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Steam and Hot Air Condensers.

It will be evident to every engineer that the Regenerator of the hot air engine illustrated on the preceding page, is exactly the same in nature as heating the feed water of a high pressure steam engine, by exhausting the steam through a tube laid in the tank. The use of the same air over and over again, as it was employed in the *first* Ericsson engine, and as has been proposed for other hot air engines, is just the application of the old surface steam condenser to the hot air engine. Both of these principles, as applied to the steam engine, effect a considerable saving of fuel, but this cannot be the case, in the same degree, when applied to hot air. The use of the Regenerator, in the hot air engine, is ostensibly to catch the heat and save it, as it exhausts from under the piston. Well, let us ask what is the amount of lost heat by the exhausted air? "Just that of the temperature, 60°, 80°, or 100°, at which it escapes into the air" it has been said. "And if the air be used at 491° (15 lbs. pressure) the loss of heat will only be about 13 per cent., with the exhaust at 60°, which is very economical working." Very economical, we must respond, but not quite so much of a saving as if none of the heat at all were allowed to escape. To make a perfect economiser of all the heat in hot air engines, as has been attempted by the use of a Regenerator, all that has to be done is simply to save all the heat entirely by exhausting direct into the heater, and using the same air over and over again. By thus economizing all the heat. (saving the 13 per cent. lost at 60° of exhaust) a hot air engine can be produced, embracing all the *effective* qualities of the famous Static Pressure (stand still) Engine, upon the principle of exhausting the steam of a steam engine direct into its boiler. By placing the question in this light, it becomes evident that a perfect Regenerator to save all the heat is also a perfect "resister" to the action of the engine.

The reason why it is economical to condense steam in an engine, is owing to its peculiar quality of shrinking suddenly, by a small expense of power, from a great to a small bulk —from 1728 to 1—by condensation in the condenser, thus forming a vacuum (when perfect) equal to the pressure of the atmosphere. If steam condensed gradually and uniformly and lost but a small part of its bulk as it parted with its heat, it would be folly to use a condensing steam engine, because it would work so sluggishly. One reason why surface steam condensers, with many excellent qualities, have been so unsuccessful is owing to their being so slow in condensing the steam, in comparison with direct condensers. Hot air, unlike steam, contracts uniformly when exposed to cold and to only half its former bulk by parting with 491° of sensible heat; it does not contract suddenly, like steam, but sluggishly, and is, therefore, in its very nature, unsuited for the application of the principle of surface condensing; and yet, it has been attempted to apply to it the very principles of the two old steam condensers to protract its exhaust, increase resistance to the feed, and thus operate *very economically*.

The best way to employ hot air as a motive agent appears to be in working it expansively, as far as this possibly can be done, then exhausting it into the atmosphere. A "regenerator" is neither a scientific nor common-sense adjunct to an air engine. It is an attempt to impose perpetual motion upon the engine, by making the same quantity of heat do repeated duty over and over again on fresh quantities of cold air, thus creating an infinite amount of power by a definite amount of caloric—a philosophical fallacy.

There are two hot air engines now building at the Novelty Works, this city: one a huge locomotive, the other a small high pressure engine, to work at 100 atmospheres. Their authors are put upon their metal to make them successful. The locomotive is a large working engine capable of testing the principle fairly.

The Engineer.

One of our English correspondents, in a letter published in the last number of this journal, alluded to the publication in London, of two new scientific weekly papers, one of them bearing the above name. The first number of this work is now before us. In form it is somewhat like the SCIENTIFIC AMERICAN, has sixteen pages, is well printed, well illustrated, and contains a large quantity of very valuable and useful information. It is designed to occupy, in England, the same relative position as that held by our own paper in America.—Among the writers in the first number is Mr. James Napier, the eminent Scottish chemist. He furnishes an excellent article upon steam boiler incrustations. We extend the right hand of fellowship to our brethren of the *Engineer*, and most cordially wish them success in their enterprise.

Our correspondent alluded to the fact that the *Engineer* had made an extensive use of the columns of the SCIENTIFIC AMERICAN without giving us proper credit. For example, six engravings are taken from us without mention of the source whence they are derived. This, we suppose, arises from inadvertence. The SCIENTIFIC AMERICAN is the only weekly publication of its kind in the United States, and all its engravings of American inventions are original. It has been the common practice of a few monthly magazines, published in this country, whenever they want illustrations, to reproduce engravings from our columns; and this is often done without credit. This practice has perhaps confused our English cotemporary, and led him to suppose that our engravings were common property, for which the courtesy of acknowledgment was not due.—The statement we have made will, we presume, set him right on that score.

