

With a quick, deep sigh of relief, Mr. Cunningham fell back into his chair as the door closed after his friend, and I, relieved as it seemed from a mighty weight, threw away the spiritless music upon which I had been engaged, and broke into a gay, blithe song and rattling melody, which appeared scarcely sufficient to express the voice of my joy; but very soon, long before the first outbreak was over, a message came from the guest I had fancied gone, requesting Mr. Cunningham to go to him in the library, as he had something of importance to say before he left the house.

Mechanically—rather by instinct, than as the exertion of an independent will—my stepfather rose to comply with his friend's desire, and for a moment stood hesitating; but the brief pause over, during which his countenance reflected in the pier-glass above the instrument, worked terribly, he walked hurriedly towards a door which opened on the lawn, exclaiming, with an oath, "I won't go!—tell him I'm out!"

Five minutes after, with stealthy tread, like a cat's, Mr. Baldwin came in, saying, as he glanced around, "Oh! Mr. Cunningham is really gone; what a strange fellow he is! surely he needed not to take alarm at my summons, and run away, to avoid fixing a day for dining at Hatton. Well, lest he forget to do so, I have written this note, which you will, perhaps, be good enough to give him, in case he returns before I do. Good evening, once more!"

And once more he went out, leaving me alone, not blithe and happy, as I was before, but sick and faint, oppressed with that terrible dread, that vague sense of coming evil which is so unfeeling and wretched, and against which it seems so vain to struggle. Whatever was impending, and as plainly as the raven scents blood, I knew and felt that something was at hand I could not help connecting it with the bad man who had just left me; and so far from feeling more at ease now that he was gone, I would have given the world to recall him, to keep him in my sight, to fight, so to speak, in open daylight, face to face with my enemy.

Eagerly, shudderingly, I gazed upon the little twisted and sealed billet, which lay alone on the dark table, feeling as if within its folds was something which it nearly concerned me to know—something which, if I knew, would alter my whole life's course, but which was as closely hidden from my knowledge as if the secret, instead of lying thus in fragile paper before my very eyes, was hidden in the depth of the earth. At last, just when, according to my restless custom, I had walked myself calm, Mr. Cunningham returned, and seeing the note, took it up and opened it.

The table by which he stood was immediately under the chandelier, the light of which fell full upon his face, and I, from my seat in a shaded corner, could mark the rapid changes of his countenance as he read the scroll.

Hate, fear, and avarice, in their fiercest shapes, passed over and distorted his handsome features. These feelings throughout were mingled with remorse and compunction, which, struggling vainly with their mightier antagonists, were speedily defeated. (In whatever mood of relenting he had gone out, and however unwelcome the note and its peremptory style might be, it was evident he would obey it.)

"Well, Isabel," he said, during a time, "how have you been amusing yourself during my absence? tolerably well, I hope?" and he came up to the sofa where I sat. "You look pale and tired; not in a very good one for a journey this week."

"A journey?"

"Yes, to Bath. Your mother is getting tired of being alone; and I thought, if you were able, we would go down on Saturday."

"I shall be quite ready. I feel very well now—better than I have done for weeks."

"You do not look so. But now we will have some supper—I want something after my walk—and then go to bed. Rest is the best thing for you."

And, ringing the bell, he sent an order to the nousekeeper, adding, "And tell her, if she has any of that jelly which was ordered for Mrs. Cunningham, to send some in for Miss Neville, who requires such things continually. There should have been some at dinner!"

"No, thank you!" I interposed; "I never take supper, only a glass of milk and a biscuit, which the housemaid brings into my room the last thing, and I take during the night."

"Ah! so I have heard—at least," he said, confusedly, seeing my surprise, "I think you told me so before!"

"No, indeed; I have only adopted the plan lately, while you were away, and certainly have not spoken of it to you before."

"No? Ah, well, I must have fancied it, I suppose. But now lie down until the tray has made its appearance. By-the-bye, have you finished the wine I left out for you? it was some of your mother's favourite vintage."

"No; it had a nauseous taste, and so I did not take it."

"I am sorry for that, it would have strengthened you greatly; I hope it has not been wasted."

"I do not know. I saw the decanter in the library to-day."

"I will get it, then. I prize the wine very much, for I have not much left, and it is too good to go into Danby's room."

And, taking a candle from the sideboard, Mr. Cunningham left the room, returning after a few minutes, saying, "I do not wonder you disliked it; I must have made a mistake, and in my hurry gone to the wrong bin; and whoever decanted it mended the matter by breaking the crust, and making it as muddy as ditch water. It was fit for nothing, so I have sent it into the kitchen. I am glad you did not drink it; let me give you a glass of this, it may bring the colour to cheeks which have become terribly white."

"No, thank you, I am perfectly well."

"Impossible, with that complexion! Ah! I fear your apparent recovery was too rapid to be trustworthy," continued my stepfather, fassing about the sofa, to my intense annoyance, while the table was being prepared. "Why there, by Jove, she is fainting—water, water! Ah! that's right."

And before I could save myself, or remonstrate, a glass of water, snatched from the table, was thrown full in my face, causing me to gasp and shudder; while at the same moment the man was dispatched for assistance, and a scent-bottle of extraordinary power was thrust upon me, to the imminent danger of my breath, which for a few seconds was completely stopped, and only recovered with many choking and convulsive struggles; which occurring just as the servants ran in, effectually alarmed and readily disposed them to believe Mr. Cunningham's assertion, that I was very ill.

Utterly vain were the indignant protestations I would fain have made against all that was going on. Every movement was watched, and treated as hysterical; every word silenced ere half spoken; while exclamations of pity for my sufferings went round and round the circle, until feeling half frantic, I daresay I looked so.

"Poor dear!" cried the fat, sympathising housekeeper, evidently regarding me as a sort of sight, and speaking in that loud, hissing whisper, which, of all tones on earth, is the most irritating. "I knew all along that you would not last—'tis such a flattering complaint—well to-day, and gone to-morrow. Well, it is a comfort that Mr. Cunningham's returned."

"Oh, dear, dear!" sobbed somebody else; "isn't it sad!—and she going to be married, too—and all those sweet, pretty curls—whatever is to be done?"

Angry beyond expression at all this folly, which Mr. Cunningham assisted by sighs and shrugs, and conscious that with my dripping hair and wet face—from which, no doubt, the bath I had received had driven every trace of colour—I presented a most wretched figure, I tried once more to speak in self-defence; but the first attempt proved the uselessness of the effort, the determination of the pitying bystanders to believe me seriously ill; and therefore, with a kind of sullen anger, I resigned myself to my fate, suffering myself to be laid back upon the sofa, and trying to wait patiently for a turn of affairs.

But that was long in coming; for even then, as I could not but see, we were all—the servants and myself—but puppets on the stage, the wires which moved us being held by able and wary hands.

Five minutes' quiet listening, while all the rest were talking, served to convince me that, for some cause or other, my stepfather desired to impress the household with a belief, not only of my present dangerous illness, but also of my being a prey to some constitutional disease which had been daily strengthening, and was now coming to a crisis.

Enraged and astonished as I was, I yet controlled myself sufficiently to lie still, and, through my half-closed eyelids, to watch the countenance of Mr. Cunningham, as he stood for a time before me.

It was pale and resolute, although about the mouth there were sundry twitchings, and in the eye certain restless glances, which proved that, however resolved the spirit might be to do and carry through whatever he had resolved upon, the body was weak and shaken, bearing traces of the mental struggle which had been endured and conquered. It was a repelling countenance, and, as I read it, it seemed as if I read also that it was that of my deadliest foe

—he in whose hands my instant doom was vested. Romantic novel-readers, and daring young ladies who have never in their whole lives encountered dangers save in books, or from the points of refractory pins, may paint to themselves, reading this, how differently to me they would have acted—how boldly they would have spoken, and defied Mr. Cunningham—how pathetically claimed protection from the servants, and how magnificently have denounced his villany—and may condemn my conduct as contemptible and cowardly. But I have little of the heroine in my composition, and know that, however grand defiance and accusation may read in story books, they are awkward weapons in real life—never successful, unless the charges made can be proved; and, even then, the victory gained by them is not always a triumph. Certain as I felt of Mr. Cunningham's treachery and evil designs, I could not prove them. Against what, then, should I demand protection? And how plainly even the smallest common sense showed me I should weaken my own cause, and strengthen his, by making accusations I could not establish by a single word or corroborative circumstance.

