble black; a solution of verdigris applied hot stains it green; a concentrated solution of carmine applied hot stains it red; orpiment dissolved in ammonia stains it yellow; the sulphate of copper, blue; and a solution of magenta, purple. The marble should be warmed before any of these solutions are applied, so as to open its pores and enable it to absorb more of the coloring matter. Marble may be stained according to beautiful designs with such colors. This art was more extensively practiced in Italy during former ages than it is at present.

COPPERSMITH'S CEMENT.—Boiled linseed oil and red lead mixed together into a putty. The washers of leather or cloth are smeared with this mixture in a pasty state. Resin mastic alone is sometimes used by jewelers to cement, by heat, cameos of white enamel or colored glass to a real stone, as a ground to produce the appearance of an onyx.

PLUMBER'S CEMENT.—Black resin 1 part, brick-dust 2 parts, well incorporated by a melting heat.

CEMENT OF DIHL FOR COATING THE FRONTS OF BUILDINGS.—This cement consists of linseed oil, dried by being boiled with litharge, and mixed with porcelain clay in fine powder, to give the consistence of stiff mortar. Brown color may be given with ground bricks or pottery. A little oil of turpentine aids its cohesion upon stone, brick or wood; it may be applied to sheets of wire cloth and laid upon terraces to make them water-tight; but lead is not much more expensive.

CEMENT FOR WINE-BOTTLE CORKS.—This cement consists of pitch hardened by adding resin and brick-dust.

A COMPOSITION FOR ARCHITECTURAL ORNAMENTS is formed of glue, chalk and paper pulp; the paper aiding the cohesion of the mass.

APPLICATION FOR THE EXTENSION OF A PATENT.

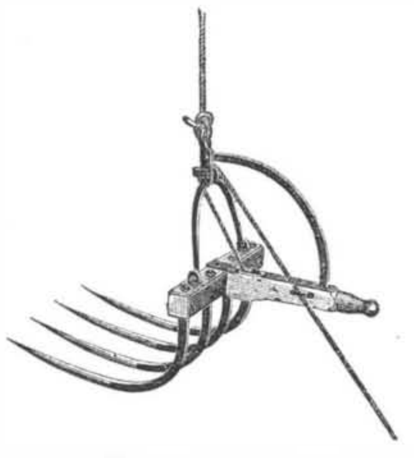
Ox-yoke Fastening.—A. A. Hotchkiss, of Sharon, Conn., administrator of the estate of Andrew Hotchkiss, deceased, has applied to the Commissioner of Patents for the extension of a patent granted to said Andrew Hotchkiss, on July 17, 1849, for an improvement in Ox-yoke Fastenings. The petition will be heard at the Patent Office on June 29th; the testimony will be closed on the 15th of that month.

WOOD PAPER.—There is an establishment at Royer's Ford, Pa., in which paper is manufactured from wood. Any kind of white wood is used. From five to six cords are consumed each day. About two and a half tuns of paper are manufactured per day, running day and night. Over fifty hands are employed, and the paper is used by a number of the leading newspapers. The experiment of making writing paper is just being tried. The art of making paper out of wood is decidedly a novelty and is well worth the attention of the curious.—*Exchange.*

IMPROVED HORSE HAY-FORK.

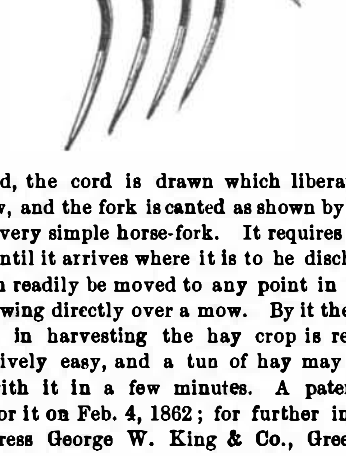
Great benefits have of late years been conferred upon our farmers by the successful application of improved implements and machines for saving severe human labor. The pitching of hay in the barn by hand was among the most laborious exercises of the farmer; but he can now be relieved of this toil by applying horse-power to unload his wagons, by a simple adjustable fork like the one represented by the accompanying figures. One of these figures represents the fork in a position ready to be pushed into the hay on a wagon, and the second represents it in the position it occupies when discharged.

