the attack, if it had not been for the shelter of a pseudonym."

"Mr. Jones will think me very thin-skinned," said Miss Filmer with a smile; "but I do not think that I should have taken any fair criticism of my book, however severe, to heart. Indeed, some were kind and others harsh, and I set them against one another. But this particular notice seemed to be dictated by personal malice, for it sought to turn me into ridicule, as well as my work. It made me feel as if I had done a bold and unwomanly thing, and certainly cured me for ever of authorship. No success would compensate one for being made the object of such attacks."

If I gave you my real name, which of course is not Jones, you would recognise the fact that I am not generally considered deficient in that useful forensic quality—er—suppose we call it *brass*. Even in those early days I was not easily put out of countenance. But on that occasion I *did* wish that the bottom of the boat would open, and a friendly barbel of whale-like proportions absorb me quietly.

For once in my life I did feel most utterly and intolerably ashamed of myself. That pretty little, delicate, gentle girl, so refined, sensitive—oh, it was just as if I had struck a blind man, or an infant!

"That is the old form," gasped Sinclair. "But I—say—you know—we have—to come—back—again."

"You will knock my poor husband quite up, if you row so fast," said his wife with a smile which had a touch of anxiety in it. And in truth, trying to escape from my reflections, and not aware what I was about, I had set him a racing stroke, and we were tearing through the water at a grand pace. I easied at once, and presently we turned; I was so thoroughly disconcerted, however, that I made my blistered hands an excuse for changing places, and so shifting the brunt of conversation to Sinclair.

Before we retired that evening, I borrowed the volume of poems. It was indeed the "Echoes of the Heart" which I had treated so unkindly; but why did they let her choose such a provoking title? I read every line before going to bed, and felt more ashamed of myself as I proceeded. It was not merely the merit of the verses which rebuked me, though they were more than meritorious, but the kindliness, the broad charity, the flashes of eloquent admiration, excited by all that is most noble in humanity, should have guaranteed the book against insult, at all events. I passed a bad night over it, but recovered my self-possession in the morning, and at breakfast expressed myself in terms which brought colour into the cheeks and light into the eyes of the poetess. As for the hostile critic, I alluded to him in a way which prevented the ladies ever mentioning his libel again, for fear, as Sinclair told me, lest I should find out who the culprit was, and become engaged in some personal conflict with him. That I might be spared no element of remorse, Miss Daisy proved to be an orphan, and poor; her father, a retired colonel, having fallen into the trap which catches so many old officers, and become director of some company which broke down and swallowed his little property.

However, I managed to calm myself down, and tried to make amends by being as agreeable as I could to the young lady I had unwittingly injured. It was rather a dangerous operation, considering that I was several years short of thirty, and she was still younger, but it had the fascination about it which dangerous games often have. What with bathing, boating, and making amends, a fortnight slipped away presently, and when I returned to town at the end of that time, I could hardly be called a free man.

LEWIS HOUGH.

THE GATHERER.

The Melo-Piano.