(To be continued.)

#### GLASS, AND GLASS-MAKING.

GLASS is one of the most beautiful, as well as one of the most useful substances which we possess.

Glass supplies the shopkeeper, the horticulturist, and the chemist with a great variety of necessary articles, and many of our domestic utensils are made from this material.

Perhaps the purpose to which glass is most beneficially applied, is that of windows. How gloomy—how dismally our dwellings would appear if the windows were covered with canvas or tattered parchment, instead of being filled with beautiful transparent glass! But the use of glass in many of our buildings extends beyond the windows—buildings which have recently been constructed having glass for their principal material; such, for instance, as glass hot-houses, cow-houses, and the coverings of the various railway stations, market places, and workshops.

Since Sir Joseph Paxton astonished the world with the Exhibition Building of 1851, magnificent structures of iron and glass have risen up at Sydenham, in America, France, Ireland, and Holland.

And how is glass made, and what is its composition? Glass is not dug from the earth, as some persons have been simple enough to suppose, although the materials used in its manufacture are obtained from that source. Wonderful as it may seem, sand is the principal ingredient in glass; and this, combined with chalk or lime, potash, and some metallic oxide, forms, when submitted to an intensity of heat, a beautiful transparent crystal.

The origin of glass, like many other discoveries, appears to be veiled in mystery. Pliny supposes it to have been accidentally discovered by some shipwrecked mariners of Phœnicia, whose vessel was freighted with a sort of fossil-alkali, which is one of the constituents of glass. Wishing to prepare some food, they lighted a fire with this substance on the sand, when, through the agency of the heat, the sand and alkali united, and formed into a vitrified mass—a circumstance which gave rise to the art of glass-making. Whether this old story has, or has not, any foundation in fact, it is certain that the ancient Egyptians knew this art, and carried it to a high degree of excellence, since some of their beautiful productions—consisting of bottles, beads, and inlaid mosaics—are still extant. Their bottles were of the choicest colours, with finely-waving lines; and their small mosaic work was of such delicate designs, that a strong magnifying power must have been used in putting them together, as is required now if we desire minutely to examine them; particularly the feathers of birds, the hair, and other intricate details. Glass beads have been found on the bodies of Egyptian mummies, which are supposed to have been embalmed upwards of three thousand years ago; thus showing the absurdity of considering the art of glass-making a modern invention.

The ancient Egyptians, who were masters of almost every branch of learning, appear to have well understood the method of forming glass vessels and ornaments of every imaginable colour and description; and, no doubt, the art of flint-glass-making was acquired from them, and brought into Europe by the Romans. The Venetians excelled in the art of white and coloured glass-making, and had carried it to great perfection in the fifteenth and sixteenth centuries.



The first flint-glass manufactory in England was established at the Savoy House, in the Strand.

Flint-glass has its name from being formerly made from calcined flint; but fine sand is found to yield a clearer ware, and is preferred on that account. Sand from Lynn Regis, St. Helen's, and the Isle of Wight is well adapted for glass-making, and is extensively employed by the manufacturers of glass.

The materials used in the composition of *white glass* are Lynn sand (which is washed, burnt, and sifted for the occasion), red lead, or litharge, carbonate of potash, and small quantities of nitre, arsenic, and manganese—the proportions of which vary in almost every manufactory. The following proportions produce a first-rate quality of white glass: fine white sand, 100 parts; carbonate of potash, 35; red lead, 30; nitre, 3; and small additions of arsenic and manganese. It may also be stated that a considerable quantity of broken glass, or cullet, as it is called, is made use of in the above mixture. All kinds of glass are melted in furnaces, which are constructed either of fire-bricks, or stone that is as free as possible from iron, because, if much iron exists in the stone, the high temperature to which the furnace is driven causes it to drop, and, falling into the glass metal, it greatly deteriorates its quality. The furnace for the purpose of fusing (called *foundry*) flint-glass is made of fire-bricks, and is of a circular form, with a sort of dome-shaped top, or "crown." It is furnished with holes for the admission of the fuel, and with smaller apertures for the receiving of the glass materials, from which the workman obtains his metal. The glass pots in which the materials are melted are formed from the finest fire-clay, that obtained from Stourbridge, in Worcestershire, being accounted the best adapted for the purpose. They are larger at the top than at the bottom; and the top is arched over, that no dust, or other injurious particles, may fall in, with a hole near the top for receiving the mixture, and for the insertion of the tube or "pipe" by which the metal is obtained. The process of melting is termed *foundry*, and requires the highest possible degree of temperature to which the furnace can be driven. The metal, when properly fused, is allowed to cool down to the required consistency, skimmed of all impurities which may be floating on the surface, when it is ready to be operated upon, and to be made into any form that may be desired.

The operations are simple and beautiful, and are performed with remarkable quickness and dexterity. One single description may be given as an insight to the various other methods of blowing flint-glass articles; namely, the process of making a fish-globe.

A tube, or *pipe*, of iron, as represented in the margin, is heated at one end, and the workman immerses this extremity slightly into the metal; turning the pipe round, he presses gradually out of it the semi-viscid fluid, draws it from the furnace, and rolls the collected metal backwards and forwards upon a rectangular table of cast-iron (a *marver*).

By dint of rolling, the metal is made to blow in an even and uniform manner throughout, and when it has assumed somewhat the shape of a pear, it is sent to the blower. The blower heats the vitreous mass in the furnace, draws it quickly therefrom,

blows into the pipe, swings it a little, cuts the part near the pipe with an iron instrument something resembling a pair of shears, blows into it again, and retreats. Having acquired sufficient heat, he blows it to the size required, its form being almost similar to a balloon, with a neck at that part attached to the tube. The blower then flattens the extremity

glass of every kind is apt to fly or break to pieces from the variations of temperature to which it may be subjected.

Besides the foregoing method, there are other ways of producing articles of flint-glass—namely, by blowing or pressing the liquid glass in metallic moulds as represented in the engraving below. In this manner imitations of cut-glass are obtained, the metal acquiring the several forms with as much faithfulness as wax.

By this means the public are enabled to enjoy the cheap luxury of every variety of fancy glass ware, which they would not have done if these productions depended entirely upon the process of grinding or cutting.

Glasses for the different descriptions of optical instruments, as spectacle-glasses, telescopes, microscopes, &c., are obtained from *white glass*, in which case every possible care is taken to preserve the metal from all *wave*, dust, or any gritty particles, which would be the means of rendering the glasses useless.

The production of glass fitted for the construction of lenses for large telescopes, is a work of such extreme difficulty, that those who excel in it become celebrated, and take rank among the men of science. It is a lamentable fact that, previous to the year 1845, English glass-makers were almost entirely debarred from the opportunity of competing for this honourable distinction; but since the removal of the vexatious fiscal interferences with the manufacture of glass, they have been enabled to enter

into honourable competition with their neighbours on the continent, who had heretofore



INTERIOR OF A FLINT-GLASS MANUFACTORY.



FLINT-GLASS MELTING POT.

furthest from the pipe with a piece of smooth wood, which is for the bottom of the *globe*; an iron rod (*punty*), with a small portion of hot metal, is attached to the centre of this bottom; a piece of cold, wet iron is applied to the part which was cut to form the neck, a smart tap is given to the pipe, and it is disunited from the *globe*. The neck is then exposed to the action of an intense heat, and when sufficiently softened, the workman inserts his work-tool within the neck, and turning the "punty" rapidly, while pressing with the instrument, the aperture becomes enlarged, a rim is formed, and a beautiful globe for keeping gold-fishes is produced. The fish-globe is then placed into a hot kiln to anneal, or temper, where it remains till



BLOWING MOULDS.



ROLLING GLASS.

gradually cooled by the withdrawal of fire from the annealing-arch; for, were it not thus tempered,

monopolised the construction of dioptric lenses for lighthouses, as well as other kinds of large optical glasses.