FIG. 1.



The teeth of the fork are secured in the usual manner in a cross-head, to which is fastened an iron suspension yoke. On the top of this yoke is an eye to which the rope is secured that elevates the fork with its load, and also lowers it. This rope passes up over a pulley secured in a beam of the barn, then down and over a pulley fastened to the floor, thence to the horse which operates the fork. A shank projects behind the head of the fork, in the interior of which is a sliding spring catch. A metal bow-brace, secured to the head of the suspension yoke, passes backward through an opening in the shank. On the lower end of the bow-brace is a notch, shown in Fig. 2. A cord is attached to the inner end of the sliding spring catch in the shank, thence carried over a roller in the yoke and down to the person who is on the wagon, or the one who is to discharge the fork. The fork is thrust into the hay by taking hold of the shank and yoke with the fork in the position as shown in Fig. 1, then it is raised with its load by the horse drawing on the upper rope shown. When the fork has arrived at the place where it is to be

FIG. 2.



discharged, the cord is drawn which liberates the brace-bow, and the fork is canted as shown by Fig. 2. This is a very simple horse-fork. It requires no attention until it arrives where it is to be discharged, and it can readily be moved to any point in a barn so as to swing directly over a mow. By it the greatest labor in harvesting the hay crop is rendered comparatively easy, and a tun of hay may be unloaded with it in a few minutes. A patent was granted for it on Feb. 4, 1862; for further information address George W. King & Co., Greenville, N. Y.

THE gold fields of New Zealand are now yielding at the rate of 20,000 ounces per week.

Bristol's Anti-friction Slide Valve.

We have examined a model of this apparatus, and found the mechanical arrangement very simple. It consists of a slide valve mounted upon steel rolls in such a way that the weight, amounting to several tuns in a large valve, is removed from the valve seat and the valve itself enabled to move easily back and forth; thus relieving the tremendous strain on the valve-rods and eccentrics, and adding materially to the effectiveness of the machinery. The inventor has experimented very carefully upon the relative proportions of the two surfaces—those under the rolls and the valve face itself—and we are assured that the latter is always steam-tight, requiring no lubrication and unlikely to cut when neglected. If all the conditions claimed for this invention are obtained, it is certainly a long-sought-for desideratum and solves a great problem in steam engineering. These valves are now fitted to some new engines in United States sloops-of-war. See advertisement on page 287.

LITERARY NOTICE.

ANNUAL OF SCIENTIFIC DISCOVERY.—A Year-book of Facts in Science and Art. Sheldon & Co., New York; Gould & Lincoln, Boston.

This volume presents in a compendious form a large amount of scientific information, useful for reference and interesting to those who are fond of natural science. The work is prefaced with an admirable portrait of John Ericsson, the inventor and engineer, to whom is attributed the honor of bringing into public use the *Monitor* batteries. The several discoveries in manufactures and the arts are alluded to, and all objects of interest in the material world have their appropriate place alloted them. Information that can be obtained from no other sources is here easily attainable, and will be highly prized by the searcher-after-facts concerning the progress of the world. Mr. David A. Wells is the editor, and the arrangement of the matter does credit to his taste and judgment.

"WELL'S COMMERCIAL EXPRESS AND PRODUCE REPORTER."—We have often desired to obtain statistics of the grain crops and of the cereals generally which are raised at the West, and we have always found *Well's Commercial Express and Produce Reporter* a reliable reference for the purpose. It contains a large amount of useful intelligence on those points, and has, in addition, extracts from the best journals of the day; also, the latest market reports and editorial suggestions to the business community, which are doubtless valued and heeded. Every merchant in the produce trade should consult its columns.