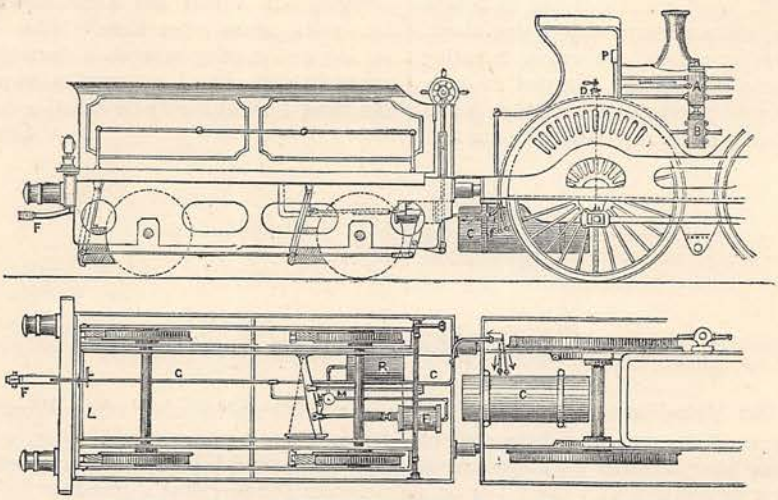
The favourite musical instrument of these modern times, the piano, has lately received an improvement which will enable it to compete with the violin or a wind instrument in producing long-sustained notes. The absence of the power to maintain these has, ever since its invention, been the one great drawback of the piano; but now, by simply pressing an additional pedal, a series of hammers are set free, causing a continuous vibration of the string of any key the player has struck, so long as that key is pressed, and ceasing the moment the pressure is withdrawn. By it also the transition of the sound from *pianissimo* to *fortissimo* is achieved with a singularly delicate gradation approximating to the organ itself. Beethoven's sonatas, Mendelssohn's "Ohne Worte," and similar compositions with sustained notes, when performed on the improved piano, combine with its original clearness and precision a grandeur and beauty which it has hitherto been impossible to obtain. Three distinct modes of playing are within reach of the performer: first, the ordinary manner; secondly, the addition of these sustained notes by touching the new pedal; and thirdly, a handle enables him to remove the pianoforte action, when there remains a tone like that of the harmonium, but free from reediness. The new instrument is called the Melo-piano, and as the mechanism can be fitted either to grand or cottage pianos, may be expected soon to come into common use. It is the invention of Signor Luigi Caldera, of Turin.

Rafts for Saving Life.

When a vessel founders in mid-ocean, or goes to pieces on a rock, it too frequently happens that the boats she carries are totally inadequate to save the lives of those on board. Often they are smashed by heavy seas sweeping over the decks, or "stove in" against the side when lowered, and even if successfully launched, do not afford accommodation enough for crew and passengers. Many terrible instances of this are on record—when, after the lifeboats had left the sinking ship, crowded to the water's edge, the ears of those in the boats have rung with the cries of scores of others left behind clinging to the reeling hull. Under such circumstances, the first thought of these latter remaining on the vessel, if the weather moderates at all, is always the construction of a raft on which to reach the shore. Such rafts, extemporised from beams and planks roughly bound together, have saved the lives of hundreds; but in how many cases the ship has broken up before it was possible to make them! It is now proposed that vessels should be provided with rafts beforehand, and carry them on board, so as to be immediately available when required. But as a raft is a very clumsy thing, taking up a good deal of room, it became necessary to devise some plan by which they could be adjusted to the ship without interfering with convenience in working it. One method suggested is that a part of the upper deck should be so constructed as to be capable of floating by itself, and of being quickly fitted with mast and oars, and lockers for provisions. This idea is stated to be applicable not only to merchant ships and passenger steamers, but to ironclads; for instance, the *Devastation* could have the hurricane deck made upon this principle, and the *Invincible's* upper deck might carry a raft. Some of the vessels of the navy could have them in several places, as the *Wivern*, on poop and forecastle, and also amidships. Such rafts on the poop or forecastle would be made of cork, in compartments, or with air-tight cells. Places could be found for them, too, on the other turret-ships. The recent experience in naval warfare has shown that the destruction of an ironclad is often accompanied with great loss of life, these vessels going down so quickly, as the Turkish monitor sunk by a Russian shell in the Danube—when, if we recollect rightly, hardly any of the crew were saved—and the same thing happened to the armour-plated ships blown up by torpedoes. The use of these dreadful appliances in modern encounters at sea has naturally called attention to the means by which the lives of brave seamen may be saved after they have done their duty to the last. Some officers, however, think that the proposed rafts would be too cumbersome for ironclads, and prefer the system of buoyant hammocks, by which a man finds a life-preserver in his very bed. A raft has been designed which could be carried as the captain's bridge; and, even if awkward on board an ironclad, they may be applicable to vessels used for trading and passenger purposes.