The various coloured glasses are made in the flint-glass manufactory, and are produced by adding different metallic oxides to the composition of sand, pearl-ash, &c. To obtain an amethystine tint, oxide of manganese is added; for brown, oxide of iron; for green, oxide of copper; for blue, oxide of cobalt; for purple, oxide of gold; for ruby, sub-oxide of copper; for yellow, oxide of silver; and for white, oxide of tin.

(To be continued.)



treasures, the most valuable among which was a gold watch and chain, purchased by her desire with part of the money once sent by my grandmother; three rings, also her present; the diamond hoop left by my father, which Mr. Cunningham had so tried to obtain; and twenty pounds in money, the savings of many years. Besides these was a locket, containing my father and mother's hair, wreathed round with Fulke's; two letters from Bath, the only ones my mother had ever written to me; and my father's miniature, which, lent to me by my mother long, long ago, had never been reclaimed.

These articles safely secured in my dress, I stood, wrapped in a large cloak and bonnet, a bundle of common necessaries in my hand, about to pass for ever from my mother's house, into the strange, wide world, of which the youngest infant on the place knew nearly as much as I did. But, just as I turned to go, a sudden impulse urged me to carry away the milk and the note, and learn at the first town I came to, whether indeed I had judged rightly, and the former was poisoned.

Without delay, therefore, I returned, poured the liquid into a little bottle which stood upon the dressing table, tied it safely in my bundle, and then, without a farewell look, pushed back the low French window which had been left unshuttered, and in a moment stood upon the terrace.

The moon was setting, and the early morning, which was now at hand, was very dark and cold.

For nearly an hour I walked on quickly and steadily, reckless of where I should go or what I should do; until at last I found myself on the high road, the dawn just breaking over the hills.

Then—recalled to consciousness by the single circumstance of a road stretching right and left, and the necessity of following one or the other—I paused.

The world was indeed before me where to choose, and knowing no more of one place than another, without a friend or welcome anywhere, it was, of course, a matter of perfect indifference which way I went.

It is strange, but the idea of immediate pursuit never struck me. Presently, I knew there would be an eager search; but now, for a few hours, I seemed to feel that I was safe. I sat down, therefore, on the milestone, for I began to be sensible of the unusual weight and fatigue of my clothes and bundle, and resolutely calling back my thoughts from the thousand subjects among which they had been roaming, set myself to think of the future, and what I should do for daily bread.

Alas! for the woman who, without friend or money to help her, first enters upon the study, and finds herself standing alone in a world of which she knows nothing, to wrest or win a living from it.

It was fortunate for me, that, thus entering upon my career, the future was hidden from me; and that, although warned by common sense of many difficulties and struggles, I had no real, true conception of their extent. If I had, who can tell whether I should have had courage to go on, to face the dangers which lay before me? As it was, I thought that work was always to be had by those willing to do it; and that the earnings of the frugal and industrious were always sufficient for their wants. The terrors of starvation, therefore—which, had I been more experienced, better learned in the hard world's cruel lore, would have unnerved and sickened me—were mercifully spared.

Some privations, utter absence of all luxuries, I expected, and did not fear. To the former I had been well inured in early days; and of the last, I had never had many. Decent food, however plain, and quiet shelter, were all I cared for; and I had no fear of not being able to earn them somehow. I was young, and tolerably strong; I had energy and faith; what, then, had I to fear?

Ah! how very young and ignorant I was; the very birds—*town birds*—would have been wiser. Only one thing I did fear terribly and shrink from, and that was the idea of mingling with my fellow-creatures—the making acquaintance with, and going about, among strange people.

Meanwhile, time wore on; the sun was up, and sounds of life, breaking the night's long silence, commenced. Men, going to their work, began to pass at intervals, and stare inquisitively at me, as I sat on the stone; and then I knew that if I would escape without leaving aught behind me by which I could be traced, I must loiter no longer, but proceed on my journey at once.

But where? Ah! how my thoughts had strayed again. Hours had passed, and I was no nearer a decision than I had been when first I rested there, nor could I stay to weigh considerations and deliberate now.

I rose, therefore, at once; and, as it often does, accident determined my course.

A handkerchief which I had taken from my pocket, caught by the morning wind, fell off my knee, and was blown a few paces up the road. I followed it, and went on.

A mile or two further the London coach overtook me; I stopped, and was taken up—outside; for the nimble guard, who sprang down to help me, judging from my dress and bundle that my finances were not in the most flourishing condition, never even hinted at the inside—a consideration for which I, who felt that fresh air was absolutely necessary to keep me alive, and that I should be inevitably suffocated in the hot, close atmosphere within, was exceedingly thankful.

Fast and merrily the vehicle sped on. The horses were fresh, the road clean and level as a table, and the load light, while the breeze, sweeping over the fragrant country fields, seemed to bring new life in every breath we drew.

Inaugurated by the air, the sense of freedom, and the cheerful, rapid travelling, I lost for a time the consciousness of all I had and was still to suffer; and, giving myself up like a child to the present, strange as it may seem, enjoyed the journey thoroughly. Once or twice during the morning the coach stopped for refreshments, and at the solicitation of the guard, who was very kind and attentive, I had some biscuits brought to me, in order to avoid the necessity of leaving my seat.

"You're a stranger to travelling, miss," he said, dropping into his place beside me, after the last bar of his parting serenade was blown. "Aint much used to forage for yourself?"

"No; this is my first visit to London."

"Ah! it's a grand place for those who have lots of money, but a precious bad 'un for those who've got none, or got to make it. I hope you've plenty of friends there!"

"No!" I answered, rather mournfully.

"No!—then what on earth takes you? But, I see, going to a situation."

"No, I am an utter stranger to London, and every one in it."

"My life! Why, whatever are those as belongs to ye about, to let a lady-looking young cretur like you come up to Lunnun for, without no friends to go to?"

"It is my own choice. Circumstances oblige me to exert myself."

"Well, well—that may be. Exerting yourself won't you, nor nobody else, no harm—'tis what we was sent in this world for; but surely there's better places to do it in than Lunnun, the wickedest hole out-an'-out that God's blessed sun shines on!"

"Is it? Well, I hope I shall not have much to do with the bad part. I must try to find out the good, and keep with them."

"Ugh!" and the man pulled a wry face; "your sarch 'ud end somethin' like the chicken's did, when the storm came on, and the little fool ran out to the hawk to ask him to take her in and shelter her."

(To be continued.)

### GLASS AND GLASS-MAKING.

(Continued from Vol V., page 412.)

#### BOTTLE MANUFACTURE.

THE bottle-manufacture is evidently an offshoot from that of flint-glass making; but its products are from coarser materials, and not of so fine a finish, although they are of more general utility in daily life, the demand for the various sorts of bottles, pickling-jars, and so forth, being high and incessant. The furnace for the fusing of bottle-glass is of a square form, with an arch-like top or "crown." The crucibles are of a different shape to what the flint glass-pots are, being destitute of the hooded top which these possess. The materials used in making bottles are mostly of the coarsest kinds, the productions in this department being more for use than for ornament. At some establishments, the ingredients for the making of bottles are "fretted" (partially fused), before being introduced into the glass-pots, in "arches" built for this purpose; but the composition is nowise uniform, it being varied not only in different manufactories, but in the same glass-works at various times. The following mixture will produce a good green bottle-glass:—Sea-sand, 2½ cwt.; chalk or lime, 2 cwt.; soda-ash, 1 cwt.; and arsenic (arsenious acid), 2 lb. There is no necessity for allowing the metal to cool down, as in the foregoing branch, after it is brought to a state of vitrification,

but the operation of blowing it into the forms desired may at once be proceeded with.

The processes are different, in some particulars, to those of the flint-glass making, being simpler and more expeditiously performed—the productions, with but few exceptions, are obtained by blowing the vessels in metallic moulds. An iron tube is heated at one end, the operator immerses this end in the liquid glass, obtains the required quantity, rolls the mass upon a smooth stone, blows into the tube a little, inserts the metal within the mould (which opens in two), closes the bivalvous mould, and blows into the tube until the liquid glass assumes the particular shape given to it by the mould. It has now received its desired form, but is still in want of the ring which is to be seen round the necks of bottles. A piece of wet iron is applied to the neck, a blow is given to the bottom part of the bottle, and it is separated from the iron tube; then an iron rod, with a small portion of hot metal on one end, is attached to the bottom; the part severed from the tube is exposed to the fire; a ring of hot metal is formed round this part, and the bottle is in a finished condition. There are some descriptions of glass vessels made in this branch without the assistance of moulds being required, as carboys (large vitriol bottles), retorts, &c., the eye of the manipulator being the only indicator he employs.

