

And they call it a Fever,
Putrid or low;
But I and the weaver
Both of us know
That the fetid well-water, and steaming styes,
And the choked drains' gases, that unseen rise,
Subtle and still,
Sure and slow,
Certain to kill
With an unheard blow,
Are the fiends who poisoned that maiden's breath,
And eling to her still as she sleeps in death!

And the weaver, haggard, and worn to the bone,
With clasped hands and despairing moan,
Knowing the poison that lurks in the room,
Still doggedly stays till he meets his doom!
I laugh to think,
How they greedily drink
Of the poisoned cup
Till they drink it up!
And ever to time-honoured filth revert,
And love to the death their old King Dirt!

BIRMINGHAM GLASS WORKS.

LITTLE children are sometimes as much puzzled as older people, about how the world got on before they and other wise moderns were born; about how men lived without the conveniences and comforts afforded by our arts of life. We are not quite so conceited now as we were a century ago, in regard to our superiority to the ancients; for, the farther we go back among ancient monuments, the more evidence we find, that some of our most recent inventions and luxuries were in common use before old Troy was founded, and before the venerable Abraham set out on his travels a young man. About one thing, however, little children are right enough, as far as we know. They are not absurd in asking, how people, in old times, ever got on without glass windows? We knew a little child, who was fond of looking out of the window in bad weather, when there was no getting a walk: and the same child had to go a long journey in a post-chaise, day after day, before railroads were made; and how any child could have borne the being boxed up in a post-chaise so long, without a window to look out of when it was windy, and the rain-drops to watch on the pane during the showers, there is no saying. She was so far aware of this, that she asked everybody likely to answer her, what people did when there were no windows? The more she was told of wooden shutters, that were closed in bad weather, or of horn or parchment panes, which let in a dim, dirty light, but could not be seen through, the more she pitied the ancients, who knew nothing of the amusement of watching the jerking, capricious drops on a window, which seem never to be able to make up their minds which way they shall run, in their inevitable general direction from top to bottom. And what groping work, trying to read, write, or

sew, behind parchment panes! and how cold, most days of the year, if the wooden shutters were opened to let in light! Something of this may be seen now, in the homes of some people who speak our language, and otherwise live pretty much as we do—the settlers in the wilder parts of the American woods, where the glazier has not yet found his way.

When the mail drives up at night, with its load of hungry passengers, there shines the settler's dwelling—the yellow light, and the scent of broiling ham or venison, diffusing themselves at once through the square holes, which will be closed by shutters when the mail drives off. The light streams out, and strikes red upon the stems of the pines, or yellow upon those of the beeches; the fragrance streams out upon the fainting senses of travellers, and unto the nostrils of the negroes, who gather about the door, as the heavy coach jolts up to the threshold, and the chill night air rushes in upon the cooking dame and her "help," and makes the lamp flare; or, if the air be not chilly, swarms of mosquitoes invade the dwelling, and amply prove the curse of the want of glass windows. Yet this—if we leave out the mosquitoes, and aggravate the dulness and dampness of the air—was what our forefathers had to put up with, not so very long ago. Three centuries since—when Alnwick Castle was in its glory, and had all manner of conveniences that ordinary dwellings were without—the glass windows of the Duke of Northumberland were put up only when the family were at home, and taken down immediately on their departure, for fear of accident. So lately as two centuries ago, the only glazed windows in Scotch dwellings were those of the upper rooms in palaces; the lower windows being still furnished simply with wooden shutters. It is true, this was one thousand years after some of our churches and abbeys had been graced, and kept warm and dry, by the use of glass windows. At least, we know that artists were brought from the Continent to glaze the windows of a church and monastery at Wearmouth, in the county of Durham, in the year 674; and the mention of the subject brings before us the beautiful painted windows that the pious put up in our cathedrals, and other churches, long before that Duke of Northumberland was born, whose "casements" were taken such care of whenever he left Alnwick.