Continuous Brakes.

It may be hoped that railway companies are as anxious as the general public to reduce the possibility of accident to a minimum. If they succeed in achieving this result, they will consult their best interests in every way. Continuous brakes have often been suggested as an effectual remedy; and we give diagrams illustrating the action of the Westinghouse automatic brake, which is considered to present certain valuable features. For simplicity, we deal with the tender arrangement only, but it must be understood that similar apparatus (without, of course, the motive-power) is used with each carriage. An air-pump—of which A is the steam, and B the air cylinder—placed on the locomotive compresses the air in the main reservoir, C, underneath, and the auxiliary reservoir, R; the vessels being charged with air at a pressure of from sixty to eighty pounds per square inch. The communication between C and the train is made by a single line of gas-pipe under the carriages, joined together by



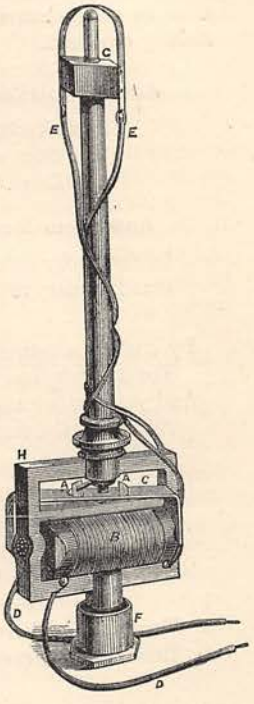
THE VACUUM BRAKE.

hose and couplings, F. The pipe from C is connected with D, the handle for working the brake. From C the air passing along the whole line of pipe and through the triple valves, M, causes the pistons to rise, and charges R. There is now throughout the whole system a uniform pressure, of which the amount can at any moment be ascertained by referring to a gauge, P, on the engine, and on each van. A tap, L, is fixed at each end of each carriage, and these must all be open except the one at the rear of the train, which must be closed. The brake is now *off*. To put it *on*, all that is necessary is to reduce the pressure in the brake-pipe, G. This causes the piston at M to move down, which at once opens the communication between R (still fully charged with compressed air) and the brake cylinder, E. Instantly rushes the air into E, forces out the piston, and applies the brake.

There are three ways of applying the brake :— 1. When the driver has occasion to do so, he turns the handle, D, to the opposite side. This severs the communication between C and G. Then the triple valves, M, act as already described, and the brake is *on*. Now, by placing D in its first position, the pistons at M are raised, R is recharged, the pressure in G is thus increased, and the brake is taken *off*. 2. If the guard wishes to apply the brake, he opens the tap, L, the pressure is reduced, and the brake is *on*. It is obviously essential for the guard to have the means of applying the brake, as for example in the case of fire, breakage, or other accident, or in the event of the driver not seeing, or neglecting, or misunderstanding signals. 3. Automatic action. If a train when running become divided, the hose-pipe between the carriages is at once broken, and the pressure in G being *ipso facto* reduced, the brake is *full on* in both portions of the train. The Westinghouse brake would thus appear to be admirably adapted for its special purpose, and its automatic action is justly regarded as perhaps its most perfect point.

Self-acting Lamplighters.

