Evaporative Qualities of Iron, Copper and Brass in Boilers.

In a recent article on page 204, this volume SCIENTIFIC AMERICAN, we presented some very useful information on this subject from the London *Mechanics' Magazine*. It was stated from a series of experiments conducted by George Tosh, that brass boiler tubes were found to possess an evaporating power exceeding those of iron twenty-five per cent, and that copper tubes exceeded those of brass thirty-one per cent. We observed that the accuracy of the experiments was doubtful, and our doubts we perceive are confirmed by the last issue of the London *Artisan*, received by us since the article referred to was published. It contains a very good report of the discussion which was elicited by the reading of Mr. Tosh's paper before the Institution of Mechanical Engineers. At that meeting, W. B. Johnson stated that the results obtained by the author of the paper (Mr. Tosh) were very different from his experience, as he had been led to the conclusion that there was no appreciable difference between iron and brass in evaporative power. He had a good opportunity of comparing them on a large scale in "two boilers of 160 horse power each, which had been made exactly alike, excepting that one had iron and the other copper tubes. The result of the working of these boilers was about equal, and no difference could be noticed beween them."

Professor Rankine stated that a series of experiments had been tried a number of years ago, by James R. Napier, with experimental boilers of copper and iron of various thicknesses heated over the same gas flame, and he found but a small difference in their evaporative power, about one-thirtieth being in favor of copper. "In all experiments of the kind," he said, "the state of the heating surface was important, that is, whether smooth or rough, clean or encrusted. The effective evaporating result or transmission of heat through metal depends on three properties—first, the resistance of the first surface (that next the fire) to absorption of the heat; second, the resistance of the internal particles of the metal to the conduction of heat; and thirdly, the resistance of the second surface (that next the water) in giving off the heat. The resistance to internal conduction is less in copper than iron, but its surface resistance is greater. It had been found in experiments very carefully conducted that when the surface became dull, the transmission of heat through all metals was about equal."

Mr. Siemens stated that Dr. Ure had proved by a series of experiments that the conducting power of copper was so good, that by increasing its thickness in a boiler, its evaporative power was not sensibly retarded, while with iron, the result was different—by increasing its thickness, evaporation was greatly retarded. On the other hand, Mr. Roberts stated he had found that the thickness of the metal in a boiler—whether of copper or iron—greatly affected the evaporation of the water. The plates, when thick, retarded the passage of heat, and tended to injure the metal by not permitting the caloric to be carried off so rapidly as it should be by the water. He found that brass tubes of No. 18 wire gage, lasted much longer than thicker ones of No. 14 wire gage, under the same conditions precisely. Mr. Craig stated he had not found much difference in practice between brass and iron tubes in locomotives, and did not know of any definite result in favor of one more than the other as to evaporative powers.

Mr. Henry Maudsley stated that in steam engine boilers—particularly marine and stationary—there were other reasons affecting the use of copper or iron beside evaporative qualities or conducting power for heat. Their durability, under exposure to rusting or corrosion, and liability to encrustations being formed in them, were questions of great importance. He had known a case of nine marine copper boilers ordered for Naples in preference to iron, because allowance had to be made for their being sometimes laid up without working, and not to suffer from rust, as iron boilers were sometimes under the same conditions seriously injured in eighteen months, while copper boilers were not affected. The original cost and conducting power of boilers, under the same circumstances, were secondary questions to durability.

Mr. Tosh then stated that where he has had charge of locomotives and other engines for several years at Maryport, he had used a great number of brass and iron boiler tubes with apparently equal success, but brass tubes had been generally preferred for locomotives working at a high pressure, because there is less difficulty in keeping them fast in the tube plates, and encrustations are not so liable to form on them as on those of iron; and when iron tubes became leaky in the least degree, their ends were rapidly destroyed, which was not the case exactly with brass. Iron boiler tubes are now extensively employed in England, and many engineers are of opinion that no other kind should be used, but brass is still preferred by the majority.

The foregoing information on this subject—giving the substance of opinions expressed by engineers distinguished in their profession—is of much importance, and will interest our readers generally.

Laboratory—No. 2.