THE NATIONAL ACADEMY OF SCIENCES.—At the late session of Congress, an act was passed for the formation of a National Academy of Sciences, and fifty corporators, mostly members of the American Association for the Advancement of Science, were included in the bill. A preliminary meeting of the corporators were held in this city, last week, and fifty members were present; Prof. Joseph Henry of the Smithsonian Institute, was chosen president. A committee was appointed to report a plan of organization for the Academy.

MOVING A CHIMNEY.—A remarkable work was accomplished at Worcester, Mass., last week. The chimney-stack at the iron-works of Nathan Washburn, which is 100 feet high, having in it 60,000 bricks and weighing 170 tuns, was moved a distance of 150 feet and turned partly around, without the slightest accident, and not even a brick was dislocated.—*Commercial Bulletin.*

A WOMAN was walking in a street in Philadelphia the other evening, with a box of matches in her pocket, when she fell; the fall ignited the matches and her clothes were set on fire; in her alarm she started to run, thereby fanning the flames, and she became so badly burnt that she soon after died in the hospital.

ACCOUNTS from the principal agricultural centers of the Western States inform us that the prospect for the coming crop of winter wheat is very good. Notwithstanding the great scarcity of labor, more than an average breadth of land has been sown in most places.

Draining a Classic Lake.

In Southern Italy, not far from the frontiers of the Roman States, an interesting work of engineering is now being prosecuted. This is nothing less than the attempt to drain the famous Lake Fucino. This lake is simply a great pool surrounded by mountains. Last year the waters of this lake were drawn off through a tunnel, four miles in length, which had requiredeight years to cut; and drains are now being made in the seat of the lake for rendering the recovered soil fit for cultivation. The lake covered 40,000 acres of land, which in a few years will be converted into arable land. Julius Cæsar planned the draining of this lake nearly nineteen hundred years ago, but the Emperor Claudius made the first attempt. Pliny describes the wonders of a tunnel following the sides of a mountain at a depth of a hundred feet. And it was, indeed, an astonishing attempt in those days, when the engineers had none of the appliances of modern science. Claudius employed 30,000 men in the attempt for eleven years, and exhausted the public treasury. When he believed that his work was complete, he celebrated the event by one of the greatest *naumachia*, or water-fights of Roman times, in which 19,000 men, divided into two fleets, fought to death "to make a holy-day." Claudius, Agrippina and young Nero (who, a few months later, became master of the empire), the imperial court and an immense crowd of spectators were present at this fearful and imposing gladiatorial contest. When the play was terminated, the dam which stayed the waters from the tunnel was removed, and they rushed in with a roar, but soon rolled back. The tunnel was a failure! The cause of this failure remained hidden for centuries. The work was re-commenced under Trajan and Adrian; still later by Frederick II., in 1240; by Alphonso I., of Arragon, in the seventeenth century; and lastly, by Frederick I., king of Naples, in the eighteenth century; but all failed. In 1826, Afan de Rivera, Chief of the Public Works in the kingdom of Naples, obtained leave to clean out the cut or drain made by Claudius. This work was finished in 1835, but the problem of draining the lake was as far off as ever. At length, in 1853, a Neapolitan company obtained permission to drain the lake and take the reclaimed bed for their remuneration. On investigation, it appeared that the tunnel constructed under Claudius had not been so devised as to draw the water from the lake, the Emperor had been cheated by his Minister of Public Works. The engineer of the modern company finally decided to destroy the Roman work and make one of double the dimensions.

Aniline Colors—Who is the Inventor of Aniline Red?

It is generally conceded that Prof. Hofmann, of London, England, is the original and first inventor of the red color derived from aniline. Some doubts have been raised, however, in the minds of many inventors and manufacturers in this country, in regard to this fact, since Joseph Renard, of Lyons, France, has obtained patents in France and in the United States, in which he claims, as his invention, the red coloring matter obtained by treating aniline with a metallic salt, or its equivalent. To clear up these doubts we publish the following data:—

The process of Prof. Hofmann, in London, has been published in *Les Comptes Rendus de l'Academie des Sciences*, Vol. XLVII., page 492, in the number for October, 1858, under the head of "Action of Bichloride of Carbon on Aniline."