If Mr. St. George Lane Fox's scheme for lighting lamps by means of electricity be practicable and economical, as there seems every reason to believe that it is, and if vestries and other public bodies be induced to adopt it, the occupation of the lamplighter (as such) will be gone for ever. His proposed plan will here be briefly explained, but his interesting paper on the subject gives much ampler details than we have space to enter into. The lamp-area in a town or city would be divided into a certain number of districts, each containing some 300 lamps. These would be put into communication with each other by an insulated wire, which would traverse the circuit of lamps, and return to the station whence it started. At this station there would be a magneto-electric apparatus for generating the necessary currents which, when sent along the wire, would turn on the gas, light it, and turn it off. To each lamp is applied a mechanical arrangement (see engraving), which is only 2½ inches high by 2½ inches wide, and by which the system is worked. The socket F is fastened to the top of the gas-pipe, and the frame H is hollow to allow the gas to flow up to the burner at the summit. The gas is turned on or off by a valve, the lever of which is seen caught by one of the studs A. The two studs A A are carried on the upper part of the permanent horse-shoe magnet C, which is supported on the point of a fine pivot working in a cross-piece in the frame H. This permanent magnet has a reciprocating horizontal movement, and if we suppose its position in the diagram to be reversed, the other stud A would in that case carry the pin or lever back through a small space. This pushing of the lever one way or the other serves to turn the gas either on or off. The magnet is moved by a change in the polarity of an electro-magnet consisting of a soft iron core in a coil B. According as the current is sent forward or backward through the coil, so is the polarity of the core altered, and the permanent magnet is turned on its pivot. The current that turns the gas on or off is conveyed from the magneto-electric machine at the central station by the wire D D, which connects all the lamps. Let us suppose the gas has been turned on, the next operation consists in sending along the wire D D a powerful discharge, derived from a condenser raised to an enormous electro-motive force. Around the primary coil B is wound a secondary coil of fine wire, and of much greater length. The condenser discharge creates a secondary current along the wire E E, thereby developing a small spark just over the burner. The discharge which passes through the primary wire has the same effect simultaneously in the secondary wire in all the lamps of the circuit, so that the gas having been turned on as already described, the whole of the lamps are lit. If the first and last lamp of a circuit be within sight of the station, the continuity of the circuit will be ascertained by the lighting of these two lamps. To put out the lamps, it is merely necessary to send a reverse current through the primary wire, which will cause the permanent magnet to turn on its pivot and strike the lever of the valve, so as to turn off the gas. An ebony collar G prevents the dissipation of the secondary current. The gas is sealed at the valve by glycerine or oil of bitter almonds, which is well adapted to resist the action of frost. The wires are carried from post to post at a height of sixteen feet above ground, this mode being less expensive and more expeditiously fitted than underground transit, which, however, could



be resorted to where circumstances made it preferable.

Mr. Fox's scheme has been subjected to a protracted test, and has been found to work with efficiency and economy, one estimate putting the annual saving at £1 per lamp. His experiments have been conducted with patient and conscientious thoroughness; and whatever may be the ultimate fate of his invention, he is to be congratulated upon the results that he has already obtained.

Answer to Hidden Quotation on p. 316.

"A man's best things are nearest him,
Lie close about his feet."
Lord Houghton's "The Men of Old."

Answer to Double Acrostic on p. 254.

In rhyme far sadder than the saddest prose,
Our Laureate tells of ENOCH ARDEN'S woes.

I.

By cruel hands the innocent is slain,
For calumny has touched the Moor's young wife;
And yet *EmiliA* makes the treason plain,
And seals the testimony with her life!

II.

In British annals many a noble name
Shines with the light of an immortal fame;
Nor less shall *NapieR* win applauding hands,
As on Magdala's rock he proudly stands.

III.

To make *OdD* even, one would need to be
Blest with a cleverer head than you or me!

IV.

Though of Good Hope there's one, yet sailors tell,
You're disappointed when you know it well;
For if you round a *CapE* in stormy seas,
You lose both equilibrium and ease.

V.

A beauteous queen, yet frail as fair,
She lives renowned in story—
HeleN, who brought to some despair,
While others reaped but glory.

M. L. T.

A Rival to the Sea-Serpent.

For many years strange rumours have been afloat of a gigantic earth-worm which has committed great depredations in the south of Brazil, and Herr Fritz Müller has recently communicated some wonderful accounts he has heard of this marvellous creature, which is known by the name of the "Minhocuo." The descriptions given by different persons of the animal vary considerably as to its size, appearance, and operations, but all accounts concur in attributing to it vast and almost incredible dimensions and power.