Suppose any one had mentioned, at any of these dates, such a thing as a whole house made of glass,—what a romance the notion would have appeared! Some say, indeed, that old Chaucer did imagine such a thing; and in his "House of Fame" there is a description of a dream of a temple of glass, with metal pillars, stretching far away, and crowds of people from all regions roaming about within it: but Chaucer's readers received this as a dream. The chimera has come

among us, and sat down in our midst, in solid reality. Most of us can testify to it on the evidence of our own senses. But so few have visited the awful birthplace of this chimera—so few have any idea of the fire caverns, the dim vaults, the scorching air, the rush, roar, glare, and appalling handicraft from amidst which that light and graceful creation came forth to lie down on the grass in Hyde Park, that we must tell a little of what we saw when we went hunting out its birthplace.

In plain words, we have been permitted to see the glass-works of the Messrs. Chance, near Birmingham. In old reports of the glass-manufacture, we find Birmingham low down in the list of places in England where the process is going forward. It can never be so again. The establishment which produced the Crystal Palace must stand first in the world until something greater has been done. It is only within three centuries that the manufacture has been heard of at all in the district; and a century ago it was not known in the town of Birmingham. Messrs. Chance's works are not in the town, but at Smethwick—half-an-hour's drive from it: and, indeed, they would take up too much room in any town. The buildings occupy many acres; and the canal has to stretch out various branches among them. The number of men, women, and children employed, are twelve hundred or upwards. The schools on the estate contain from four hundred to five hundred children (not all connected with the works, however); and the consumption of coal is,—but we will excuse any reader from believing it, without seeing the coal heaps,—from eight hundred to one thousand tons per week. To those of us who consider and calculate about buying ten or twenty tons of coal per year, it is a marvellous thought,—that of the coal-bill for an establishment which consumes nearly one thousand tons in a week, and in every week of the year;—say forty-seven thousand tons in a year. Visitors to the works may pass hither and thither for four or five hours together without entering the same place twice; and they may go again and again, without coming upon many traces of their former visits. The vastness of the buildings is as striking as their number; and the passage through lofty, dim, cool, vault-like sheds, is an admirable preparation for entrance among the furnaces and kilns.

In one of these sheds we see, heaped up against the walls, masses of sulphate of soda. This portion of the material is brought from the alkali works of the same firm, not very far off. In another shed there are millstones, revolving on edge, for grinding to dust the small proportion of coal required hereafter. Elsewhere, we see heaps of chalk; and, in one shed, the greatest quantity of fine sand we ever saw in one place, except on the sea-shore. St. Helens, near Liverpool, yields

very fine sand for glass-making; but this roomful is from Leighton-Buzzard, where there is a sandpit belonging to this firm. As it is sifted, wreaths of it rise, like white smoke, and curl under the rafters. Thus, we have seen the materials; and must next observe the apparatus for the cooking of them.

It is a desperately rainy day; and the roads which lead from one place to another are inches deep in black mud and puddles. Of course, the canal does not look very engaging; and the procession of boats on it, laden with coal, is about as wet as everything else. There are carts in the alleys filled with broken glass; and there are heaps of broken glass piled up against the walls. Women are at the cart's tail, or under sheds, picking the glass; that is, separating whatever is stained with iron in the process of glass-making, or otherwise coarse, to be made into coarse glass again, while the clear and fine is set apart for higher purposes. A cart-load of rubbish and sweepings is about to be shot into a canal-boat. Being drawn across our path, the cart is ordered away, but the man in charge calls out from the other side, that we must wait our turn. Shocked at such a speech, men within hearing rush to turn the horse, and spill the rubbish on the wharf, which afflicts the strange-looking carter. The poor fellow is not quite sane. One of the pleasant incidents often observable in these large establishments is the employment of poor creatures who would otherwise be sadly desolate. Where there is a will there is a way, in such large concerns, of finding something that the foolish or the partially infirm can do; and it seems as if the will was never wanting.