Equivalents.—We can no more make progress in chemistry without studying its principles and its laws, than an artist can paint a perfect picture without knowing the rules of perspective; it is for this reason that we have recently turned from the subject of experiments to that of doctrines, especially as we hope that some of our readers will at a future day give us credit for being the finger-post on their road of life which pointed to the path leading to honor. The term "equivalent" in chemistry has much the same meaning as it has in ordinary things. An equivalent means of the same value; thus, twenty shillings in silver (English currency) are equivalent to one sovereign in gold. In the laboratory, the word equivalent implies an atom of matter that is equal to another of a different kind; thus, as we learned in a previous article, that every atom of an element has a specific weight compared with another atom, this weight has, by the consent of philosophers, been denominated its "equivalent." Hence, 28 parts of iron, combining with sulphur, always unite with 16 parts of that fiery element; let the weight of the materials be in grains, ounces, or pounds, the same proportion is always there—in sulphuret of iron. You will say, for the sake of argument, "But suppose we only put 14 parts of iron to 10 parts of sulphur, they will unite." Chemical doctrine says "No," for there will be free sulphur containing no iron; in the mixture, the 14 parts of iron will have combined with 8 of sulphur, which is in the same proportion stated, for as 28 : 16 : : 14 : 8. It is thus we call 28 the "equivalent" of iron, and 16 the "equivalent" of sulphur, because we have made hydrogen as the standard of comparison, and have fixed upon 1 as its equivalent, and the base or unit of calculation in measuring the equivalents of all other bodies. A list of equivalents or atoms in weight is given in every elementary work on chemistry; it is, therefore, sufficient for us to point out the road where the philosopher's stone may be found.

Alloy for Medals, Small Figures, &c.

Herr von Bibra states that an alloy consisting of 6 parts bismuth, 3 tin, and 13 lead, is very fusible, and remarkably hard, without being brittle. The fracture does not present any crystalline appearance. When objects cast with this alloy are moistened with dilute nitric acid, and rubbed with a woolen rag, the raised portions appear bright, and the depressions dull. Some castings of medals from gypsum molds were so perfectly reproduced that writing, which could be read on the originals only by aid of the microscope, was quite distinct in the copies. It is probable that this alloy would be serviceable for typographic purposes.—*American Mining Chronicle.*

Foreign Summary.

C. D. Seropyan, of New Haven, Conn., has secured a patent in England for a mode of preparing bank notes, bills of exchange and other papers, to prevent counterfeiting by photography and its kindred processes, by using two or more colors, which do not reflect nor transmit, but absorb the chemical rays of light, one of which shall be so applied to the paper as to cover the surface with a tint of a red or a yellow shade of color, while an ink of a different color from the surface tint shall be used for printing the other parts of the note, that is, the obligatory and ornamental parts of the said surface. Where this mode of preparing notes is observed, counterfeiting by photographic or kindred means cannot be effected; for so long as the tint or ground and the vignettes and lettering remain together, a distinct impression of the latter cannot be obtained sufficiently clear and distinct to answer the purpose of the counterfeiter, because both the colors neither transmit nor reflect, but absorb, the chemical rays of light.

POWERS, THE SCULPTOR.—We observe that our distinguished countryman, Powers, has secured another patent in England for a machine for punching, stamping, or cutting metals or other substances, in which the tool can be changed very quickly, and the whole machine can be taken to pieces and re-adjusted with great expedition. Like the singularly and novel formed rasps he invented a few years since, it appears to be simple in construction and admirably adapted to the purposes for which it is designed.

ANOTHER AMERICAN TELEGRAPH.—There is a project on foot at St. Petersburg for establishing a strictly overland telegraphic company with North America. The plan has been presented to the government by a Belgian engineer, and consists in carrying a telegraphic line by Siberia, and to establish a submarine communication between Capes East and Prince of Wales, then to join the lines to those of the United States through the territories of Russia, and England.

THE LEVIATHAN.—Some idea of the immense magnitude of this monster steamer may be formed from the fact that the mere cost of completing her for sea, putting on board stores, &c., and fitting her for the trip she is expected to make to Portland, Maine, the coming summer, will amount to the enormous amount of $600,000. No less than ten anchors are required to hold her at her present moorings, each with lengths of cable from 40 to 160 fathoms. All her masts are to be stayed by iron rope standing rigging of the most massive kind, the shrouds and stays of which are so secured at their ends through iron rings as to enable a single skilful man to cast loose all the fastenings of each mast in five minutes, in the event of disaster, though until the rings are opened, the sides might yield from the ship before the shrouds would yield.

THE ATLANTIC TELEGRAPH.—Four hundred miles of new cable are in course of manufacture to supply the loss from the failure of the experiment last year, and 300 additional miles which it has been resolved should be provided, so as to allow greater length of slack than was originally contemplated. The cost for these additional 300 miles is estimated at $180,000. It is generally believed that the plan of joining the cables in mid ocean, instead of starting from either shore, will be resorted to. Considerable modifications are being made in the machinery, and experiments are now in progress with a view of making the machinery for paying out as nearly as possible self-acting.

NEW LUBRICATING MATERIAL.—M. Rohrig has discovered a means of removing the acid principles of fat, and thus enabling it to be applied as a lubricator for machinery, without danger of oxydizing the metals with which it comes in contact, besides freeing it from all disagreeable smell and taste, and rendering it to a consistence of castor oil. It hardly colors copper, bronze or brass, does not run like olive oil and other thin oils, and is much cheaper than the ordinary lubricating material.