By one observer it is described as an animal of gigantic size—a yard thick; by another, as measuring over eighty feet long, and having horns. It is said to have scales like an armadillo, and a skin as thick as the bark of a pine-tree, while trees are upturned in its movements from one place to another, and trenches are formed several yards wide. A noise as of thunder is heard when the Minhocuo is moving underground, and his appearance is considered to be the presage of a rainy period.

That some hitherto unknown animal exists in the regions mentioned appears probable, and it may not be long before the diligent inquiries of scientific men may bring to light authentic particulars of this interesting prodigy.

The Manufacture of Rubies.

By far the most valuable of precious stones—far exceeding in value even the diamond—is the true Oriental ruby. We now learn that a method of making artificial rubies has been discovered in France—rubies not merely in imitation of the real stone, but made of the same material and to all appearances exactly like the priceless gem.

The similarity between the natural and artificial stone appears indeed complete, as they are both of the same hardness and weight, both crystallise hexagonally, and lose colour when heated, and gain it when cooled. As there seems no difficulty in their manufacture, it is probable that there will be thrown into the market a number of artificial rubies at a comparatively moderate charge, and that they will be largely used in ornamental jewellery and art decoration. Whether this new manufactured article is, however, likely to be prized as the natural product, is a question on which many will probably at present have their doubts.

The Out-door Business Girls of London.

We are glad to find that our recent paper on this subject* has borne practical fruit, in giving an impetus to the good work of establishing institutes and homes for the numerous class of females employed in the factories and workshops of the metropolis. At Bromley-le-Bow, in the centre of a densely crowded district where nearly 2,000 girls are engaged in the match manufacture alone, the committee appointed to further the movement have secured the building known as the Old Palace—formerly used as a hunting-box by King James I.; and this not only forms an institute in the ordinary sense of the term, but also affords a home for a limited number of those who may have no settled abode. The Old Palace—a lofty brick-built mansion, containing twenty large airy apartments—is admirably suited to such a purpose; and the arrangements made by the promoters clearly indicate that they appreciate all the requirements of the undertaking. A subscription of twopence weekly constitutes membership; and the girls on leaving their places of employment at the end of the day can proceed direct to the institute, where they are first enabled, if they desire it, to obtain tea at a moderate charge, and then provided with various means for spending the remainder of the evening pleasantly and profitably. Thus, rooms are set apart for reading and suitable amusements, and for classes formed for teaching sewing and the elementary

* Vol. III., page 661 (October, 1877).

branches of education; while in the longer summer evenings a large piece of ground, formerly a garden, at the rear of the building will be available for out-door recreation. It is intended, also, in course of time to form a lending library for the use of those who belong to the institute, and such alterations and improvements in the existing arrangements will be introduced as experience in the work may suggest. At present the funds will permit of only twenty beds being fitted up for those who (by payment of a small sum) sleep in the home. There is, however, ample room for more, and it is hoped that after a time nearly double that number will be accommodated. An excellent feature of the establishment, and one which cannot fail to be a great boon, is the provision of a large kitchen-range for the purpose of cooking the dinners of those girls who live at a long distance from their work. To expect that this, the first institution of its kind, should have been *started* without aid from outside would be, of course, unreasonable; we still think, however, as we stated in our former article, that in order to be thoroughly successful, the great aim should be to make it entirely self-supporting. If this be done—if those for whom it is intended be enabled to feel not only that it forms a place of evening resort at once attractive, enjoyable, and useful, but that there is also absent from it all appearance of patronising charity—there need be little apprehension as to the result; and we believe that the establishment of the Bromley Institute would prove to be only the beginning of a movement that would soon extend to all the large cities of the kingdom.

Double Acrostic.

My first, the dead love of my second, lives
Immortal through a poet's tragic lay;
My second is the character that gives
Unto the poem such a wondrous sway.

I.

Where nodding Fortune signified her wishes,
I stood upon the sea-coast nigh the fishes.

II.