#### WINDOW-GLASS.

We have no reason to be surprised that the ancient Egyptians, a people who understood the art of producing glass in its various multifariousities, should have been ignorant of the use of glass in the form of windows; because, being situated in the hot climate of Africa, they employed a vigorous style of architecture, in order to shelter themselves from the scorching influence of the sun's rays. Glass windows, in all probability, are not of so recent an invention as is usually supposed. In the excavations at Pompeii, which was overwhelmed by a tremendous eruption of Vesuvius, in A. D. 79, plate-glass of the finest description has been brought to light, which had every appearance of having served the purpose of window-glass. The younger Pliny, in describing his winter residence at Laurentinum, more than hints at the existence of glass windows. He writes: "On every side of this hall there are either folding-doors, or windows equally large, by which means you have a view from the front and the two sides, as it were, of three different seas. From the back you see the middle of the court, the portico, and area. . . . Through the folding-doors you see the opposite chamber, and from the window is a prospect of the inclosed portico. On that side next the sea, and opposite the central wall, stands a little elegant recess, which, by means of glass doors and a curtain, is laid open to the adjoining room, or separated from it." Glass windows are stated to have come into use in the sixth century, and were introduced into England in the twelfth century.

Crown-glass, so named on account of its circular form, is the most perfect, in point of surface and transparency, of all other descriptions of window-glass; but it cannot be blown so as to produce panes of such ample dimensions as are obtained from plate or sheet-glass. Crown-glass was first manufactured in England by workmen from Lorraine, France, in the year 1567; but, ten years later, glass windows were still so rare, that, according to the family records of the Duke of Northumberland, the glass windows of Alnwick Castle were removed whenever his family happened to be absent from home. Even in Italy, glass windows appear to have been scarce in the latter part of the seventeenth century; for, in a letter dated December, 1687, a traveller thus writes: "They (the Italians) are ignorant concerning glass windows, and their window-frames are merely furnished with canvas, or with paper, which is continually in tatters, so that some contrivance has to be invented every night, in order to shelter themselves." Crown-glass crucibles are made from the finest clay, thoroughly dried, and then placed within "arches" (large brick ovens) to be baked, previously to the



CROWN-GLASS MELTING-POT.

being "set" into the furnace. These "pots" will hold about one ton of glass material, and their form somewhat resembles a common tumbler-glass. The furnace is of a square shape, with an arched "crown," and having a grate below, a stone shelving on each side of this grate (the shelvings are termed "sieges" for the "pots" to stand upon. Six or eight "pots" are the number which are put into one furnace, and these will be serviceable for about ten or twelve weeks, when they are taken out and replaced by new ones.





THE GATHERER.

The mixture for producing a good crown-glass is composed of the following ingredients:—Sand, 10 cwt.; chalk or lime, 3 cwt. 1 quarter; soda-ash, 4 cwt.; charcoal, 25 lbs.; arsenious acid, 8 lbs.; and manganese, 3 lbs. These are all intimately mixed together in a state of fine powder, and then consigned to the "pots" for fusion. The furnace is driven to intense heat for about twenty to twenty-four hours, when the materials are fused or thoroughly "fluxed," and perfectly vitrified. The liquefied glass is then permitted to "settle" or cool down for the space of six hours; after which it is skimmed of all impurities that may be floating on the surface, and is now fit for the operation of the workman. The operator, technically called the "gatherer," takes an iron tube or "pipe," heated at one extremity, dips this heated end into the vitreous fluid, when he begins to turn the "pipe" gently round, pressing gradually out of the "pot," and thus obtaining his first quantity, called the "first time," which he allows to cool a little, and then returns it to the "pot," "gathers" another layer of metal over this, and obtains the required amount of glass; namely, from twelve to fourteen pounds.

In the next place, the vitreous mass is rolled upon the "marver" (as described in our last week's article), till it assumes almost the shape of a pear, and has a hardened point made at the end farthest from the pipe; it is then blown into a little, and sent onward to the "blower." Having heated this "piece," as it is called, the blower rolls the remote part over a "marver," cuts it where it unites with the pipe, and blows into it; he then reheats his metal, and enlarges it to the size of a large globe.

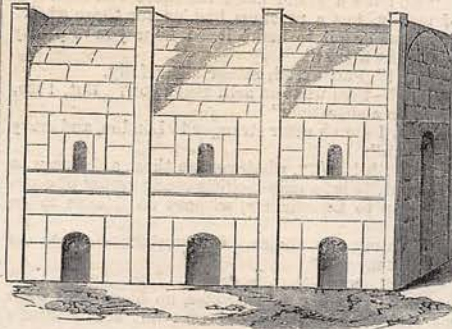
The blower now plunges the "piece" into a larger-sized furnace, blows it to the extent desired, immerses it for the last time within the furnace, and, as the glass becomes softened, he turns the pipe quickly round, at the same time drawing it from the

furnace, by which means the globular "piece" is made to flange out, and thus the hardened point, now called the "bullion," is drawn into closer contact with the part attached to the pipe, and is now taken to be dissevered from the tube. This is done by the application of cold wet iron to that part which was previously "cut down" by the blower, and then giving the pipe a blow with a wooden hammer. But we have mentioned that there was a "bullion" at the remote portion of the piece; to this bullion an iron rod or "punty," with a small bit of metal on its end, is attached, before the pipe is separated from the piece, and this separation leaves an aperture of about four inches diameter, which is applied to an extreme heat, and afterwards taken by the workman or "punty-sticker" to the "flashing-furnace," where it receives its final form. The "opener" inserts the whole piece within the furnace, and by dint of turning the "punty" rapidly round while the glass is in a melting condition, the piece flattens, the aperture expands gradually and beautifully out, and thus is produced a circular



TABLE OF CROWN-GLASS.

plane sheet of glass, called a "table," which is carried away, while in a spinning motion, by the "flasher." Having stiffened, the "table" is placed horizontally, "clipt" off the punty with a pair of "shears," and placed within the "kiln" to anneal. Six hundred of these "tables" are piled upon their edge inside the kiln, where they remain for about forty hours; after which they are withdrawn, divided in two halves, and finally cut into panes of various sizes by means of diamonds. It may be



THE MELTING FURNACE.

added, that a table of glass measures from fifty to fifty-four inches in diameter, and will produce a pane about thirty-four by twenty-two inches.

PLATE-GLASS.

Plate-glass must have been made nearly two thousand years ago, being first employed for mirrors and doors for the interior of mansions, and afterwards adapted to windows for coaches and commercial establishments. The first plate-glass manufactory in England was established at Lambeth, in the year 1673, and carried on by workmen which the Duke of Buckingham



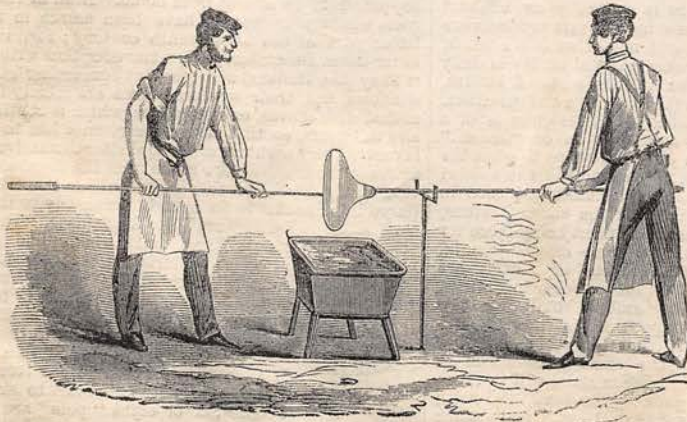
THE BLOWER.

brought over from Venice. The manufacture of plate-glass requires two furnaces: one for melting the glass mixture, and the other for the purpose of refining this vitreous mass previously to its being "cast."

