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THE BLAST FOR IRON FURNACES.

In the manufacture of iron, a blast of air is forced into the furnace by machinery to support combustion. The object of this is to intensify the heat, without which the iron in the ore could not be melted and separated from the impurities in the ore. Success and economy in iron-smelting are due mostly to the management of the blast, and yet this subject has not in common practice received that general and minute attention which it should command. It has been calculated that, with the air of a blast heated to 300° Fah., about eight tuns of air are forced into the furnace in making one tun of iron. In a furnace, therefore, which produces 20 tuns of pig iron per day, no less than 160 tuns of air must be pumped into it. The amount of power required to work a furnace is therefore very great, and especially so when the atmosphere is moist, because in such a case a considerable quantity of water in vapor is forced into the fire, and its capacity for heat is so much greater than that of dry air, that an extra amount of fuel is wasted thereby. In clear cool weather, when the air is free from moisture, a furnace works better and with more economy than when the atmosphere is charged with vapor. If iron-smelters therefore could employ some cheap chemical substance, through which the air could be passed, to absorb its moisture before entering the heater of the furnace, a great saving of fuel would be effected and a more intense heat maintained.

It is still asserted by many persons, that superior iron is produced with the cold blast directed into the furnace, instead of the more general mode of heating the blast first. The hot blast, however, increases the yield of iron. In a furnace using the cold blast, and another the hot blast, both being of equal capacity and smelting the same ore, the latter will yield one-third more tuns of iron in the same space of time. It has been asserted that there is no other advantage derived from the hot blast; that it requires as much fuel and as much flux to the ore, as in using the cold blast. This, however, is a moot point, as many iron-makers contend, that the hot blast saves both fuel and flux, as well as time in making iron. Perhaps the saving of fuel is more important than any other item connected with smelting iron; it is more important at least than is most generally conjectured, to the obtaining of a superior quality of iron. Thus, for example, sulphur is most injurious in its influence upon iron, and the coal, especially that of our Alleghany coal fields, contains a considerable quantity of it. It is therefore self evident that if iron ore could be smelted with one-half the quantity of fuel to the tun, it would be exposed to but one-half the quantity of sulphur, and a superior product would be obtained. Every attention should then be devoted to the saving of fuel in smelting iron, not only as a question of direct economy, but of collateral economy also in making a superior quality of iron, which will bring a higher price. If the hot blast economizes fuel, it should also produce a superior iron, with proper care. It is generally believed that this would be the result, but it is contended that more slag is retained in hot than cold blast iron. Here is another point for the consideration of iron manufacturers, and it invites efforts for improvement.

In the Clyde Iron-works, Scotland, where the hot blast was first applied, 257 tuns of coke were required to make 32 tuns of iron in the furnace by the cold blast. In this quantity of coke 2.57 tuns of sulphur were introduced. When the hot blast was applied and the air heated to 300° Fah., 164 tuns of coke only were required; and when the blast was heated to 600° Fah., 72 tuns of coke were sufficient, which reduced the quantity of sulphur from over two tuns to .72 of a tun in making 32 tuns of pig metal. The coke contained one per cent of sulphur, which is less than is found in the coke used in very many of our American iron-works. By such facts we have indubitable evidence of the benefit of the hot blast in smelting iron with fuel containing sulphur. The decrease of the quantity of sulphur going into the furnace also effects a saving of lime, as a quantity of lime exceeding the amount of sulphur is always required and used to nullify its effects to a certain extent. If then, as some contend, a better quality of iron is produced by the cold than the hot blast, it would appear that this subject requires further practical investigation to get at the root of the evil.

It has been found that the yield of iron in furnaces is increased, by raising the pressure of the blast. Furnaces that yielded 24 tuns per day under a pressure of 4 lbs., in the blast, have increased their yield to over 30 tuns by doubling the pressure. This is also a source of economy, but how high the pressure may be carried with safety has not been determined. Great improvements have yet to be made in the manufacture of crude iron from the ores.

THE SAILING OF THE "GEORGE GRISWOLD" WITH PROVISIONS FOR THE LANCASHIRE SUFFERERS.

