The Scientific American.

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY
At No. 37 Park Row (Park Building), New York.

O. D. MUNN, S. H. WALES, A. E. BEACH

TERMS—Three Dollars per annum—One Dollar in advance, for our months.
Single copies of the paper are on sale at the office of publication, and at all periodical stores in the United States and Canada.
Sampson Low, Son &.Co., the American Booksellers, No. 47 Ludgate Hill, London, England, are the British Agents to receive subscriptions for the SCIENTIFIC AMERICAN.
☞ See Prospectus on last page. No traveling agents employed.

VOL. VIII, NO. 4....[NEW SERIES.]....*Nineteenth Year.*

NEW YORK, SATURDAY, JANUARY 24, 1863.

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,