Up an inclined plane we go now, under heavy drops from the eaves, and take shelter in a place curiously furnished. The large floor is almost wholly occupied with great caldrons of ash-grey clay;—very handsome caldrons, round, smooth inside and out, with a thick smoothly-rounded edge, and each standing on its own platform. These are the "pots" in which the "metal" is to be melted in the furnace. There are three pot-makers in the establishment; each of whom makes three pots in a week. One of them is busy now, with a labourer and a girl to help him. The labourer is treading the clay. He has a watering-pot in his hand: his feet are bare, and his trousers turned up; and he tramps about on his platform with a squashing tread, which is not pleasant to us, and can hardly be more so to him. Everybody says there is no way but this of making the clay fit for pots; but we cannot help fancying that one will soon be found. The girl is at a table, with a mass of clay at her right hand. She is making it into sausage-like rolls; and her employer is building up his pot, by laying these rolls in order round the edge, and squeezing them down smooth, so as to exclude the air, and make the whole of as close a grain as possible. The bottom is no less than five

inches thick, and the sides nearly as much; and five or six months are required for the drying of a pot—passing, as it does, through various degrees of heat, from that of the room in which it is built (seventy degrees when we were there) to that which is to cause its destruction. Inquiring when this catastrophe was likely to happen, we found that a pot may last any time between one day and three months. Few last so long as three months. It must be a grief to see a pot fall to pieces in one day, after having been watched in the drying for half-a-year; but there may be some little consolation in its not being wholly lost. The fragments are ground down to powder, and mixed with four times the amount of fresh clay, to make new pots. The clay is from Stourbridge. The pots hold thirty-five hundred-weights each of molten metal.

And now we must go and look at the molten metal in the pots, and see how it is treated. We find ourselves on a sort of platform, in front of six furnace mouths, which disclose such a fire within as throws us into a secret despair; despair for ourselves, lest we should lose our senses, and for the men, because it seems impossible to live through the day in such a heat. Looking into one of the openings, as well as we can from behind a screen, we see that the spectacle is one of exquisite beauty. There are the great pots, transparent with heat, and of the palest salmon colour, just distinguishable by their rims from the fire which surrounds them. Rising on tiptoe, we can see the metal—a calm surface, somewhat whiter than the pots. Turning to the men, we observe that they work over a row of troughs of water. We should like to plunge our head in, if the water were not so dirty. It is for cooling the pipes. The workman dips one end of his pipe into the metal, taking up a portion which is of the consistence of honey. He lays his pipe across the trough, and laves it with water, while a boy blows into the end, swelling the metal into a small globe. The effect of the breath is seen in a paler central bubble, spreading itself through the red mass, and expanding it. When more metal has been taken up, enough for a sheet of glass, it is to be carried to the next shed, where there are more furnaces, and the globe is to become a cylinder. Before we follow it there, we are offered the privilege of blowing through a pipe. We empty our lungs into it, again and again, but without producing the slightest effect. Our breath goes away easily enough, but no bubble ensues; we look rather foolish; so we hasten away, to see what becomes of the globe we have seen created.

We pass a man who is hewing out, with a small hatchet, a hollow in a block of wood, large enough for the globe to be rolled about in. In the next shed, each workman has one of these blocks to himself. It contains some water; and as he rolls his red-hot globe in it, a boy sprinkles more water upon it.

The water seethes and bubbles, but does not reek. The heat is actually too great to permit evaporation. The globe is tossed about, and blown into again. If the pipe is raised in the air while blown into, the metal becomes cheese-shaped: if held horizontally, the form produced is a globe: if pointed downwards, the globe is elongated. This particular mass is elongated. In a moment it must be heated again. Between the range of blocks and the furnace, there are bridges across a deep chasm; a bridge to each furnace mouth. The workman runs along his particular bridge, holds his metal into the furnace, withdraws it for another toss, heats it again, with another puff through the pipe, and at last has blown a hole through the further end. The whole expands, the edges retreat, and we now see the cylinder form arranging itself. There he stands on his bridge—as half-a-dozen more men are standing on their respective bridges, swinging the cylinder at arm's length, even swinging it completely round in the maddest way; the scarlet colour at the further end shading off beautifully into soberer reds up to the point of the pipe, where the central knot is still scarlet. When it is of the right length (that is, for the Crystal Palace panes, somewhat above forty-nine inches), the cylinder must be detached from the pipe. For this purpose it is laid upon a wooden rest; a touch of cool iron breaks off the pipe; with pincers, a strip of red-hot glass is drawn off from the end of the pipe, and laid like a ribbon round the cylinder, near its closed end. After this, a gentle tap severs the closed end, and we have the cylinder complete.