A scene of unusual interest was witnessed in our harbor on the morning of Friday, January 9th. The occasion was the sailing of the new and beautiful ship, *George Griswold*, freighted with a precious cargo of provisions for the relief of the suffering operatives of Lancashire, England. A large number of our most distinguished citizens were congregated on board the vessel prior to her sailing; and after the Treasurer of the International Relief Fund Association had made his financial report, some very interesting addresses were made by clergymen of our city, who had been invited to take part in the ceremonies. The remarks of the Rev. A. D. Smith, D.D., of this city, were specially appropriate and felicitous; and we regret that our limited space will not admit of our reporting them.

The Treasurer's statement showed that some $108,000 had been contributed through him; besides some $30,000 which had been subscribed through the Corn Exchange Association. After purchasing the provisions for the cargo of the *George Griswold* (consisting of 12,236 bbls. of flour, 315 boxes of bread, 125 bbls. of biscuit, 50 bbls. of pork, 50 bbls. of beef, 167 bags of corn, 102 boxes of bacon and a few tierces and bags of rice, &c.), the Treasurer said there was left in the treasury a balance of over $30,000; this latter amount, with such donations as may still be made, will be soon expended, and another cargo—of greater or less dimensions, according to the liberality of our people—will soon follow the *George Griswold*.

The Lancashire cotton manufacturers, as a class, have amassed princely fortunes; and we rejoice to learn that they are now liberally sharing their means with their suffering operatives. At a public meeting held in Manchester on the 2d ult., £130,000 ($650,000) was subscribed, and many have pledged themselves to continue their contributions. This conduct has commanded the respect of the civilized world, and has made our own people assist the more heartily in their "labor of love." The people of Lancashire, England, have always exhibited a degree of love for free institutions, and we most deeply sympathize with them in their present distressing emergency.

We hope the good ship will have fair winds and a safe passage on her errand of mercy, and that many hearts may be made glad by the distribution of her precious cargo.

THE rough diamond is called bort, and the "points" used for glass-cutting are fragments of the borts.

THE LOSS OF THE MONITOR.

The recent naval disaster off Cape Hatteras, in which the nation was deprived of a vessel which possessed an historic interest, calls for some more decided expression of opinion than it has yet received. We have considered it necessary for the defense of our shores that we should have iron-clad vessels. Congress appropriated $13,000,000 to arm and equip such defenses, and we have at this writing four turreted batteries, one iron-clad frigate, and one iron-clad gunboat or sloop ready for active service. The first four are Ericsson batteries, counterparts (according to the inventor) of each other. The defects in common with the merits of one are repeated in the whole. To reverse the order of our statement, their merits are chiefly impregnability, their defects unseaworthiness. This was discovered in the first voyage of the *Monitor*, and has ever since existed in her, culminating in her total loss. The peculiarities of these vessels consist in the modified application of Timby's principle of a revolving tower combined with a hull having projecting armor shelves, or in other words, wide guards. The tower is, as yet shot proof, and the guards secure the hulls proper from damage by rams or shot. All other qualities have been sacrificed to obtain these. They are unventilated except artificially; they are dark and gloomy below; and the quarters for the officers and men are unfit for habitation. The engines and boilers are good, with a few exceptions. The boilers are Martin's patent, to which, if properly made, there is no objection, save in the case of a tube blowing out; they are then useless until the hole in the tube sheet is plugged. The *Monitor* was well provided with pumps, but they were unable to save her.