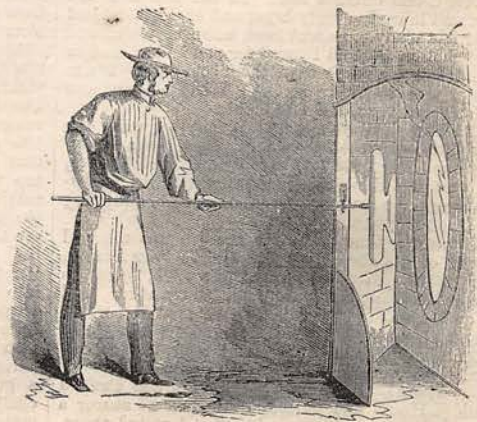
The melting-furnaces and pots are similar to those used in the crown department; but the refining furnace is different, being furnished with a fire-brick door to each crucible or "cistern," and the cisterns being smaller and dissimilar in shape for the purpose of being taken from the furnace when required. The manufacture of plate glass requires the greatest care and attention, and the materials from which it is made are the following:—Refined sand, 784 lbs.; chalk or lime, 112; carbonate of potash, 260; nitre, 20; and 600 of "cullet." These, being intimately mixed together, are first fused in the melting furnace, and then carried with wrought-iron ladles into the refining furnace: this removal of the metal is called "lading." The metal is now subjected to a high degree of temperature, to free it of all impurities, such as "blisters," or air-bubbles, which are caused by transferring it from the melting-pots to the cisterns, and is afterwards allowed to cool down to the proper consistency for "casting."

The glass metal is then tried, and, if found to be in a fit condition, a fire-brick door is opened, the cistern is encompassed with iron clasps, drawn from the furnace by a crane, and swung in a hanging position above a cast-iron "table." This sort of table was formerly made of bronze, but cast-iron is found to answer the purpose better. The casting-table is about 264 inches long, 170 broad, and 7 inches thick; being supported on a huge frame with iron wheels.

Two parallel iron bars, or "frams," are fixed on the surface of the table, which support the roller in its progress, and also serve the purpose of determining the thickness of the glass. The roller

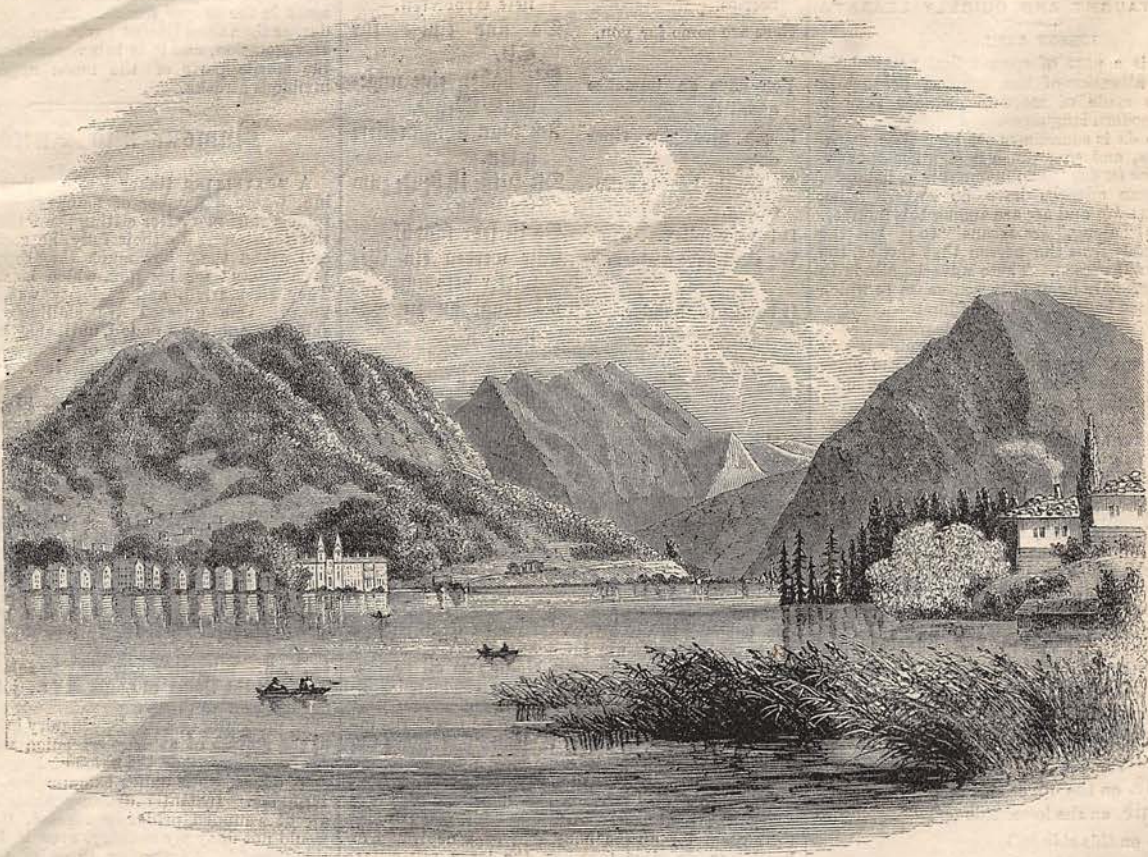


THE PUNTY-STICKER TAKING THE PIECE OF GLASS FROM THE BLOWER.



THE FLASHING FURNACE.





THE LAKE OF TEGERNSEE, BAVARIA.

is of cast-iron, extends the whole breadth of the table, and is made to run along by a chain which is fastened to each end, and wound round a windlass by two men. By a dextrous movement, the cistern is made to scatter its vitreous contents over the surface of the casting-table, and instantly the weighty roller moves along in a slow, majestic manner, and reaching the extremity of the table falls suddenly off, and is received within the arms of a machine, which is so nicely balanced, that it occasions not the slightest shock in its descent. When the plate has stiffened a little, it is slid into the annealing-kiln, the bottom of which is rendered perfectly uniform, and covered with sand, in order that the plate may slide easily along. When the bottom is covered with plates the "arch" is made closely up, to exclude the ingress of cold air, and to prevent the glass from cooling too rapidly. At the end of a fortnight, the plates being tempered and cooled, they are withdrawn from the kiln, deprived of their rough edges by a diamond, and "sorted" according to their size and quality; if being necessary, when "blisters" occur, to cut the plate to the best advantage, by dividing the inferior from the superior part with the least possible waste. In the next place, the surface of the glass has to be ground. A plate is cemented upon a large horizontal stone table with plaster of Paris, and a second is fixed and suspended in a reverse position over the other, sand being introduced between them, while the suspended plate receives a rotatory movement by means of machinery. When one side is sufficiently smoothed, the reverse surfaces are turned towards each other, and ground similarly to the others.

This renders the plates perfectly even, and they are next submitted to the process of smoothing, which is accomplished by means of emery powder, beginning with a coarser powder, and finishing with a powder of extreme fineness. Finally, the glass is polished on both sides by wooden blocks, covered with layers of woollen cloth, which are made to move with great velocity across the surface of the plate, while this latter receives a slow movement backwards and forwards alternately, and "rubble" (red oxide) is inserted between the covered blocks and the plate. Thus, by the brisk rubbing, assisted with the "rubble," a perfectly smooth and transparent plate

is obtained. Plate-glass—so named by reason of its being manufactured in a flat (*plat*, French) form—has the advantage over other descriptions of window-glass, on account of much larger dimensions being obtainable from it than can be produced by the process of blowing—plates being "cast" that attain the almost incredible size of 240 by 160 inches in superficial measurement.

(To be continued.)

#### THE LAKE OF TEGERNSEE, IN BAVARIA.

In this summer weather, everybody who can manage it takes a few weeks' or a few days' holiday, and revels in the enjoyment of green fields or the green sea. Last season the difficulties of continental travelling for English tourists were increased tenfold by the Italian campaign. That difficulty no longer exists, and with our passports properly viséd, and our purses sufficiently lined, we may travel whithersoever our fancy may incline—France, Italy, Switzerland, Germany, spread their rival claims, and allure us with their several charms. Still the tourist proper is well acquainted with all that can be presented to him in these lands of travel, and would give something for a novelty. But there are many places which remain to be visited—places which do possess the charm of novelty, to which most tourists are strangers; and one of these is the locality represented in our engraving—namely, Tegernsee, in the kingdom of Bavaria.