While it lies cooling for a minute or two, we observe the making of a glass shade, large enough to cover a time-piece, or a statuette on its pedestal. Stopping short of blowing a hole in his *cul-de-sac*, the workman deposits his red bubble in a wooden mould which stands in the chasm below his bridge. The sides are flattened, while the top and ends remain round; and thus, amidst a little rush of sparks, the shade receives its form. The work done on these bridges is, perhaps, the most imposing to a novice of any part of the business. Some of the men have bare feet and legs; some have no clothing but drawers and a blue shirt; one or two, indeed, add the article of gold earrings, being Frenchmen. All have glistening faces; and all swing their glowing cylinders as if they were desperate or demented; a condition which we suspect we are approaching, under the pressure of the heat, and the strangeness and the hurry of incessantly getting out of the way of red-hot globes, long pipes, and whirling cylinders.

If we are to follow our own particular pane of glass, we must be off; for the cylinder is cool enough to be carried in a man's arms to the annealing, in preparation for the splitting. How this round thing is ever to grow flat, we cannot conceive. Supposing it split, the

inside must have a more contracted surface than the outside. Well; we shall see. It has to be annealed, before anything more can be done to it, and for this purpose, it is carried to the kiln, where it is to be well baked, and gradually withdrawn into a lesser and lesser heat, until it will bear what else it has to undergo. As we cannot stand here for a day or two till it is done, we must transfer our attentions to another cylinder, to see how the splitting is effected.

The diamonds, for cutting, are shown to us. One is mounted as on one point of a pair of pincers, the diamond looking inwards. The pincers are mounted upon wheels. This is for cutting off the edge of the cylinder, which is more or less jagged. The little carriage runs round under the upright cylinder, the diamond marking the glass as it travels; and a gentle tap severs the jagged end at the mark. Next, the cylinder is laid along upon a table, and another mounted diamond is run through the inside of it, from end to end, guided by a ruler. Another tap, and there is a split along the line, and the edges actually overlap. The glass is seen to be thicker than it is to remain. It will lose one fifth, or one sixth of its thickness in the grinding. A curious fact is observed here. Looking at the edge of a piece of red glass, we see that it is not red throughout—that, in fact, the glass, seen sideways, is greenish; but how this happens we cannot divine. It is done by taking up first a little of the red honey from the ruby glass-pot, and afterwards white—again and again, in proportion to the intended paleness of the hue. Thus, the red, while completely incorporated in substance with the rest, is spread over only the inner surface; and thus, when cut, the sheet can be embossed with white figures. Red or white, the cylinder is now to become a sheet of glass.

We adjourn to the mouth of a kiln, where we see that a slab of stone, moveable, forms the floor. On this slab lies a sheet of glass; and our cylinder is to be unrolled upon it, or its lower side would be made rough by contact with the stone. A little lime or chalk is sprinkled on the sheet, and then the cylinder is laid down upon it. As it heats, it begins to gape at the slit. The process is aided by the man at the kiln. He takes up a pole which has a wooden block at the end of it, thrusts in the block, and proceeds to iron out the relaxing cylinder. His block begins to smoke, and presently throws out sparks, more and more; but he perseveres until every corner is levelled; the sheet lies as flat as a pancake, and its two surfaces are equalised, in its semi-fluid condition. By observing the reflection of the fire on its surface, we see that it is rapidly melting. But it is not to melt away; so the slab is drawn away backwards, by a stout chain; and another is to take its place from one side.