Upon the occasion of her victory over the *Merrimac* in Hampton Roads, the nation immediately ran mad over turreted batteries. The result was the building of nine *Monitors* and the projection of several others of larger dimensions, having some important modifications. The public are not informed of the nature of these alterations. One thing is certain—the loss of the *Monitor* was due to the large upper area of her deck, raft, or whatever name it may be dignified with, which was exposed to the force of the sea. And it is further clear to any one, who has ever been out of sight of land, that no vessel built on this principle can by any possibility live in a severe storm. The peculiarity of the *Monitor* is the overhanging armored deck; now a steamboat, with the narrow guards which it has, could not live in such a sea as the *Monitor* went down in, unless the shock of the waves was abated by sponsons or their equivalent underneath; even then her safety would be much imperiled. But here, in the face of all precedent, we have a battery going outside in one of the most dangerous places on the coast, with a bow overhanging a hull built of half-inch iron, for 14 feet, and projecting at the stern for 34 feet. We have cited the example of a steamboat as possessing features in common with the *Monitor* which admitted of comparison, but the steamboat has buoyancy which permits her to ride over a sea, whereas the *Monitor* has a very limited degree of this quality, in fact so little that she did not answer to the lift of the waves at all, but rose reluctantly on one crest and bored stubbornly through the succeeding one. Instead of taking the water like a duck she took it like a diver. Now we cannot think that Captain Ericsson, when he commended the sea-going qualities of these vessels, ever entertained the idea of subjecting the *Monitor*, at least, to such an ordeal as this. The strength and thickness of the hull is not sufficient to encounter any such blows as it must have received; and the fact that the shot and shell rooms were stowed to their utmost capacity with these dead weights, added to the *Monitor's* unseaworthiness. The weight of the ponderous turret attached to the raft made a hammer, that as the battery rose and fell sluggishly on the waves shook off the thin sub-structure in a very few hours. As a means for harbor defense the Ericsson batteries possess qualities which are undoubtedly good; but for rounding Cape Hatteras in mid-winter we may be permitted to question their fitness. Precisely how far the objectionable features in the old battery are perpetuated in the new ones is uncertain; the overhang at the bow and stern has been reduced, but the fatal defect of the guards still remains. This itself can be remedied by hips or sponsons, but as the vessels with these attachments and their present eng' ıes would not steam more than three miles an ¹ our, they would be of doubtful utility in a sea-going point of view.

It is urged by a daily paper that the *Monitors*, while bei conveyed from point to point on the coast, sho' ıd have all their hatches battened down and cal ıked, and every air-hole and crevice rendered water-tight. "Then," says this oracle, "they would not sink." The writer is evidently under the impression that the turret performs the office of a funnel through which the water was shipped, that occasioned the disaster; but if we may be allowed, we will say that if the *Monitor* had possessed the buoyancy which a sea-going vessel ought to have, all the water in the Atlantic Ocean could not harm her. That the *Passaic* and *Montauk* went through to their destination we have ample proof, but the former was at one time in great peril; if we may believe the reports received, the *State of Georgia* was obliged to go about on her course and run before the wind with the battery; the water in the fire-room of the *Passaic* was at that time three inches deep.

There is a responsibility resting on some one in this matter. We have no disposition to criticize any of the *Monitor's* officers; that they acquitted themselves well and nobly under the trying circumstances to which they were exposed is fully apparent; but upon whom should fall the burthen of ordering a little vessel, such as was the *Monitor*, around the most dangerous part of the coast in mid-winter?

PROFESSOR JAMES RENWICK.

On the evening of the 12th inst., Professor James Renwick, L.L.D.—one of our most distinguished citizens—was "gathered to his fathers," at the age of 71 years. He was a graduate of Columbia College, in this city, in which institution he was professor of chemistry and physics for several years. He was favorably and extensively known for his attainments in science, especially mechanics, and was the author of several publications of a scientific character, such as a "Treatise on the Steam Engine," "Practical Application of Mechanics," "Outlines of Natural Philosophy," "Outlines of Geology," &c. He was also the author of several biographies of distingushed American mechanics, such as that of Robert Fulton and David Rittenhouse. As a writer upon such subjects he was distinguished for perspicuity and brevity. In the survey of the north-eastern boundary between Maine and New Brunswick, upon which the Ashburton Treaty was based, he was one of the commissioners. He was generally regarded as a father of those mechanic institutions in our country which have for their objects the advancement of the practical sciences, and the rational elevation of our mechanics. In all mechanical experiments he took a deep interest, and up to a very recent period was an active member of all such associations in this city. No man was more highly esteemed in New York for unostentatious demeanor combined with such extensive acquirements in solid knowledge.