At the usual temperature bichloride of carbon and aniline have no reaction on each other; at the temperature of boiling water the mixture begins to change, but even after a digestion of several days the reaction is not at all complete. By submitting a mixture of one part of bichloride of carbon and three parts of aniline, both perfectly anhydrous, during a period of about thirty hours, to a temperature of 170 to 180 degrees Centigrade, that is, to the boiling temperature of the aniline, the liquid is transformed into a blackish mass, either soft and sticky or hard and brittle, according to time and temperature. This black mass, which adheres with great tenacity to the retorts in which the reaction has been effected, is composed of several different materials. By washing it well in water a portion of it is dissolved, and the rest remains insoluble in a resinous state of more or less solidity. The aqueous solution produces with potash an oily precipitate which contains a considerable proportion of unchanged aniline. By boiling this precipitate in a retort with diluted potash, the aniline passes over by distillation until a sticky oil remains, which solidifies with a crystalline structure. By washing with alcohol and by one or two crystallizations in boiling alcohol, the mass is rendered perfectly white and pure, and a very soluble substance, —a beautiful crimson—remains in solution. That portion of the black mass which remains insoluble in the water dissolves readily in hydro-chloric acid; from this solution it is again precipitated by alkalies in the state of an amorphous powder of a dirty red soluble in alcohol, to which it imparts a rich crimson color. The greatest part of this substance is the same coloring matter which accompanies the fatty crystalline substance.

We now give a verbal translation of the original specification of Joseph Renard's patent on the preparation and use of "fuschsine" (a new red coloring matter), taken out in France, and dated April 9, 1859:—

We have given the name of "fuschsine" to this matter on account of the resemblance of its color to that of the flower "fuchsia." To obtain it we heat to ebullition a mixture of aniline and of anhydrous bichloride of tin, the ebullition being continued for 15 to 20 minutes. At the beginning the mixture turns yellow, it darkens, becomes reddish, until at the end it turns out to be a beautiful red, when it appears in small layers of a black color. At this moment, and while it is still liquid, it is poured in water, and the whole heated to ebullition; the fire is withdrawn, the moisture is left standing for an instant, to allow the insoluble parts to settle down, it is then filtered while hot, and the residuum is further extracted by repeated ebullitions with water. The filtered liquor contains the coloring matter in solution. In order to separate it, its property, to be insoluble in saline solutions, is made use of by adding to the liquor certain soluble salts in the solid state, for instance, chloride of soda, neutral tartrate of potash, neutral tartrate of soda and many others; the salt dissolves and the coloring matter precipitates in the solid state; it is separated by decantation or filtration. To use it, it is dissolved in water, and with this bath the dyeing is effected without mordants or by using the ordinary mordants, acids or salts, with the exception of mineral acids, which alter the color. In the same manner a red color is obtained by the reaction of other anhydrous metallic chlorides on aniline, amongst others, those of bichloride of mercury, perchloride of iron and protochloride of copper.

By the foregoing description we desire to reserve for ourselves the sole property in the following things:—1st, The production of that new coloring matter obtained by the reaction on aniline of certain anhydrous metallic chlorides, and particularly of the bichloride of tin. 2d. The application of this coloring matter for dyeing or printing textile fabrics, silk, wool, cotton and thread, and also hides and feathers.

By comparing the two descriptions the following result is arrived at:—

	Hofmann.	*Renard.*
Organic base used......	Aniline,	Aniline,
State of this base.......	Anhydrous,	Anhydrous,
Variable agent..........	Bichlo. of car.,	Bichlo. of tin,
State of this agent.......	Anhydrous,	Anhydrous,
Temperature............	Ebullition of the aniline,	Ebullition of the aniline,
Coloring matter obtained,	A magnificent crimson,	A beautiful red,
Nature of this matter....	A resin,	A resin,
Mode of extraction......	By dissolution in water.	By dissolution in water.