We go round to see what becomes of the sheet. We find it in a somewhat cooler part

of the kiln, about to be removed, that the stone slab may go back to its proper work. A boy is to effect the removal. He lifts up the sheet with a long "fork," as he calls it, and gently lays it on the top of a pile of predecessors, which are gradually cooling. When nearly cooled, they are to be transferred, in the iron box which now contains them, and where they are to stand on edge, separated by iron bars, to a sort of railway truck, where they stand, shut up in their box, until they have become accustomed to a natural temperature, and may be carried on to the grinding. There we must leave them, while we take a look at the treatment of two other kinds of glass—flint-glass, or crystal, and crown glass.

There is no flint now really used in the manufacture, though there was when crystal glass was called after it. Flints were, in those days, heated red-hot, and thrown into cold water, when they fell to pieces, so far as to be easily reducible to powder. It is still easier, however, to pick up the sand ready powdered at Lynn and in the Isle of Wight. Red lead is added, to give density to the glass; but in what proportions we did not inquire here, having learned elsewhere that that is the one question which a stranger ought not to ask. It is the grand secret of most glasshouses. Red lead also promotes the melting of the sand; it gives a greater refracting power, and a higher lustre; and it is some protection against fracture from sudden changes of temperature. It renders the glass more ductile in the working also; but there must not be too much of it, or the material will be too soft. In these works, the flint glass has a furnace to itself—built for it. It is melted in crucibles, or small pots, over and over again, until it is pure. It is left in the pots, and the furnace is shut up, and allowed to cool very slowly; when the pots fall away, and leave the glass in masses. A man holds each mass between his eye and the light; and, if he sees any speck, he splits the glass, and removes the offending particle. Peeping into the annealing oven, we see flat cakes of flint glass, about an inch thick; and it is with a sort of veneration that we look upon them. They have grand work to do soon. They are to bring down to us much that is too high, and up to us much that is too small, for our discovery without their help. They are to open to us the spectacle of starry systems—reach beyond reach, until our faculties can endure no more. They are to show us (what we could not believe without seeing) how every drop of water in a stagnant pond is thickly peopled with living animals, and how whole quarries and sea-beaches are composed of the remains of dead animals. They are to separate the rays of the sun into parts for us; and to enable the aged to read and work, forgetting their years; and to repair many a mischief of imperfect sight; and to improve the beacon-

lights upon our coasts, saving many a seaman from the snares of the ocean, and giving him years more of life. It is this particular glass of which all kinds of lenses are made; and when we think of what is included in this set of uses, we feel that all the wonders of windows and glass palaces are of small consequence in comparison with them.

Passing from thoughts of telescopes, microscopes, spectacles, and lighthouse lenses, we go to see some more window-glass—the very best kind—namely, Crown Glass. We cannot in the least comprehend how and why the “metal” we saw treated, becomes the great and beautiful disc that we beheld it grow into; we can only relate what the process is, as we witnessed it. It is considered the most striking and wonderful of all the spectacles of this fire-palace. The same sort of tube that we had tried to blow through, now took up the same kind of material, in the same manner as in the case of sheet glass; a globe was formed in just the same way, and rolled on a metal table. After many heatings, and much blowing, the farther side of the globe was somewhat flattened, by pressing it against an upright surface; and then a boy brought a solid rod, with a dab of the fiery honey upon it, and fixed it in the middle of the flattened side. As soon as the rod is safely fixed, the original tube is detached by a touch of cold iron, and comes away, leaving a small hole. The workman throws down his tube, takes the rod, and twirls the globe like a mop, thrusting it into the furnace very often, to prevent its cooling. It swells and spreads, and reflects the flames on its film-like surface; the hole enlarges, and the edge curls back, till the globe looks like a vast lamp-shade. As the twirling continues, the edge folds backwards, more and more, till it makes a tubular ring all round. Suddenly, this ring bursts, and its substance melts into the flattening material which it surrounds, and the whole becomes a disc, or circular plate, of from fifty to sixty inches in diameter, of the same thickness throughout, except just round the rod in the centre. The plate is carried to the annealing kiln, and there is tilted with a “fork,” until it stands on its edge—the foremost of a regiment of discs, separated from each other by bars. Window-panes are to be cut out of it, by-and-bye; and the thick part, in the centre, is to glaze out-houses and the like.