A Turkish town, a woman's name,
As house a-fire known to fame.

III.

Philosopher of olden days
Who, among other curious ways,
Did often walk in sleep.

IV.

Upon the Continent my name
Is well known in the roll of fame;
A father and a son with me
For ever will remembered be.

V.

I constant fly from east to west,
My tongue goes fleetly as the wind;
Oft I speak false, must be confessed,
For what I say I do not mind.

VI.

A loreley of olden times,
Whose name just fits into these rhymes.

VII.

Part of a dress worn in the East
By a once mighty Eastern priest;
But now 'tis worn in East or West,
Or anywhere where 'tis possessed. J. G.

Sewing by Galvanic Battery.

One of the latest applications of the galvanic battery is in driving sewing-machines, which it is stated can now be done at the moderate expense of a few halfpence a day. The battery is of a novel construction, and was invented by Dr. Byrne, of the United States, whose ingenious discoveries are being introduced in England by Mr. H. Edmunds, jun., of London. Dr. Byrne employs a platinised compound negative plate, dilute sulphuric acid being the exciting solution, and with a battery of this kind, with eight cells, he has kept a heavy sewing-machine in motion. He has also invented what is called the Pneumatic Battery, the principle of which is the injection of air into the solution, the result being the development of a current of extraordinary power, and of great heat. With one of ten cells, a stout platinum wire, thirty inches long, was quickly made red-hot. How or in what precise manner the introduction of air causes so large an increase of power, is a question now being carefully investigated by scientific men, and has aroused much interest. The pneumatic battery is expected to prove useful in the fine arts.

Medicated Baths.

"How I wish we had a bath-room in the house!" is an exclamation frequently heard in those establishments where the lack of conveniences, or the necessity of practising economy, prevents the introduction of this great sanitary agent. As the knowledge of the medical properties of certain forms of the bath spreads abroad, the desire to possess so valuable an article naturally increases, and the attention of manufacturers has been turned to the construction of a simple, cheap, and efficacious means of enjoying its advantages. Mr. James Allen, of London, has designed a new Hot Air and Vapour Bath which seems to combine these qualities. It may be used not only as a simple hot-air bath, but with herbs, such as camomile, or poppy, also with laudanum, spirit of camphor, vinegar, &c., or a sulphur bath can be instantly made by mixing half an ounce of milk of sulphur in a pint and a half of water in the boiler. An iodine bath can likewise be obtained if wished for, and the directions for use are of the simplest character.

While writing of baths, it may be worth while to mention a form of shower-bath invented by M. Bozerian, and favourably reported upon from the hospital of Saint Antoine, where it has been in use. The leading idea is that the bather himself supplies the shower, pumping it up by working pedals with his feet. It comes down with additional force, and the exercise is said to be beneficial.

The Source and Use of Iron.