Correspondents

J. C. R., of Va.—A patent cannot be obtained for any improvement but in the name of the inventor. The apparatus for extracting tannin from bark, described by you, is not new, and therefore not patentable. Vegetable oils are generally injurious to leather, and so are some animal oils. Flax, olive, and whale oils soon rot leather. Tallow and neats-foot oil make a good leather composition. Tooth powders should be avoided, if possible; they are not required if the teeth are, as they should be, kept clean.

E. B. S., of Iowa.—You will find the artificial ears to which you refer, illustrated on page 67, Vol. XII, SCI. AM.

C. O. R., of N. J.—The fine gloss on shirt bosoms can be produced by a mixture of gum arabic with the starch; but we believe that our city laundresses do it by the quickness with which they iron.

M. F. C., of Iowa.—The friction of your water-tight joints through which D passes, would alone prevent your ever obtaining perpetual motion. Turn your attention to something useful, and do not try to catch shadows.

M. A. W., of Ill.—You can precipitate iron from its solutions as sesquioxyd, by adding a solution of carbonate of soda. It cannot be precipitated in a metallic state.

F. L. W., of S. C.—We could not get up nice engravings of your invention without the aid of a model to take the views from. Engravings taken from the drawings which are attached to the Letters Patent can seldom be made to illustrate an invention in so practical a manner as when the views are taken from the machine or a working model: therefore it is as important to you to furnish good material, to get up your engravings from, as it is to us.

E. C. M., of N. Y.—Your communications cannot be published. We can fill our columns with matter of more interest to our readers than what you have written.

P. A. P., of Fla.—A revolving battery intended for the use of war vessels, is not new. If you have anything new in this department it can be patented. Send us a sketch and description of it for examination.

A. H., of Wis.—The employment of a long tube through which to run out the submarine telegraph cable, has been already suggested to us.

J. J., of Ohio.—The "Railway Association" for the encouragement of inventions, to which you refer, is *non est inventus.* The squaring of the circle means the multiplying of any part of a circle into such a number as will give the exact circumference—without a remainder.

R. F. B., of Mo.—Your plan of propelling boats by two direct-acting blades working in tight boxes through the stern of a vessel, is not new, except in being placed on an incline, and being lifted out of the water at each stroke. This is not an advantageous method of operating; they should be placed horizontally.

S. R. Reed., of Buffalo, N. Y., wishes to correspond with the manufacturer of the ditching machine exhibited at the Elmira (N. Y.) Horse Fair last fall. Inventors and patentees who hide their light under a bushel must expect to be neglected, or if found at all it must be by some such method of pursuit as is adopted in this case. Such requests as Mr. Reed makes are becoming very numerous.

H. H. F., of Miss.—We are of opinion that your present patent covers the modification of your machine, as represented in the diagram you have sent us.

B. B., of Ohio—Gloves made of stout cotton canvas, boiled in a strong solution of alum, and then dried thoroughly, should last much longer than either leather or india rubber, for handling potash. Several methods for steering vessels have been patented; see Captain Brown's, illustrated on page 268, Vol. 6, SCI. AM.

L. S., of Ind.—Your idea of conveying gas in suitable vessels from place to place, for the purpose of illuminating small villages, is very old. Many years ago a company was formed in London to manufacture illuminating gas, and deliver it to the consumers in bags at their own houses. It was a failure.

J. W. H., of Ind.—Your theory "that there are two funnel-shaped holes running into the earth from the poles, through which light and heat enter into it, to disseminate their life-giving properties, and which for forty years you have been maturing," is highly improbable. Mariners and explorers have been very close to both poles, and have not seen anything of the holes; again, the penetrative powers of light and heat have been measured, and we know exactly how they penetrate the earth. The facts are against you, and true theories can only be formed on known facts. The idea is an old one, having been first promulgated by a Prussian philosopher in the time of Frederick the Great.

L. E., of Pa.—The expansion of hot air is uniform. The pressure increases one pound for every 33 degrees of heat. The pressure is 15 pounds on the square inch, when raised to 490 degrees of temperature.

R. B. N., of Pa.—Your barn being 40X90 feet, should be protected with a lightning rod at each end, which should extend at least ten feet above the summit of the roof, and down several feet into the damp ground, or into a well of water. Unite the sections perfectly together, and fasten the rod to the barn with glass cleets, or brackets of dry wood covered with shellac varnish. The higher and thicker the rod, the more perfect will it be as a lightning conductor.

W. J. S., of ——.—Messrs. Crum & Paul have a patent for an improved process for making bread, but we are not aware of any patented machinery of theirs for this purpose. If you had informed us in what State you reside you would have had our answer by mail several days since. There are Newports in almost every State in the Union.