It is unnecessary to continue the parallel any further; by looking at the dates of the two descriptions it will be seen that Hofmann obtained the same color by nearly the same process (the only difference being that one uses bichloride of carbon and the other bichloride of tin) which Renard claimed as his invention about six months after the publication of Hofmann's process in *Les Comptes Rendus.*

Direct Photographic Printing on Paper.

The following remarks were written by M. Poitevin, and published in the *Bulletin de la Societe Francaise de la Photographie:*—

"In the new principles of permanent printing in carbon or other inert pigment, which I submit, the pigment remains imprisoned in an organic material, originally insoluble, and remaining so in those portions not acted upon by light, or coagulated in certain parts only of the impressed surface. The first principle, that which I have most followed up to the present time, rests upon a well-known reaction—the insolubility communicated to organic matters, such as gum, albumen, gelatine, &c., by salts of iron, the perchloride, for example, and upon a new fact which I have observed, which is, that this matter, coagulated and rendered insoluble in cold or warm water, becomes soluble under the influence of light, in presence of tartaric acid, which, reducing the ferric compound, restores the organic matter to its natural state. Gelatine is the substance with which I hav succeeded best. The following is my mode of operating. I dissolve 5 to 6 grammes of gelatine in 100 grammes of water, and add sufficient quantity of carbon or other inert pigment to obtain the intensity of tone I desire to produce. I pour this solution into a flat dish, and keep it warm so as to prevent the gelatine solidifying. Each sheet of paper is floated on one side only on this solution, and a uniform coat of colored gelatine adheres to it; I then place the sheet of paper on a flat surface and leave it to dry spontaneously. To sensitize these sheets, I impregnate them on both sides with a solution of perchloride of iron and tartaric acid in the proportion of 3 to 1. The quantities which have appeared to me most suitable being 10 grammes of perchloride to 100 cubic centimetres of water, and 3 grammes of tartaric acid. I leave the thus-prepared sheets to dry in the dark; then the coating of gelatine has become completely insoluble, even in boiling water. I print these surfaces from positives on glass or on paper, and in all those portions upon which the light acts, the coating becomes soluble in warm water; this solubility, be it understood, commencing from the surface. After a few minutes' exposure to the sun, if the positive *cliché* be not very dense, which is preferable for this kind of printing, I remove the paper from the printing frame, and immerse it in warm water; thereupon all the parts which have been modified by light dissolve in proportion to the quantity of light which may have passed through the various portions of the positive *cliché*. In the parts corresponding to the lights of the *cliché*, the black or colored coating will be dissolved down to the surface of the paper, leaving perfect whites, while in the half-tones a part only of the coating will dissolve, commencing with the surface, and these half-tones will be rendered upon the greater or lesser thickness of the coating of gelatine remaining insoluble; and as this part is in immediate contact with the paper, it cannot be removed by washing; as to the portions of the negative which are entirely black, they will be rendered by the entire thickness of the primitive coating. To complete the proof, it is only necessary to dry it in the air, or treat it with water acidulated with hydrochloric acid, which removes the stain of salt of iron, then to wash it freely in water, and dry it again spontaneously. It is now unchangeable, but a tanning of the gelatine, accomplished by known methods, with alum, bichloride of mercury, &c., will give it greater solidity. Before this fixing we can make whites wherever they may be required, by means of a pencil dipped in warm water. We do not encounter such dangers in this method as presented themselves in that I proposed in 1855, in which I employed a coating of gelatine mixed with an alkaline bichromate and carbon, and which I printed by means of negatives; for in that method the gelatine was rendered insoluble by light, commencing at the surface, and the half-tones were removed in the washing, undermined from beneath by a portion of the coating remaining soluble. The method I now propose does not possess this inconvenience, and to obtain perfect proofs by it requires only suitable paper with a glazed surface, uniformly coated with a film of the colored preparation, which will be found easy to realize in practice."