STEAM ON CITY RAILROADS.

Any one who has ever watched a heavily loaded city passenger car, drawn by reeking and straining horses, cannot but pity the brutes, and wish that some other means could be adopted as a motive power. We have a remedy at hand; why then should we not use it? The introduction of steam, to do the work of human muscles in quenching fires, has been so rapid, and the good results derived are so apparent, that the number of hand-engines are decreasing every day; those who would multiply them evince only an opposition to progress and natural reform, which happily does not prevent the adoption of the new agent. We think that if any of the railroad companies were to introduce dummy engines in the place of horses, they would soon find many advantages arising from their use. In the first place, although the prime cost is more than horse-power, they are not so expensive to keep in repair, and to feed with coal as horses are to feed with oats or hay. They can be more easily managed, take less room in the track, and in short their advantages more than compensate for their demerits. These demerits are said to be a liability to frighten horses by their uncouth appearance. This idea is a wholly visionary one. The engines can be all enclosed in the car, and if horses do not now shy at these, they certainly will not hereafter, provided steam be employed. The Broadway railroad is progressing; let this company be the first to introduce steam and they will certainly be benefited by it.

EXPLOSIONS OF STEAM BOILERS.

Upon no other subject are philosophers, engineers and men of science generally, so much exercised and so much at variance as in their theories respecting the causes of steam boiler explosions. No sooner does some new opinion appear, or some new agent is asserted as the dangerous element, than a boiler explodes under circumstances which set the savans' opinions aside, and force them to go to work at investigating the subject over again. Boilers have burst under every possible circumstance and in every condition—while the engines which they have driven were at work and while they were quiescent—with low steam and high steam—with water and without water, and under mysterious circumstances apparently the most impenetrable. Yet the world is just as much in the dark as ever. Formerly it was a generally received opinion that the contact of comparatively cold water with an overheated plate, generated an excessive amount of vapor of an especially dangerous character, the expansive force of which no form of boiler nor any diameter of safety valve could operate against effectually. So generally was this opinion received, that all explosions were at one time attributed to it, and the engineer who was so fortunate as to survive his disaster, was universally discredited when he asserted that there was plenty of water at the time of the accident.

But lo! certain inquisitive men—and it is to them that science owes all her discoveries—quietly take a boiler, heat it to redness, and then inject water in quantities. So far from blowing it up, the vapor only discharges itself through the safety valve with a mighty roar!

This theory, as a universal and general source of danger, has gone to the clouds with the puffs of steam that destroyed its value. Perhaps the latest cause assigned as the mischievous force which destroys steam boilers by explosion is that of electricity. We find an account of an apparatus once used to ascertain the presence of this agent, and the manner of its generation in steam, in a philosophical work:—

"The apparatus was a common high pressure steam boiler, about three feet long and twenty inches in diameter, mounted on insulating pillars, and strong enough for a pressure of 200 pounds to the inch. The steam was suffered to escape by jets of a peculiar form, on the side of a box into which it was admitted by a cock. Faraday, in investigating the electricity of steam, found that dry steam gave no excitement, and that the electricity resulted from the friction of vesicles of water against the sides of the orifice. Hence the box contained a little water, over which the steam escaped, and was partially condensed. The jet had an interrupted passage to produce friction, and its nozzle was lined with dry box or partridge wood. The vapor escaped against a plate covered with metallic points, to collect the electricity, and ending in a brass ball insulated from the earth. The boiler was negative, and positive electricity was collected at the ball, provided the water was pure and free from grease. Turpentine, and other volatile essences reverse the polarity, while grease or steam from acid or saline water destroys all excitement. If the nozzle of the jet ends in ivory or metal, there is also no excitement. A boiler, such as is described, will develop in a given time as much electricity as four plate machines forty inches in diameter, making sixty turns a minute—a truly surprising result."

Thus it appears from high authority that electricity can only be obtained in steam under extraordinary circumstances. Certain features in the detective apparatus must be rigidly conformed to, otherwise it fails to appear. And what is sufficient to utterly nullify any value this theory may have had, is the fact that the presence of grease or steam from salt water prevents the electrical fluid from manifesting itself. As steam boilers are rarely, if ever, free from oil in small quantities, it will be seen that there need be but little danger apprehended from boiler explosions through electricity.