Bavaria was anciently a duchy, subsequently it became an electorate, and, last of all, was constituted a kingdom. It is divided into two distinct parts—namely, the "Territory of the Danube and the Maine," and the "Territory of the Rhine." Thus it is watered by the largest rivers of Germany, and to this fact, as well as to its salubrious climate, is attributable the fertility of the soil. Bavaria contains several noble lakes; a portion of the lake of Constance is situated within its territory, and, in addition to this, there are numerous others, most of which abound in fish, and are the seats of valuable fisheries.

Tegernsee is one of the prettiest lakes in Bavaria, lying between Munich and Innsbruck. The name

originally given to it was Die Grün See (the Green Lake), which has been corrupted into Te-Gern-See. Starting from Munich by coach at six o'clock in the morning, the visitor arrives at the lake about mid-day. About two hours and a half are taken up in traversing the full length of Tegernsee, but not more than half-an-hour in crossing it. It is surrounded by hills covered with trees, and is commanded on the south by the range of the Bavarian Alps. At its northern extremity is the small town of Gmund, with its paper-mills and Belle Vue Farm built on a height which commands a delightful prospect of the landscape. On the east is a small city or borough, bearing the name of the lake, and boasting what was, once upon a time, a regal castle, subsequently an abbey of Benedictines, and which now belongs to Prince Charles of Bavaria.

In 744 the Pope presented to the monks of Tegernsee the body of St. Quirin, martyred in the third century at the age of twenty-six; the body was placed on a car drawn by bullocks. According to the popular superstition, the oxen came voluntarily to the yoke, and followed their own inclination on the road—an idea which is probably derived from the account recorded in the book of Samuel of the milch kine bringing up the ark from the land of the Philistines. Following the legend, we learn that St. Quirin's bullocks rested in a prairie on the shores of the lake: the peasants, supposing that something extraordinary was to be found there, examined the ground very closely, and discovered a kind of oil which was traced to the adjacent rocks, and to which, for centuries afterwards, peculiar virtues were supposed to attach.

The Bavarian families which during the summer visit Tegernsee generally reside at the inns in the ancient town, and take their pleasure by making voyages up and down the lake, and by excursions to the neighbouring heights. The beauties of the locality are enhanced by the retirement from the noise and bustle of the world which it offers to the visitor; it is not thronged with tourists; all its Arcadian simplicity has not yet departed; Nature has not been "improved" by Art; and these are the best inducements that can be offered to the visitor who really values a few weeks' tranquillity, or who is a true admirer of the picturesque.



Harry scarcely knew why he felt so embarrassed by Lena's gaze; but he was in the house of God, and so he resolved not to let his thoughts wander to either Lena or Hector.

He had always been remarkable for the power of his will, and the strength of his resolution; and he determined not to glance again at Lena, and, having resolved, he was firm.

He escorted Fanny back to her own door. He never saw her again. It was his last visit. In the middle of the week he was to sail for Sydney. There was an immense deal to do at the counting-house, and Harry had little leisure to note anything; but even in the midst of the hurry and bustle he was aware of a something of almost imperceptible change in Mr. Linley's manner.

Cautions to beware what intimacies he formed, particularly with women, earnest advice to save his money, and general maxims on the great importance of strictly moral conduct, were mixed up with evidences of great confidence and intense affection.

The day came for Harry's departure by train to Liverpool. Lena had risen to make breakfast for him. For a few moments they were alone—and Lena, who was pale as death, seemed on the point of saying something to him, but her courage failed her. "She wants to ask me about Hector," he thought; "she saw me in church with poor Fanny. Her maid's sister has perhaps told all; but even if so, how can I help her? The past! if she is jealous of the past (and who that really loves is not jealous of the past?), present, and future, what comfort could I give her?"

While these thoughts passed through his distracted mind, Lena rose from the breakfast table, and walked to the window. Harry's eyes followed her as she sank on a chair, and, while her whole frame was convulsed, she burst into a passion of tears. Her face was turned from him, but she held out her hand to him as she said, "Oh, Harry! are you really going? Oh, I am so miserable! so desolate!"

Harry drew near, took her hand, as he said, "You desolate! you miserable! Oh, Lena! you whom I thought so happy!"

She looked at him with a confiding tenderness that took him off his guard—he was not much more than twenty, and had loved her half his life.

"Oh, Lena!" he cried, sinking on his knees before her, "do not let a groundless jealousy embitter that life whose happiness I would gladly die to promote. There is no cause now, there never was any cause, as far as Hector's heart was concerned. As for me I will not say I would die to serve you, I will say more—I will live to be of the slightest use to you! Believe this of me—it is all I ask."

Mr. and Miss Linley came in at this juncture, and, after many kind adieus, Harry set off in a cab with Mr. Linley for the Great Northern Station, Euston Square.

As they walked a few minutes on the platform, Mr. Linley said—

"If you've anything on your mind, Harry, write to me from Liverpool. I don't want to pry into your secrets. I suppose there is no such thing in reality as an old head on young shoulders; but, if you've got into any trouble, be sure you've no friend who'd be so glad to get you out of it as I should be. Tell me all; and if you've not done quite right by any one, remember it's never too late to mend, or, rather, to atone. Ah! my poor dear boy, how much you might have saved yourself in many ways by opening your heart betimes to your best friend!"

"Indeed, I do not at all comprehend," began Harry, when the engine began to pant, and puff, and blow. The monster's shrill screech was heard—the bell rang—the people crowded into the carriages—Mr. Linley wrung Harry's hand, with a fervent "God bless and keep you, my dear boy!" and Harry was soon far away. But as he sped along the shining rails, his thoughts reverted to Mr. Linley's remarks, and he tried again and again, and again and again, in vain, to fathom their meaning.

What so mystified Harry, is of course plain to the reader.

Not only had it come to Mr. Linley's knowledge that Harry had sold out the £600—the savings of a life—but the sister of Lena's maid Jessie, who knew him by sight, had reported to Jessie his regular visits to Fanny, her opposite neighbour; and Jessie of course conveyed the gossip to her mistress.

How terrible to Lena's heart and Harry's character were the inferences drawn by Lena, and by her aunt and uncle, who were soon apprised of all; and when the knowledge of his secret visits to Fanny were coupled with his selling out the £600, and his appearance with that unhappy girl at the

city church, Lena and her aunt and uncle could not but give him in their hearts a name which a lingering love prevented from passing their lips, and that name was one which he—brave, frank, generous, devoted fellow—least of all deserved; one which it would have broken his honest heart to think that Lena could couple with the memory of him, and that name was HYPOCRITE!

And yet, whenever that name rose from her heart to her lips, she tried to drive it from both, and the thought of the little handkerchief worn for so many years on that brave breast, and of the words of passionate devotion that had burst from Harry (against his will) at parting, came back to her tormented mind.

Lena was a girl of singular strength of character and originality of mind.

Gay, sprightly, fanciful, thoughtless, vain, and even frivolous, she might appear, at times, to a casual observer; but those who knew her well, and had observed her closely, were aware that for deep feeling and strong resolve, constancy, and determination, Lena had few equals among her sex.

Foam may gather, bubbles may glitter, and straws and flowers float on the surface of the ocean, as it smiles in the sun, but it is none the less a fathomless deep, in whose caves are hoarded priceless gems and treasures untold.

And so it was with Lena; and Harry knew that it was so. How could he help knowing it? Had she not been for nearly ten years the hidden Ida of his breast, the secret idol of his heart, and the study of his life?

But, being what she was, what chance would the showy Hector have but for that one mystery—the selling out of the savings of his life, and the intimacy with Fanny Franks?

(To be continued.)

## The German Language

CLEARLY TAUGHT AND QUICKLY LEARNT.

### LESSON XXIV.

SOME German adverbs have more than one signification. *Sonst* means "formerly," "otherwise," or "else," according to the sense in which it is used.

*Erst* may mean "first," or "not before," or "no more than," or "only." If "only" is used in the signification of "no more than," you must render it in German by *nur* and *bloss*.