The heat from these last-seen furnaces is tremendous. The men do what they can to shield themselves from it. They wear masks—gauze, fastened to the rim of an old hat. One holds a wooden screen before the face of another, and all are as quick as possible, both for their own sakes and that of the glass. Still, it is a marvel how they can bear it. We are told that it is by their working very moderately, as to time—four or five days (of seven hours) in a week. Thirty-five hours in a week are considered a fair share of work for

glass-blowers; but, if a pot breaks, they must work until another is put in. Thus, their time is spent between arduous toil and leisure; and this circumstance points to the expediency of furnishing them with amusement which may make their leisure harmless. The public-house used to be a terrible temptation to men so tired, heated, and thirsty; and to many it is so still. Of late, reading-rooms have been opened, which appear to be an inestimable resource. There the workman may enter at any hour during the day, and find a good fire, a table covered with newspapers and other periodicals, and some comrades reading the news. There is a good and increasing library; and the men may take the books home, and are encouraged to do so, that they may spend the evenings with their families.

We have still to see how the sheet-glass becomes smooth and polished. It has to undergo three processes more;—grinding, smoothing, and polishing. Probably the first thing every stranger does on entering the grinding-room is to burst out a-laughing,—the machinery is so grotesque;—so like being alive and full of affectations. It is patent machinery: the exclusive possession of this house. One sheet is moved about upon another with a movement like that by a human arm, scrubbing and grinding; and the repetition of this, by scores of machines in rows, produces a most ludicrous effect. The sheets have been properly squared before by being cut with a glazier's diamond. The grinding now, with sand between the sheets, takes three hours for each side; and they come out of the process opaque, but without seams or serious blemishes. They must be smoothed by hand; and this is done by women, who rub them with fine emery, and remove any remaining specks. From forty to fifty women are employed in this work at long tables, where their action is very graceful, as they bend over their work, and use the steady and equable pressure required. The polishing is done by machinery, in the same sort of red apartment, filled with red machines, tended by red work-people, which was described in the account of Plate-glass making, at page 433, of our second volume. The noise here is horrible. Noise and rouge, and the tyranny of the rolling presses over the tortured sheets, bound down immovable, give an infernal aspect to the place, very unlike some things that remain to be seen.

We pass through more and more of these vast rooms, each of which would contain a house. One is full of glass shades, of all sizes, from that which would cover a life-size statue, to such as would preserve butterflies from dust. In a closet, opening out of this room, a man is plying the wheeled diamond with a weight and measure, carefully cutting the bottom of shades true and even. Here are bell-glasses for fern-houses, and some with a trough for water round the edge. Here, too, are shades made to order, for

particular objects,—as a group of statuary,—where the back of the shade is wider than the front. In another room, boys are cutting little squares of glass on marked counters, with rulers and glaziers' diamonds. These are to cover miniatures and daguerreotypes; but where they can all go to—many thousands in a week—we cannot conceive. The demand from America is very great, we are told: but it seems to us, that if all American and English children were to amuse themselves with breaking the glasses of miniatures, what we now see in this room would repair the damage. If such be the quantity of glass in bits, it may be conceived what the amount must be in sheets. We pass hundreds and thousands set on edge. Handfuls of straw are thrust between the plates to keep them apart; and in rooms near there is a vast packing always going on.

The conclusion of our survey is charming. We find men, women, and boys painting and enamelling glass. A sheet is covered smooth with a white enamel, which has itself much of the character of glass. Slips of brass, with patterns cut out, are laid on the enamel, and rubbed over, so as to leave the pattern clear. It is, in fact, stencilling; only, instead of laying on paint through the holes in the pattern, the enamel beneath is rubbed off there. A woman is covering a sheet all over, except a border, with some thick black substance. This sheet is to be embossed. The border is to be corroded by an acid, and she is protecting all the rest of the surface by this covering. An artist is painting a broad border with the blue iris—as beautiful as life—and convolvulus and poppies. The panes of lanterns are almost as astonishing for quantity as the miniature glasses; and extremely various in patterns. But we should never have done, if we told what pretty things we saw; or if we entered into details about the schools; or described the life and condition of the twelve hundred work-people connected with this vast establishment.