Gases of Decaying Vegetation.

The following are condensed extracts from an interesting paper, lately published by M. Bossingault, the distinguished French chemist:—

M. Boussingault remarks that Mr. Bennett many years ago, first took notice of the emission of air from the surface of leaves; Priestley recognized this air to be oxygen; and Senebier proved that the oxygen gas eliminated by leaves under the light of the sun came from the decomposition of carbonic acid gas. Théodore de Saussure, nearly at the beginning of the present century, ascertained the fact that the volume of oxygen gas produced was not quite equal to that of carbonic acid decomposed; and, also, that nitrogen gas was always evolved, to an amount about equal to that of the oxygen gas which had disappeared. He supposed that this nitrogen came from the substance of the plant; not considering, what is now obvious, that the substance of the plant did not contain, and therefore could not have furnished, anything like this quantity of nitrogen.

In modern times, Daubeny was unable to obtain from leaves oxygen gas free from azote; and Prof. Draper states that he found the astonishing amount of from 22 to 49 per cent. of the gas emitted from the leaves of *Pinus tæda* and *Poa annua* to be nitrogen. The first step towards the elucidation of the matter was made by Cloëz and Gratiolet, who, exposing the leaves of a common pond-weed in water slightly impregnated with carbonic acid, found, the first day, that 15.70 per cent. of the gas eliminated was nitrogen; the second, 13.79; the third, 12.00; the fourth, 10.26; the fifth, 9.53; the sixth, 8.15; the seventh, 4.34; the eighth, 2.90—that is, the oxygen gas grew purer and purer, exactly as if the azote retained in the tissues of the plant, or in the water, was gradually expelled by the oxygen. Similar experiments were made by Boussingault in 1844, confirming these results; and also, later, a set of comparative experiments, with and without leaves, which confirmed the truth of the conjecture as to the source of most of the nitrogen. But, after all, he could not obtain any oxygen gas free from azote.

Boussingault now devised a new method of proceeding, by which he avoided the difficulty about extraneous nitrogen, &c. The average results of 25 experiments, made with a variety of plants, are that 100 measures of carbonic acid gas, decomposed by foliage under the light, gave 97.2 of oxygen gas; and that 1.11 of azote had appeared, which could not have come from the water, nor have been contained in the plant. At this point, Boussingault raised the question whether this gas, which remained after the absorption of the oxygen was really nitrogen. A set of experiments, devised and executed in this view, brought out the interesting result, that the supposed azote—which, moreover, corresponded very nearly with the amount of oxygen gas that had disappeared, was oxide of carbon, *i. e.*, carbonic oxide—also a little protocarburet of hydrogen. So, foliage, during the decomposition of carbonic acid, does not really emit nitrogen gas, but, with the oxygen gas, emits some oxide of carbon and some protocarburet of hydrogen; and these combuttible gases, like the oxygen, are produced only under the light of the sun. These gases constantly accompany the oxygen, when the sun acts upon a vegetable submerged in water impregnated with carbonic acid. Is this also the case when carbonic acid is decomposed by foliage in the air?

Boussingault concluded his paper with the remark, that the earlier observers looked at their discoveries rather from the hygienic than the physiological point of view; that, while Priestley announced his brilliant discovery, by the statement that plants purify the air vitiated by combustion or by the respiration of animals, it is curious that, a century afterwards, it should come to be demonstrated, before the Academy of Sciences, that probably the leaves of all plants, and certainly those of aquatic plants, while emitting oxygen gas, which ameliorates the atmosphere, also emit one of the most deleterious of known gases—carbonic oxide! He closes with the pregnant and natural query, whether the unhealthiness of marshy districts is not attributable—at least in part—to the disengagement of this pernicious gas by plants?