Speaking of engravings brings our attention to four diagrams, in the said number of the *Engineer*, illustrative of what is termed "Perry's Improved Printing Press." The invention consists in a method of notching the types, making them larger at one end than the other, and placing them around the periphery of a cylinder. It is stated to be the invention of Mr. T. J. Perry, of the Lozells, Birmingham, England. We presume that Mr. Perry is candid in believing himself to be the first inventor, and the editor of the *Engineer* is perhaps correct in presenting the cuts as illustrative of a new invention. For their information, however, we would state that the same invention was patented in England by an American citizen, some twelve years ago. We refer to the British patent number 9308, granted March 23, 1842, to Mr. Moses S. Beach, of New York, now proprietor of the New York *Sun* newspaper, who was then interested in the invention. The original inventor is Mr. Jeptha A. Wilkinson, now of New York, but an Englishman by birth. An American patent was granted to him for the same invention on the 4th of January, 1853. A working machine was constructed in this country some fourteen years ago, but for some reason was never publicly introduced. Within two years past some new machines have been made, but we have not heard that they were fully successful. They have not been adopted by any newspaper proprietor that we know of, although Mr. Wilkinson claims, as does Mr. Perry, that they can print from twenty-five to thirty-five thousand sheets per hour—a rapidity which exceeds, by far, any steam printing press now in use.

Exhibition of Inventions in London.

We have received a circular from the London Society for the Encouragement of Arts, inviting us to contribute to its annual exhibition, which takes place in that city on the 24th of March next. We suppose the invitation is open to all American citizens who choose to become exhibitors. The exhibition is intended for the display of machines, models, drawing, and descriptions of new inventions. They must be delivered, at the cost of the owner, on or before March 8th, at the House of the Society, Adelphi, London. The Secretary, Mr. P. Le Neve Foster, should be immediately advised by all who intend to exhibit.

If it were not for the expense of freight, we should ourselves be tempted to become exhibitors, and our show would be no mean one. We have a ship load of models of new inventions on hand in our establishment, that we should only be too happy to get rid of in the way proposed. As for drawings, we could send the last volume of the SCIENTIFIC AMERICAN. That valuable work contains about five hundred original *delineations*, and above *two thousand descriptions* of new inventions. In addition to the foregoing, we could furnish a hundred or so Letters Patent of the United States, now stored in our iron safes. Each of them contains a splendid steel plate view of the American Patent Office, and a drawing and description of some new invention.

We hereby give notice to European Scientific Societies, and Governments generally who are concerned in expositions, that whenever they wish for contributions of a nature similar to those called for by the London Society, they have only to apply to us. We will engage to give them a full dose, on the shortest notice—they paying the expense of transportation.

Copper and its Uses.

There are copper smelting works in the United States, situated at Cleveland, O., Pittsburg, Pa., Baltimore, Md., Detroit, Mich., Boston, Mass., and one in Georgia (the name of the latter place we have not obtained.) At these works the quantity produced last year was about 13,000 tuns; or the fifteenth part of that smelted in the valley of Swansea. The Lake Superior ores are smelted at Detroit, Pittsburg, and Cleveland, and are said to yield a great quantity of silver, which makes the smelting of them very profitable. This business has been steadily and rapidly increasing during the past ten years, and it must increase until the United States becomes *the* great copper smelting country. Two things only are required for this, an abundance of good ores, or native metal, and plenty of cheap coal. The native metal and ores are found in exhaustless quantities, and our coal fields are the largest on the globe. As there is no coal in the Lake Superior region, ore will have to be exported thence to the nearest navigable point where coal can be obtained cheapest. The city of Erie, Pa., may yet become a great copper smelting place, because it has a convenient harbor, and anthracite and bituminous coal—both of which are used at Swansea—could easily be obtained by railroad from the Pennsylvania mines. An improvement in smelting copper ores is said to have lately been introduced into the "Eureka Mining Co.," Georgia, by which, from a small furnace, using about 5 cords of wood per day, two tuns of pig copper, containing 60 per cent of pure metal, are obtained from ores containing only 14 per cent of metal.

East Tennessee is a great copper region; no less than 14,191 tuns of rough ore being mined there last year. About two-thirds of the copper used in our country is the product of our mines; the remaining third is imported chiefly in pigs from Chili.

Copper can be obtained pure for experimental purposes by exposing it to a stream of hydrogen in a gun barrel heated to redness. By taking 100 parts of common copper, 10 parts of the oxyd of copper (common copper scale) and 10 parts of green bottle glass, ground fine, and fusing them for half an hour in a crucible, the copper will be found at the bottom, in an exceedingly pure state. This is a very simple way of producing purified copper for experimenting.