There was a certain fountain in the centre of a certain Exhibition which need not be described, because everybody knows it. We have been to see how that fountain was made, and have had the honour—a somewhat laborious one—of lifting some of its portions; a shell, a spike, an ornament or two, each of which required the whole strength of an unpractised person to raise from the ground. The weight of the fountain, before the trimming and dressing, was upwards of four tons. Mr. Osler engaged three railway carriages (passenger train) to convey it to London, he taking his own seat in a fourth. A wall was built in the centre of the transept for the foundation of this beautiful structure; and the building up was done slowly and carefully. When the Queen and Prince Albert walked round the screen which surrounded the work which Mr. Osler was superintending within, they could not have imagined—for

none but the artificer could—what would be the beauty of this transparent shaft, with its streams of water falling like a veil around it, when the slanting sunlight from the roof touched it, and sent thousands of gleams and sparkles through it. It could be, and it was, removed in one night; but many were the anxious nights and weary days which passed over the making of it. If the Messrs. Osler could have devoted their works and their people wholly to the making of this fountain, it would have been pleasant enough; but it had to be done in addition to their ordinary business; and desperately hard work it was.

We saw how some of its parts were made, in seeing how ornamental glass—vases, pitchers, decanters, chandeliers, and many fancy articles, come out of the hands of the workmen. Of the earlier processes of the art we need not speak, as they resemble those which were described long ago; but there is one circumstance which ought to be noted; the form of the great chimney of the glass-house. Mr. Osler knows what he is about in matters of science; and he perceived that the prejudice in favour of a chimney with a narrow top was a mistake. He determined to build his the same width, inside, all the way up. Perhaps, if he had to do it over again, he might even make it wider at the top, as the heated air requires plenty of room for expansion and escape. Some people thought the plan a very odd one, and said there could be no proper draught. Everything else about this carefully planned glass-house was capital; but who ever heard of such a chimney for a glass-house? There it is, however, resting upon strong pillars; and with such a draught, that at times the business is to moderate it.

Passing the mixing rooms, the pots, the melting, the blowing, we give a moment's attention to the method of forming a decanter or pitcher. The workman sits in a "chair"—a bench with two long arms to it—and rolls his iron pipe or tube, with the left hand on these arms, to keep the soft glass in shape, while with the right he applies a pair of tongs to fashioning the neck of his decanter, or claret-jug, or whatever it may be. It is a pretty sight; and so are the long vistas of glass, in the kiln first, and then in the "leat"—the milder oven, in which the annealing of the smaller articles is done. We leave the glass-house, and travel to the manufactory, where we see how the drops for chandeliers, and all manner of arms and branches, are made, and how the cuttings, and polishings, and putting together are done. Here is a deaf and dumb man casting drops and "spangles," as small square drops are called. Why not? Hearing and speech are not required for this work; and there he sits diligent and still. One wonders what he thinks about, all the while. He tosses a bit of coal into his little furnace, every minute or so. The coal is on his right hand, and on his

left are the "lumps" of flint-glass he is to use. He pushes forward one at a time into the heat before the fire, that it may be warming for its work. With his left hand he holds the rod, on the end of which is the "lump" he is using; and in his right is the mould in which the drops are to be formed. He melts his lump, and lays a yellow trail into his mould, and shuts down the lid upon it. Out comes the drop, three-sided, rough, and attached to the lump. He knocks it off, pushes it on one side, and begins another. When he comes near the end of his lump, he makes smaller drops and "spangles," until only enough remains to fasten on the new lump which has been roasting in preparation. The place is lighted only by the furnace fires. The glare is intense to the workman on his stool; and his sight would suffer if the daylight were mixed with it: so he darkens the window.