THE EXERTIONS OF OUR FRIENDS.

When we announced a few weeks since that we should be compelled by the unprecedented rise in printing paper, to increase our subscription price $1 per year and two cents per copy, we did it reluctantly, but felt that it was unavoidable. At the same time we called upon our friends to aid us by putting their shoulders to the wheel and using their influence among their acquaintance in behalf of the Scientific American. They have, we are happy to say, responded nobly, we are daily receiving large accesions to our subscription list, accompanied by letters full of complimentary allusions to our progress and the efforts we are making to not only keep up the standard of the paper as the only journal of its class in the country, but to carry it far beyond any distinction it has as yet achieved. The following letter was received from Mr. G. M. Holmes, of Gardiner, Maine, who accompanyed it with a list of twenty new subscribers:—

Messrs. Editors:—After much trouble I have succeeded in procuring a list of twenty names for the Scientific American for the ensuing year. With the same amount of labor, at any other time, I could have got at least forty names, but most of our mechanics have gone to the war, which makes the labor of forming clubs harder than ever before.

Allow me to thank you for myself and the club from this place, for the excellent matter with which the Scientific American has been filled for the past year. We think that your endeavors to improve the paper have been eminently successful; not that it was not always "first-rate," but that for the past year it has been better than ever.

Herewith I enclose the list with the amount of subscription. Geo. M. Holmes.

Gardiner, Maine, Jan. 1, 1862.

All we can say, in answer to Mr. Holmes's complimenting, is that we will endeavor to make the present volume more interesting than any previous one.

To a great number who have sent us lists of subscribers we are under obligation, and to the following persons we would render our special acknowledgment:—From Mr. F. Marston, of Houghton, Mich., we have received a list of 33 names; from the American Watch Company, Waltham, Mass., 24; Mr. H. N. Hemingway, of Des Moines, Iowa, 23; Mr. C. F. Hill, of Hamilton, Ohio, 23; Mr. S. Chadwick, of Wilkins, Pa., 23; Mr. E. Miller, Meriden, Conn., 22; Mr. S. Durivage, of Oswego, N. Y., 21; and from Messrs. T. Lyman, Sandusky, Ohio, and G. M. Holmes, Gardiner, Maine, 20 subscribers each. This last is, as the reader will discover, from the writer of the letter above quoted.

The press too have vied with each other in seeing which of them could say the most complimentary things. A recent number of *The Mariettan*, published in Marietta, Ohio, contains the following paragraph of praise:—

The Scientific American for last week, the closing number of the volume, contains, beside much other valuable matter, an illustrated article explaining the methods by which the *Great Eastern* was repaired. To engineers and hydraulic mechanics, if not to every curious and intelligent reader, this number of the Scientific American alone is worth the subscription price.

The Indianapolis *Daily Journal* thus praises us:—

The Scientific American has issued its prospectus for 1863, which will make the 8th volume of the new series. This publication has established itself as an authority in science and mechanics so firmly, that no man who desires to be "posted" in the progress of either can afford to be in ignorance of its opinions. It is conducted with great ability and judgment, is always ready with a well considered opinion for any topic of importance, yet is not dogmatic and overbearing, as papers devoted exclusively to some special subject are apt to be within their peculiar dominion; it is not too learned to despise entertainment, and its pages contain as much interesting miscellany, relating however to arts, inventions and discoveries, as any paper we know of, and it is illustrated profusely and admirably. So far as we know, Europe has no publication of the same class that compares with it in variety, excellence, and soundness of matter, or beauty of illustrations.

Really, gentlemen, if this kind of thing is to be continued, we shall be greatly embarrassed. We hope our readers will allow us this little corner to ourselves this week, and pardon the egotism which has prompted us to quote the good sayings of our friends.

Thus far the ice crop has been a complete failure this winter.

The annual clip of wool in California for 1862 was 5,600,000 pounds.