NATIONAL FINANCES.—The appropriations made by the Thirty-seventh Congress are as follows:—Extra session, July, 1861, about $264,000,000; long session, ending July 17, 1862, $913,000,000; short session, ending March 4, 1863, $1,100,000,000. Receipts from duties on imports, internal revenue, direct taxes, sales of public lands, &c., and estimates from March 4, 1861, to July 1, 1864, $320,000,000—which, deducted from the above sum, will leave the amount of indebtedness up to July 1, 1864, including the $70,000,000 debt left by the last Administration, $2,627,000,000.

NEW TELEGRAPH INSTRUMENT.—An ingenious German mechanic in Washington has nearly perfected a new telegraph instrument, which is on an entirely different principle from those now in use, and may prove far superior to any of them. He is aided by two wealthy newspaper-proprietors, who supply him with ample means for making his experiments.

Correspondence

Was the "Keokuk" a Failure?

MESSRS. EDITORS:—One of the greatest minds this planet has produced—a countryman of ours—on an occasion familiar to us all, commenced his greatest speech in the Senate of the United States in the following words:—"When the mariner has been tossed for many days in thick weather and on an unknown sea, he naturally avails himself of the first pause in the storm and the earliest glance of the sun to take his latitude and ascertain how far the elements have driven him from his true course." I have imitated this example, and avail myself of the "first pause in the storm" which has overtaken the *Keokuk* to examine her bearings, and by a plain statement of facts, which, with your permission, I will lay before my countrymen, leave them to determine "how far the elements have driven her from her true course." I shall endeavor to show that in the short life of the vessel she developed qualities which no other iron-clad hitherto built in this country possessed to the same degree, and that if her armor was not proof against the artillery of the enemy she combined other elements of scarcely less importance, and which should save her from the harsh judgment which a few unthinking minds have passed upon her.

The *Keokuk* was built for a light draft vessel, and, when ready for action, her draft was about 9 feet aft and 8 feet forward. She was a small vessel, being but 159½ long, over all, including ram and rudder. She was designed to have speed, and she attained it, running out of New York harbor at the rate of 10 miles an hour. She was intended more particularly for intricate navigation—to ascend the Southern inlets and rivers—and to do this, it was necessary she should be manageable and obey her helm promptly, which she did. She was designed to be sea-worthy, and she proved herself eminently so. She was thoroughly ventilated, and without the use of artificial means; well lighted in her cabin and wardroom, and her accommodations generally were as good as on any vessel in the service of the same tunnage. The *Keokuk* was intended to be shot-proof against ordnance in use in the naval service of the United States, at the time she was designed, and I have it from the lips of her commander, that he believed she would have proved so; but against such bolts and missiles as the rebels threw (supplied them by our neutral friends across the water), she was not proof; nor were any of the other iron-clads engaged in the action, four out of the seven of the *Monitors* being disabled, although not exposed—as is admitted on all sides—to so severe a fire. She took into action, amidst the most terrific cannonading the world has ever seen, about one hundred men and brought them all out alive, and the most severely wounded—Ensign McIntosh, as brave and true an old salt as ever trod the deck of a ship—is, I learn to my great joy, in a fair way to recover.

