The hot-blast process was invented in Scotland by Mr. James Beaumont Neilson, a practical engineer at Glasgow, and was by him made the subject of a patent, dated Sep­tember 1828, being entitled, an “ improved application of air, to produce heat in fires, forges, and furnaces, where bellows and other blowing apparatus are required.”

The invention of Mr. Neilson, like a great many other inventions, and indeed some of the most valuable, is cha­racterized by extreme simplicity ; and his invention so per­fectly accords with all the known laws of physics, that we at once apply to it the well known exclamation of wonder, “ how strange ! that a thing so obvious should not have been done long before !” an exclamation in which we too often find ourselves doing an act of injustice to the very inventors to whom we lie under the weightiest obligations. Mr. Neil­son’s hot blast is as simple a contrivance as was the steam- engine condenser of his countryman, Mr. Watt, and indeed bears a very close analogy to its character as an invention. Before the time of Mr. Watt, steam was introduced into that part of the steam-engine where it performed its la­bour, and was then condensed into water in the same place where it had done its duty, thereby causing great waste of fuel and loss of power ; and to remedy this defect, Watt introduced his new principle on which his fame rests ; he used a *separate condenser,* that is, cooled the steam, and re­converted it into water, not in the cylinder, where it was detrimental, but in a separate vessel communicating with it. In like manner, Mr. Neilson's invention consists in separate­ly heating that which was formerly done so as to be inju­rious to the process intended. Cold air was blown into a furnace designed to produce intense heat for the smelting of iron from ore, so that the cold blast of air itself re­quired to be heated by the fuel in the furnace intended to smelt the iron, and so its temperature was cooled down by the very intensity of the blast required for the desired com­bustion. To remedy this defect, Mr. Neilson introduced his new principle of hot blast ; and instead of allowing this blast of cold air to enter at once from the blowing machine or bellows into the furnace, to be heated there, he provided a *separate heating apparatus,* by which the air of the blast was to be heated by a separate furnace and fire, previously to its entrance into the smelting furnace. This is the whole invention. A hot blast of air, instead of a cold one, is thus introduced for the generation of heat. Could any thing be more simple, more natural, more appropriate, or more likely to prove effectual ? This is the hot blast, which has already in this and other countries created many millions of valuable property out of what was formerly worthless, be­cause unavailable by any of the processes formerly known.

Like most other inventions, the progress of this was at first very slow. Retarded by practical difficulties, which be­set all new processes in their first use, by men who have every thing to learn,—stopped every now and then by the prejudices of custom and ignorance, which cling with inve­terate tenacity to maxims of established practice, and repel equally the innovations which improve and those which merely alter without improvement,—opposed also by the change of interests which such a revolution must neces­sarily involve; the invention, tardy in its first steps, and feeble in its early efforts, was more than once at the point of being altogether abandoned. Like the invention of Watt, a great part of the interest in its possible remunera­tion was transferred by the inventor to strangers, whose combined efforts and influence it was necessary to obtain on the side of the innovation. To Mr. Dunlop of Clyde iron-works Mr. Neilson had to give up three-tenths of his patent rights ; to Mr. Mackintosh three-tenths ; and one- tenth to Mr. Wilson of Dundivan, retaining to himself only three-tenths of this valuable monopoly. But the transfer was judicious ; it was necessary. Mr. Mackintosh is dis­tinguished as a man of much practical science; Mr.Dun­lop was one of the most sagacious iron-masters of his time; and Mr. Wilson was a man of tried practical talent. The co-operation of these gentlemen was essential to the speedy and successful trial of the novel though simple process.

The following is the specification of Mr. Neilson’s pa­tent : “ I, James Beaumont Neilson, do hereby declare,

that the nature of my said invention for the improved ap­plication of air to produce heat in fires, forges, and furnaces, where bellows or other blowing apparatus are required, and the manner in which the same is to be performed are par­ticularly described and ascertained as follows : That is to say, a blast or current of air must be produced by bellows or other blowing apparatus in the ordinary way, to which mode of producing the blast or current of air this patent is not intended to extend. The blast or current of air so pro­duced is to be passed *from the bellows or blowing appara­tus into an air vessel or receptacle, made sufficiently strong to endure the blast, and through and from that vessel or receptacle, by means of a tube, pipe, or aperture into the fire, forge, or furnace.* The air vessel or receptacle must be air-tight, or nearly so, except the apertures for the ad­mission and emission of the air ; and at the commencement, and during the continuance of the blast, it must be kept *artificially heated to a considerable temperature.*

“ It is better that the temperature be kept to a red heat, or nearly so ; but so high a temperature is not absolutely necessary to produce a beneficial effect. The air-vessel or receptacle may be conveniently made of iron ; but as the effect does not depend upon the nature of the material, other metals or convenient materials may be used. The size of the air vessel must depend upon the blast, and on the heat necessary to be produced. For an ordinary smith’s fire or forge, an air vessel or receptacle, capable of containing 1200 cubic inches, will be of proper dimensions ; and for a cupola of the usual size for cast-iron founders, an air-vessel capable of containing 10,000 cubic inches will be of a pro­per size. For fires, forges, or furnaces, upon a greater scale, such as blast-furnaces for smelting iron, and large cast-iron founders’ cupolas, air-vessels of proportionably in­creased dimensions and numbers are to be employed. The form or shape of the vessel or receptacle is immaterial to the effect, and may be adapted to the local circumstances or situation. The air-vessel may generally be convenient­ly heated by a fire, distinct from the fire to be affected by the blast or current of air, and generally it will be better that the air-vessels and the fire by which it is heated should be inclosed in brick-work or masonry, through which the pipes or tubes connected with the air-vessel should pass. The manner of applying the heat to the air-vessel is, how­ever, immaterial to the effect if it be kept at a proper tem­perature. In witness whereof, I, the said James Beaumont Neilson, have hereunto set my hand and seal, the 28th day of February, in the year of our Lord 1829.”

The only part of the process of smelting the iron which is at all affected by this novelty, is the transit of the air from the blowing machinery into the smelting furnace. The bellows, steam-engine, water-wheel, blowing cylin­ders, equalizing reservoirs, or other apparatus of whatever sort, for producing the current of air to blow the fire, are left unchanged, as we have already described and figured them in our article on Iron. The furnace may be left of its former shape and dimensions in every respect as used in the old process, and as we formerly described them ; all that is required for the introduction of the new process, is to interpose between the smelting furnace and the blowing machinery an oven, heated by a separate fire, through which, in appropriately shaped vessels or pipes, the blast of air on its way to the furnace may be heated to a considerable tem­perature,—400o, 600º, or any temperature found most suit­able to the purpose, and so blown upon the incandescent fuel in the furnace in a hot blast, as distinguished from the ordinary cold blast of atmospheric air.

The consequences of this hot blast system in an econo­