*Schon* means "already," and "not later than." *Schon* is also used with a numerical adjective, to give it additional weight: *Er hat schon ein ganzes Brod gegessen*, "He has eaten one whole loaf."

*Noch* signifies "yet" and "still;" it is also used for the expression, "neither before nor later."

Observe that the preposition followed by the definite article contracted forms but one word. Ex.: *Am* for *an dem*; *Beim* for *bei dem*; *Im* for *in dem*; *Dem* for *von dem*; *Zum* for *zu dem*; *Zur* for *zu der*, &c.

The following prepositions require the dative case after them:—

#### PREPOSITIONS THAT GOVERN THE DATIVE.

<i>Aus</i> , out of, from	<i>gemäß</i> , conformable
<i>außer</i> , besides	<i>gegenüber</i> , over against
<i>bei</i> , on, near, with, at,	<i>mit</i> , with
up by	<i>nach</i> , after, to, accord-
<i> binnen</i> , within	ing to
<i>entgegen</i> , towards, a-	<i>nächst</i> , next
gainst	<i>zu</i> , to
<i>nebst</i> , together with	<i>zufolge</i> , in obedience
<i>seit</i> , since	<i>zuwider</i> , against
<i>von</i> , of, off, from, by	

#### PREPOSITIONS THAT GOVERN THE ACCUSATIVE.

<i>Durch</i> , through, by	<i>ohne</i> , without
<i>für</i> , for	<i>um</i> , about, round, at
<i>gegen</i> , towards, to,	<i>wider</i> , against
against	

#### PREPOSITIONS THAT GOVERN THE DATIVE OR ACCUSATIVE.

<i>An</i> , on, to, by	<i>über</i> , over, above, at,
<i>auf</i> , on, upon	concerning
<i>hinter</i> , behind	<i>unter</i> , under, amongst,
	amid, during
<i>in</i> , in, into	<i>vor</i> , before, ago
<i>neben</i> , at the side of	<i>zwischen</i> , between

#### FAMILIAR DIALOGUE.

Does this road lead to Vienna?	Führt dieser Weg nach Wien?
Go straight on.	Gehen Sie gerade aus.
Turn to the right.	Wenden Sie sich links.
How far is it?	Wie weit ist es von hier?
It is a league.	Es ist eine Stunde.
It is three English miles.	Es ist drei Meilen.
It will take you three-quarters of an hour to get there.	Sie brauchen drei Viertelstunden, um hinzugehen.
It's going to rain.	Es wird regnen.
I have no umbrella.	Ich habe keinen Regenschirm.
Let us go into this inn.	Lassen Sie uns in jenes Gasthaus gehen.
What o'clock is it?	Wie viel Uhr ist es?
I think it is three o'clock.	Ich glaube, es ist drei Uhr.
Are you thirsty?	Haben Sie Durst?
I am very thirsty.	Ich habe großen Durst.
Take something to drink.	Trinken Sie Etwas.
Drink a glass of water.	Trinken Sie ein Glas Wasser.
I should prefer a cup of coffee.	Ich würde eine Tasse Kaffee vorziehen.

#### GLASS, AND GLASS-MAKING.

(Concluded from page 13.)

At the Thames Plate Glass Company's Works at Blackwall, about 12,000 feet of plate-glass are manufactured weekly, with a consumption of 200 tons of coal. The glass manufactured by this company is celebrated for its fine quality.

In addition to the different kinds of glass already described, there is the "Patent Rough Plate" made of similar materials to the ordinary plate glass, with the difference, that no refining furnace is necessary, and the metal is produced in smaller sizes.

#### SHEET-GLASS.

Sheet-glass—thus termed because it is opened out or unrolled like a scroll or sheet of parchment, from its cylindrical form given to it by the "blower"—is made from the same materials, melted in similar crucibles and furnace, but the process of blowing, &c., is differently performed to crown-glass. Sheet-glass was introduced into England about twenty-seven years since by Messrs. Chance, of Birmingham. Previously, this method of making sheet-glass was carried on by the French and Belgians, by whom it was first manufactured in this country, and is now extensively produced by English workmen. The materials having become thoroughly fused and vitrified, the glassy fluid is allowed to cool down to the proper consistency, and is then "skimmed;" the "gatherer" then takes his iron "pipe," and, by gradually inserting it in the metal and withdrawing it, obtains a portion amounting to twelve or fourteen pounds, if the sheet is intended for the ordinary size. The blower then rolls the mass on a hollow wooden block, applies his mouth to the end of the tube, and blows until the glass assumes a hollow ovoid form, as represented in the margin.



This is taken to the furnace and heated quite soft, when the blower adroitly draws it from the fire, swings it to and fro, and blows into the glass while thus swinging it. Not having sufficient heat in the glass to be able to blow it the size required, the blower re-heats it, whirls it round his head, or rather in a vertical circle, sixteen feet in diameter, and elongates the ovoid into a cylinder, with a neck or narrow part next the pipe, and with a round end at the remote part. This round end is exposed to the heat, and the workman fills the cylinder with air. At length, being softened by the fire, the pressure of the air causes the remote end of the



hollow mass to give way, and we have before us a cylinder of glass, attached to the tube at one end. The cylinder is now dis severed from the pipe by the



application of cold iron to the neck or small part united to the tube. A string of hot metal is passed round this end of the cylinder; the glass suddenly expands at this part, and by giving the neck a gentle blow it falls off, leaving the cylinder of an equal diameter throughout its entire length, with a hole at each end. The cylinder is next taken to the "splitter," who runs a diamond length-

wise along the interior of the cylinder, which suddenly divides at this part, and is next submitted to the "flattening-kiln." The heat gradually opens the fissure; the "flattener" presses and rubs the evolving cylinder with a piece of wood ("polissoir"), until it is perfectly smooth and flat, and, when properly annealed, a flat sheet of glass is presented, which can be cut to any smaller size. Sheet-glass may be blown almost to any thickness, so as to imitate plate-glass, and, producing larger squares than crown-glass, possesses considerable advantage over it. In fact, if it were not for that wavy appearance which is seen, and cannot be avoided in sheet-glass, the probability is, that the manufacture of crown-glass would cease to exist.

The space at our disposal does not enable us to describe the various processes of enamelling, engraving on glass, the fabrication of mosaics, &c. &c. We therefore pass on to

ARTIFICIAL GEMS.

The art of making artificial gems was well known to the ancient Egyptians, who imitated precious stones most successfully in glass. For a time this art was lost sight of, but was again restored, near the close of the fifteenth century, by a Milanese painter. A vitreous compound for producing artificial gems from glass is thus prepared:—Powdered flint, one part; salt of tartar, three parts; these are mixed, baked, and left to cool; when the mixture is left to cool awhile, it is poured into a basin of hot water, and treated with dilute nitric acid so long as it continues to effervesce; then it is washed till the water comes off tasteless. It is next dried, two parts of fine white lead are added, and the mixture is levigated and diluted with a little distilled water. Calcined borax, to the amount of one-eighth the quantity of flint, is added to the preceding mixture in a dry state, the whole being rubbed together in a porcelain mortar, melted in a clean crucible, and poured out into cold water. This vitreous compound is next dried, and fused a second and a third time, a new crucible being required each time, and after each melting poured into cold water, as at first, care being taken to separate the lead that may be revived. After being melted the third time, and reduced to a fine powder, five-sixteenths of the weight of borax are added of nitre, and the mixture is fused for the last time, by which means a mass of crystal is obtained which possesses a most lustrous brilliancy. By adding the different metallic oxides, a base produced as above can be made to assume the peculiar colour of any precious gem. Thus, the ruby, the oriental ruby, the amethyst, the garnet, the topaz, the opal, the emerald, the sapphire, the yellow diamond, or the colourless diamond, can be so closely imitated, that none scarcely but lapidaries or mineralogists are able to detect the deception.

But, in general, the artificial products are of a softer nature, more easily scratched, and of less specific gravity than the natural gems, while their power of refracting light is also of a different character—a test which may be readily applied without unsettling these gems.

It must be observed, in the fore-mentioned preparations, that the fabricator merely produces an amorphous mass, which has to be subjected to the wheel of the lapidary before it will assume the ultimate polish and the several facets which are peculiar to the natural crystals. Attempts have been made to produce regularly-crystallised gems from aqueous solutions; and, in many cases, these efforts have proved successful.