The apparent thickness of armor on the sides of the *Keokuk* was 5¼ inches, put on in a peculiar manner, viz., bars of iron, 4 inches wide and 1 inch thick, were placed edgeways over the skin of the ship, running fore and aft, 1 inch apart, and between them were placed strips of wood of the same dimensions; over this were laid two plates of iron, each ⅝th of an inch thick, secured on the edges of the bars by 1⅛-inch bolts running between them and through the skin and fastened by a nut on the inside of the vessel. The actual weight of metal in armor on her sides, as will be seen from this description, was 130 pounds per superficial foot, equal to a solid plate of only 3¼ inches in thickness. On the turrets an additional ½-inch plate over the two ⅝ths, increased the apparent thickness of armor to 5¾ inches, and the weight of metal to 150 pounds per superficial foot, equal to a solid plate of 3¾ inches. The question will naturally be asked—why was not the vessel more heavily armored? Simply because a vessel of her dimensions would not support any more. Increase the size of the vessel and the armor may be increased in the same ratio. If vessels clad in eleven inches of solid iron were disabled and placed *hors du combat*, is it to be wondered at that a little vessel, carrying but about 3¾ inches of solid metal, could not stand the racket? To recapitulate:—The *Keokuk* proved to be seaworthy; to have speed; to be perfectly manageable, to be well lighted, naturally; to be well ventilated; without the use of artificial means; to have great stability; she preserved the life of every man she took into action, although sustaining the heaviest fire of any vessel in the fleet; but she was not proof against the missiles used by the enemy, nor were any of the other vessels engaged in the action; no part of the machinery of the vessel was disabled or gave out.

This whole business of iron-clads is in its infancy. and we must expect occasional disaster until experience has shown us where the weak points are, and how to strengthen them. Now that portion of the life of a vessel which is passed in action is an exceedingly limited one, and sacrifices too great can be made of creature comforts, of those immutable laws which govern and regulate health—light, air and exercise—to accomplish certain results. In the *Keokuk* I attempted a compromise, keeping in view the points I have named; and I have vanity enough to believe, that if the vessel had been twice her size, with a corresponding weight of armor, she would have passed through the fiery ordeal successfully. I mourn her loss, for I had fashioned her and watched her as she sprung into life as a parent does his first-born child. She carried with her the toil and care of many a weary day and night, and that she has not done better service, is not because those connected with her did not labor most earnestly to that end.

I have stated my case, and leave it with entire confidence to the judgment of my countrymen. The question of success or failure will be by them decided. I am prepared to submit to the people's verdict, whatever that may be; but I am not to be put down with the cry of failure, without at least measuring my strength with those who are raising it and exulting over what they suppose to be my downfall.

C. W. WHITNEY.

Breech-loading versus Muzzle-loading Guns.

MESSRS. EDITORS:—In that number of the SCIENTIFIC AMERICAN issued on March 7, 1863, I observed a communication (page 150) and an editorial (page 154), both on the above topic; and, as it is a subject on which I have had some experience and to which I have given considerable thought, *I* also desire to say a few words on it. With the communication I was pleased, because it presented an important truth in so clear a light as to leave no question on the main point asserted. The editorial I read with considerable surprise, at least that part of it which talked about breech-loaders "leaking at the breech," and "the flash of the charge in the face of the marksman rendering his aim unsteady." But when I read further, and found that you did not include those breech-loaders using the metallic cartridge, and that the only evidence of leaking at the breech and the flash was found in the "earlier Sharpe's rifles," I was considerably relieved. Now, I submit that this is not fair treatment of the subject. As to the flash in some of the earlier and defective breech-loaders, it is no more evidence against the perfect ones of the present day than would be the old match or flint lock when quoted as evidence against the perfected muzzle-loaders of modern times. By no fair construction can a party, arguing in favor of breech-loaders, be supposed to mean any but the best; certainly not defective, inferior or discarded kinds. Now, as you admit that neither of those objections lies against metallic-cartridge breech-loaders, and thus, therefore, that kind is the best, and consequently the one, in all fairness, to be used in the contest between the two classes, it seems to me that that objection is done away with—that it has no application in a discussion of this sort. But I go further, and affirm that, whatever may have been the fact with the "earlier" Sharpe's rifle, the present arm of that make does not leak at the breech and does not flash in the face of the marksman; I have fired the carbines and rifles repeatedly since the war began, and I never knew an instance of either. Thousands of them are in use in our army, and I do not believe you can find a man there who will say that there is any trouble on either of those points.

Second, It is objected that the ball may not be entered accurately, and therefore its flight will not be