The alloys of copper are very common, indeed it is the metal which forms almost every metallic alloy. Those alloys are too numerous to name. Good common brass is made by a mixture of 65 per cent. of copper added to 35 per cent. of zinc. The bearings for machinery are made of an alloy of 14 per cent. of tin added to 100 of copper. Bell metal is made of 20 parts tin and 100 copper. Speculum metal for telescopes is made of 50 per cent. of tin added to the copper. The bronze for statues is an alloy of copper containing 10 per cent. of tin. Cannons are made of the same alloy. Bell metal may be made of 78 parts copper and 22 of tin. This alloy is very brittle when cast into a thin plate like a gong, but if heated, when cast, to a cherry-red heat, held between two plates of iron, and plunged into cold water, the gong will become malleable. Cymbals may be made in this manner. The best way to make tin and copper bronze alloys, is to melt each metal separately, then pour the tin slowly into the copper, and stir well. Many of the alloys of copper are not chemical, but simply mechanical mixtures.—The speculum of Lord Rosse's famous telescope is composed by weight of 126·4 of copper, and 58·9 of tin, and is said to be a true chemical compound, brilliant, and nearly as hard as steel, and brittle as sealing-wax. It is 6 feet in diameter, and 5 1-2 inches thick. It was ground down with emery, and polished with crocus—red oxyd of iron. Muntz metal for ships' sheathing is composed of 62 per cent. of zinc added to 100 of copper. Soft spelter solder for brass is composed of equal parts of copper and zinc. A very strong alloy is made of tin 1 1-2 ounces, zinc half an ounce, and copper one pound. This is a good compound for engineering purposes. 1 1-2 ounces of tin, two ounces of brass, and a pound of copper make a good alloy for fine wheels. Three ounces of copper, one of zinc, and half an ounce of tin melted in a covered crucible, makes a beautiful alloy. There is no end to the alloys that may be made of metals by using them in different proportions —The following is a new metallic alloy, of which copper forms a prominent part, and for which a patent has but recently been obtained in England, by F. J. Anger, of London:—In a crucible the patentee first melts 100 parts of good copper, and while in a perfect state of fusion, he adds 17 parts of zinc, 6 parts of magnesite, 3·60 parts of ammonia or salt of ammonia, 1·80 parts of quick-lime, and 9 parts of crude tartar. The crucible is then covered, and the whole allowed to come to a complete state of fusion; when it may be poured into molds of the necessary shape, or into ingots or bars, to be afterwards shaped into articles of use. If the metal be required of a more tenacious character, tin may be substituted for zinc. According to the ductility or shade of color of the metal that may be required, the proportions of zinc, tin, magnesite, ammonia or salts, quick-lime, and crude tartar, are varied. This alloy is stated to resemble gold, not changing color by use, and being dense, malleable, ductile, homogeneous, and sonorous, to a marked degree.

Recent American Patents.

Improvement in Weighing Scales.—By S. S Mills and M. Bissell, of Charleston, S. C.—Instead of one arm or lever as employed in the common weighing apparatuses, the inventors provide three arms, with a sliding weight upon each. This arrangement, although simple, possesses several advantages. It permits the permanent attachment of the weights to the arms, and thus prevents the inconvenience that often occurs in shops from the loss or misplacing of the weights. It also affords great convenience in ascertaining the tare of the article, for one of the weights may be moved so as to indicate the tare, while another will show the gross sum. This improvement is cheap in construction, is much superior to the single lever scales, and is adapted for use in connection with nearly all kinds of weighing contrivances.

Improvement in Reaping Machines.—By Alexander H. Caryl, of Sandusky, Ohio.—This improvement relates to the raking apparatus of reaping machines. The platform is composed of wooden slats slightly separated. The rake teeth project up through the slats, and the head to which the teeth are attached is moved back and forth beneath the platform, by means of peculiar mechanism. The teeth in their forward movement project through the slats and sweep the straw that may have accumulated on the platform off on to the ground. On their return movement the rake teeth turn down below the slats so as not to touch the straw, but they suddenly rise again, when the forward movement commences. This sudden rise and fall of the rake teeth is accomplished by means of a weight, which is alternately wound up and discharged by the movement of the machine. This is a good improvement.

Machine for Bending Iron Hooks.—By Elisha Harris, of Providence, R. I.—Iron hooks of various forms are extensively used in the rigging of ships, and for many other purposes. They are usually bent into the desired form by hand, upon the horn of the anvil. The present improvement consists in an ingenious combination of two metallic rollers, whereby hooks