To produce cameo incrustations, the figure intended for that purpose must be made of materials that will require a higher degree of heat for their fusion than the glass within which it is to be encrusted; a mixture of China clay with silicate of potash is found to have this quality. The bust, or bas-relief, is made of this material, in a plaster mould, and, after being baked slightly, is gradually cooled. A portion of transparent glass is blown hollow, with one end open, and the clay cameo, heated to redness, is placed within it. The mass is pressed, or welded, to make the two substances adhere; and, the remote end being closed, the glass-blower draws out the air from within, thus causing the glass to collapse, and to form one.

SOLUBLE GLASS.

All glass is, chemically speaking, a silicate of some alkaline or metallic oxide; and, according to the nature of the oxide, so does the quality of the glass differ. There is a certain kind of glass which may be dissolved in water; and this is done by combining potash or soda with silica or sand, without any third ingredient being added, producing a glass which presents all the appearances of the usually formed vitreous substances. It is called *soluble glass*, and is thus prepared:—Mix intimately 100 grains of fine sand with 300 of fine carbonate of potassa; fuse this mixture in a crucible which is capable of containing four times the quantity. Carbonic acid is given out, the silica and potassa combine, and a vitreous liquid is produced—it is glass. The glass commonly called silicated potassa is poured on an iron plate, and dissolved in water, the large quantity of alkali rendering it soluble in this fluid. The compound formed in this manner constitutes pure *silica soap*, having all the detergent properties of common soap; it is, however, more active, and leaves a harsh feeling in the hand. Soluble glass is employed as a kind of paint for paper, cloth, wood, &c., to prevent or retard their inflammation on the contact of an ignited body.

GLASS TISSUE.

The products which are obtained from the use of the blowpipe are various and beautiful. By applying glass rods to the flame of the lamp, and skilfully handling the softened glass, numerous beautiful articles are produced—as birds, beads, artificial eyes, mosaics, &c. There is one novelty, the very name of which is so beautiful that one feels as if it ought to find especial favour with the public generally—that is, *glass tissue*, whose bare designation points to something delicate, graceful, glossy, and rich. The rigid characteristics of glass in its most familiar forms must be excluded from the mind whilst we think of the tender filaments which are produced by means of the blow-pipe and the spirit-lamp. The softened, ductile glass is attached at one end to a spinning-wheel, and exposed to the action of the flame at the other, when it yields to the double influence, and spins out into a perfectly fine, uniform, crystal thread. Thousands of these threads being grouped side by side, nothing can surpass the lustrous beauty presented to view; and this display has suggested the use of such fibres in woven goods. The glass threads are combined with silk ones, and woven into a delicate tissue, which may have the characteristics of satin, velvet, or brocade, according to the manner in which the weaving is proceeded with.

PHENOMENA OF GLASS.

That glass resists the action of most acids science has proved; its weight is not diminished by use or age. It is more capable than other substances of receiving the highest degree of polish; if melted several times over, and properly cooled down in the furnace, presenting a polish which almost rivals the diamond in brilliancy.

If it be made into a phial, with the bottom much thicker than the sides, and suddenly cooled in the open air, instead of being tempered in the usual manner, the result on its susceptibility to fracture is most extraordinary. It will bear a heavy blow, or severe pressure, from any blunt instrument, uninjured; but if any hard and angular substance—even so small as a grain of flint, or sharp sand—be dropped into the phial, the bottom will crack all round, and fall off. A small fragment of diamond has been seen to pass through the thick bottom with apparently as little resistance as if it dropped through the web of a spider. Instances have occurred in which one of these phials has been struck by a mallet, with a force sufficient to drive a nail into some descriptions of wood, without causing fracture; while a small fragment of flint, dropped gently into the phial, has cracked the glass to pieces. A piece of white-hot metal being dropped into cold water, and taking the form of a rounded lump elongated by a tail, is termed a *cracker*.

The round part will bear a heavy blow without fracture; but if the least particle of the tail be broken off, the whole flies into innumerable fragments, as fine as powder.

If this glass-drop be placed in a wine-bottle filled with water, and a small portion of the tail broken off, by the aid of a long pair of nippers, the concussion by the explosion (for it is almost similar to an explosion) is so violent as to break the bottle and scatter the water in every direction. All these curious results are owing to a peculiar inequality of the glass, which arises from the sudden cooling to which it is subjected.

CAPTAIN BRAND;

Or, The Pirate Schooner.

A TALE OF THE SEA.

CHAPTER VIII.

CAPTAIN BRAND AT HOME.

UPON a broad, flat rocky ledge, near a small land-locked narrow inlet, of one of the clustering Twelve League Keys on the south side of Cuba, stood a red-tiled stone building, with a spacious verandah in front, covered by plaited matting, and canvas curtains triced up all round. The back and one side of the building rested against a craggy eminence which overlooked the sea on both sides of the island, and commanded a wide sweep of reef and blue water beyond. A few clumps of cocoa-nut trees and dwarf palms, with bare, gaunt stems and tufted tops, stood out here and there along the rocky slopes, while lesser vegetation of cactus and mangrove bushes were scattered thickly over the island, cropping out with jagged edges of rock, down to the sandy beaches of the sea-shore. A deep narrow inlet of blue water lay pure and still near the base of the rocky height, where, too, was a shelving curve of white sand, sprinkled about by a few mat sheds, and on the other side the rocks arose to the elevation of a hundred and fifty feet, and acted as a precipitous wall to the water. The inlet here took a sharp turn, scooped out in a secluded basin, and then narrowing to less than forty yards in width, it wound and twisted for a good mile in a thin blue channel to the open sea. Half that distance further out was a roaring ledge of white breakers, where the long swell came hammering on it, bursting up in the air in brightish green masses, and then tumbling over the reef and bubbling smoothly on toward the shore. On a level with the water no channel could be discerned through the ledge; but looking down from the heights around the inlet a narrow blue gate-way was marked out, skirted on the surface by frothy crests of dead foam, and near where flocks of cormorants and gulls were riding placidly on the inner side of the ledge. The island itself was about two miles broad and seven long; and about midway of its width the inlet formed a forked strait, one branch finding its way to the north, between a low succession of sandy hammocks where the water was too shallow to float a duck, and the other finding an outlet, scarcely a biscuit-toss wide, between two bluff rocks. With the trade wind this passage was safe and accessible; but on the change of the moon, with a breeze and swell from the south, the sea came bowling in, in boiling eddies and whirlpools, and it required a nerve of iron to attempt an entrance. Just within this narrow mouth, on a flat beveled edge of rock but a few feet above the water, was a small battery of two long eighteen-pounders and two twenty-four carronades mounted on slides and trucks, with platforms laid on a bed of sand. Near by, beneath a low shed of tiles and loose stones, was a pile of round shot, nicely blacked, and some stands of grape and canister in canvas bags and cases, together with a large copper magazine of cartridges. Seated a little way off, on a low stool, was a dingy Spaniard with a telescope laid across his knees, which every little while he would raise to his eye, and take a steady glance around the horizon to seaward. To return, however, to the building. The verandah rested on square rough masonry, full twenty feet from the ground, which was loopholed for musketry, and with but one narrow slip of a door-way that fell like a portcullis, banded and strapped with bars and studs of wrought iron. Within this stone inclosure was a large and roomy vault, half-filled with cases, barrels, and packages, and at the upper angle was a narrow subterranean vaulted passage, barred also by an iron-bound door which led to a succession of whitewashed chambers, dark, damp, and gloomy, and then on, in a fissure-like pathway, to another equally strongly secured outlet on the other side of the crag. Leading to the verandah was a tautly-stretched rope-ladder lashed to eye-bolts let into the natural rock below, and hooked on to the edge of the floor above. This was the only approach to the main floor of the building from the outside, though within were heavy trap-doors like the hatches of a ship, which communicated to the chambers beneath. The whole structure was of stone and tiles, roughly built, but yet strong and durable, and capable of resisting any assault, unaided by cannon, that could be brought against it. The floor was divided into four rooms, the smallest used for a kitchen, the next for a magazine of small-arms, and the third a spacious bedchamber, which opened into s