The material used by man for the construction of some of the works and tools needed for his comfort and convenience changes frequently; but the reign of iron seems enduring, and generation after generation its use is extended. As time passes, too, the source from whence we obtain that valuable metal varies—varies not only with the variation in the kind of iron required, but also in consequence of the exhaustion of supplies of ore or fuel, or changes in the latter. Not two centuries ago our iron trade was decaying, for the immense tracts of woodland that had supplied the blast furnaces were being swept away, and we had to have recourse to Sweden and Russia to supply our needs. In 1740, we had in England only 59 blast furnaces, and their product was about 17,350 tons—or something like the output of one furnace now in many iron-producing districts. Sussex had at that time the largest number of furnaces, and there were none north of Yorkshire. By the use of pit-coal and by the use of the steam-engine the iron manufacture has been revolutionised, whilst discoveries of iron ore have assisted in changing the centres of the trade, and now it has practically moved from the southern to the northern counties. In recent years, the quantity of iron ore produced in the United Kingdom has ranged from fifteen to sixteen and a half million tons. By far the largest contributor is Cleveland, the output of which has grown in little more than a score of years to from six to six and a half million tons. The north-western district—Cumberland and Furness—adds over two million tons of the rich hematite ores; Northamptonshire raises about a million tons; Scotland, chiefly from the west, produces about two and a half million tons; Staffordshire, over a million and a half; Lincolnshire, half a million; South Wales and Monmouthshire, an equal quantity; Derbyshire and Shropshire, over two hundred thousand tons each; and Cornwall, Devon, Somerset, Wiltshire, Oxfordshire, Gloucestershire, Warwick, Nottingham, Cheshire, Durham, North Wales, and Ireland contribute the remainder in smaller proportions. To the sixteen million tons of iron ore we produce, we add from half a million to a million tons imported from Norway, Spain, and other parts, and smelt down the bulk of the whole. The smelting furnaces give, perhaps, the best idea of the locality of the iron manufacture, and it may be said that we have in the United Kingdom about 960 of these costly structures erected, but many of these are old and practically obsolete. They are erected in only twenty-four of the counties of England, Scotland, and Wales, in numbers varying from one each in Somerset and Hampshire to 194 in Staffordshire. The mere number of furnaces built is no true test, however, of the comparative importance of the industry in any district; nor is even the better one of the number at work; for out of the 960 furnaces, the proportion in operation is not much over two-thirds, and it is frequently less than that—the districts with old and small furnaces usually having the largest proportion idle. The production of pig or crude iron is the truest test; and it may be said that our present rate of production varies from six to six and a half million tons. Of this about a million tons are furnished by Scotland, and over half a million tons by Wales—the great bulk, in the latter instance, being from Glamorgan and Monmouthshire. Coming now to English counties and districts, and giving exact instead of approximate figures, we may group the producing counties. Northumberland, Durham, and North York form the largest contributory district, and it produced in the latest year for which official returns are procurable 2,084,185 tons. The north-western district, comprising West Cumberland and Lancashire, gives 989,871 tons; the West Riding of Yorkshire with Derbyshire and Northampton produces 621,086 tons; Staffordshire, 679,515 tons; the ancient iron-making district of Shropshire, 106,714 tons; Lincolnshire, 125,198 tons; Gloucestershire, 28,108; Hampshire and Somerset, a remainder little more, bringing up the total for England to 4,664,153 tons. These then, are the sources of our iron supply, so far as Great Britain is concerned; we import a little, but comparatively trifling, in any form, although of late the proportion has been rising.

Let us now endeavour in some degree to indicate some of the uses of the six million tons of crude iron. We export a considerable proportion of the pig-iron in its crude state. The quantity so exported has in two or three years exceeded one million tons, but it may be set down now as about 900,000 tons. Of this Germany takes more than a quarter, and Holland a proportion almost as large; France, Belgium, and the United States being amongst the other large buyers. But we export much more in a manufactured state: we send out a quarter of a million tons of bar, angle, and rod-iron; about half a million tons of railroad-iron; and hoop-iron, sheet-iron, and other kinds, bring up the manufactured iron exports to over 1,500,000 tons.

For the manufacture, we have in England, Wales, and Scotland about 7,200 puddling furnaces for the conversion of the crude iron into a material fitted for manipulation in the rolling mills, and we have a vast number of foundries. The proportions used in these two modes vary in the different districts, and vary in different years. In one large district at the present time, out of a million tons of pig-iron made, about a third is exported, a small quantity is sent inland, and the balance is tolerably equally divided between the malleable iron works and the foundries. In another, producing cheap crude iron, one half is sent out of the district, and the remainder is divided in unequal proportions, the mills and forges claiming the largest. But the change which is coming over the iron trade is modifying the proportions greatly; on the railways steel is now preferred in many cases to iron; it is used for boilers often; it is being used now in ship construction; and thus an enlarged proportion of iron is yearly converted into steel, and there are now over 110 Bessemer converters in Great Britain, as well as numbers of Siemens and Siemens-Martin furnaces.