We find women at work in the next place we enter. Wheels are whirling and whizzing, and the drops are first ground smooth, and then polished. The most wonderful thing is, the skill with which the facets of a drop or spangle are ground by the eye. Ridges meet at the top; planes slope away to the side, with a regularity truly mysterious to the novice. Out come the drops, smooth in their edges, polished in their sides, and with the obtuse angles at their ends all without a fault. It is a wonderful education of eye and touch.

In the moulding of the pendants, holes were made, by wires standing up in the mould. Hooks and eyes have to be inserted in these holes, and in the plates to which they are to hang. Girls insert these, and put the parts together.

There is a long and peopled apartment, called the metal-room, where the metallic parts of chandeliers, &c., are prepared. But more interesting, because more unlike other manufactures, is the glass-cutting, which proceeds in a vast right-angled room, where whole rows of iron mills, as they are called, are at work. Above each wheel or "mill" is a funnel, which drops sand and water on the edge of the wheel. It is, in fact, the sand which cuts the pattern—the mill being the means of applying it. Down dribbles and drips the sand; whizz goes the wheel; the glass held to the edge vibrates and seethes; and, after being dipped in the tub of water at each man's elbow, it shows the desired form and pattern; the curve, or the facet; the star, or the Greek border, or the flower and leaf garland. To save some kinds of articles which are slender, or much curved, from too strong a vibration, clay is plastered into hollows or angles. Some of the work is, necessarily, "underhand," though everybody prefers the "overhand" process: that is, it is more convenient and easy, and catches more sand, to hold the article to the upper part of the wheel than to the under. In the one case, the glass is thrust against the wheel; in

the other, it is lifted against it, which involves the holding the whole weight of the article, while much less sand finds its way to the right place. The work is both laborious and anxious. One article may require a succession of mills; and it may be spoiled in any one stage of the manufacture. Here is the anxiety of the case. In metal-working, all is pretty secure when once the model is obtained, and the first casting is found to succeed. In the glass manufacture, each article must stand on its own merits, and the thousandth requires as much pains as the first. Those pains have their reward, however, as some of our readers may be aware, if they have overheard remarks on the collection of graceful and brilliant glassware, in the Messrs. Osler's rooms in London. Another kind of tribute arrived lately from a very distant place. The Messrs. Osler had sent to Egypt, by order of the Viceroy, two pairs of crystal glass candelabra, ten feet high. The Viceroy is so delighted with them, that he has sent them—who would guess where?—to the tomb of the Prophet, at Medina; where, as his Highness's Secretary observes, they will be the admiration of hundreds of thousands of pilgrim worshippers. It is a singular destination of Birmingham products—to keep watch over the pair of genii, who are keeping watch over the Prophet in his tomb; reminding him of his good and evil deeds, and balancing the account which his resurrection is to settle. How very far have they travelled over sea and land, to stand within those iron rails, and under the charge of the forty eunuchs who keep guard there! It is a symbolic incident, indicating the spread of British arts among the remotest regions, and the strangest races and faiths on earth.

CHIPS.

NOBILITY IN SPAIN.

EXCEPTING Hungary and Poland, the most numerous crowd of nobles in the world is to be found in Spain; and here, again, the crowd is thicker in Castile and in the Basque provinces, especially in Alava, than elsewhere. In the last-mentioned district, indeed, almost every peasant is Hijo de Algo (the son of something), or, in short, Hidalgo.

In what are called everywhere the good old times, the Spanish nobility possessed many privileges, and among others was one which still exists; viz., they do not stand up to be hanged for any crime, but have the right of taking a chair, and being strangled in a comfortable manner. This punishment is called "El Garrote noble." The nobles claim a right to be addressed as "Tu" (thou) by the sovereign, signifying that they are thus acknowledged as his peers. They are divided into three ranks. In the first come the *Grandees*, who claim equality by birth with the king, and derive their origin, at some time or other, from one of the reigning families;