

detonating fog signal, which, by a slight explosion, announces the approach of a train; and a fog signal, the peculiarity of which consists in the fact of red or green lights being produced by triggers being struck by a stop placed at the side of the tramroad.

But it is not our purpose in this article to enumerate the various plans which have been suggested and occasionally adopted for the improvement of our railway signals. The grand object is to procure some one system, easily worked and readily understood, and, by mutual consent of the railway companies, to carry out the same system on every line in the United Kingdom. The adoption of some universal plan is absolutely essential, as the changes which naturally take place in the removal of engine-drivers and signal-men from one line to another are calculated to produce very serious consequences to the public. A man accustomed to one system of signals is suddenly compelled to adopt an entirely different system, and the security of the train depends on the proficiency which he attains in his new lesson. This ought not to be the case; no argument can be urged for its continuance, as a little careful attention to the subject, and a good understanding between railway companies, would render such risks impossible, and make railway travelling—so far, at least, as signals are concerned—as safe as it is economical and convenient.

PIANOFORTES.

AMONG all the varieties of musical instruments, there is not one so universally employed as the pianoforte. To perform on this instrument is an ordinary part of a young lady's education, and in an age such as ours, when music has been popularised amongst all classes, a want of this accomplishment is severely felt.

It is not our purpose, in this place, to furnish instructions for the pianoforte;\* but it may be interesting to many of our readers, both musical and mechanical, to introduce some brief account of the construction of the instrument, illustrating our article by appropriate engravings.

In the first place, we notice that the old-fashioned clavichord and still older spinet furnished the original idea of the pianoforte. About a hundred years ago, Viator, a German mechanic, invented the instrument, but he was too poor to perfect his idea, and left it for others, with less ingenuity, but more money, to carry it out. Zumpe, Tabel, Schudi, Bech, Stodart, and a host of others, turned their attention to the new instrument; clavichords and harpsichords went the way of all things, and the pianoforte became at once the rage. A German, Backer by name, came over to this country and made pianos, but did not make his fortune. His contemporary, Zumpe, was more successful, and retired to enjoy his wealth; but whether we owe to Zumpe or to Backer our first knowledge of the pianoforte, is a little doubtful. However this may be, the reputation of the instrument has been now fairly established for many years, and, in the hands of our distinguished makers, has undergone very considerable improvements.

The pianoforte is of various descriptions—*grand*, *square*, *upright*, &c. It is sufficient for our purpose to describe one of these—namely, the grand piano, the invention of Schröder, a harpsichord maker of Padua. The case of the instrument is made of oak, Spanish mahogany, rose-wood, &c., all more or less ornamented. The case is well braced, sometimes with iron, sometimes with wood; but

\* For instructions on this subject, see *Ladies' Treasury*, published monthly, price 6d.

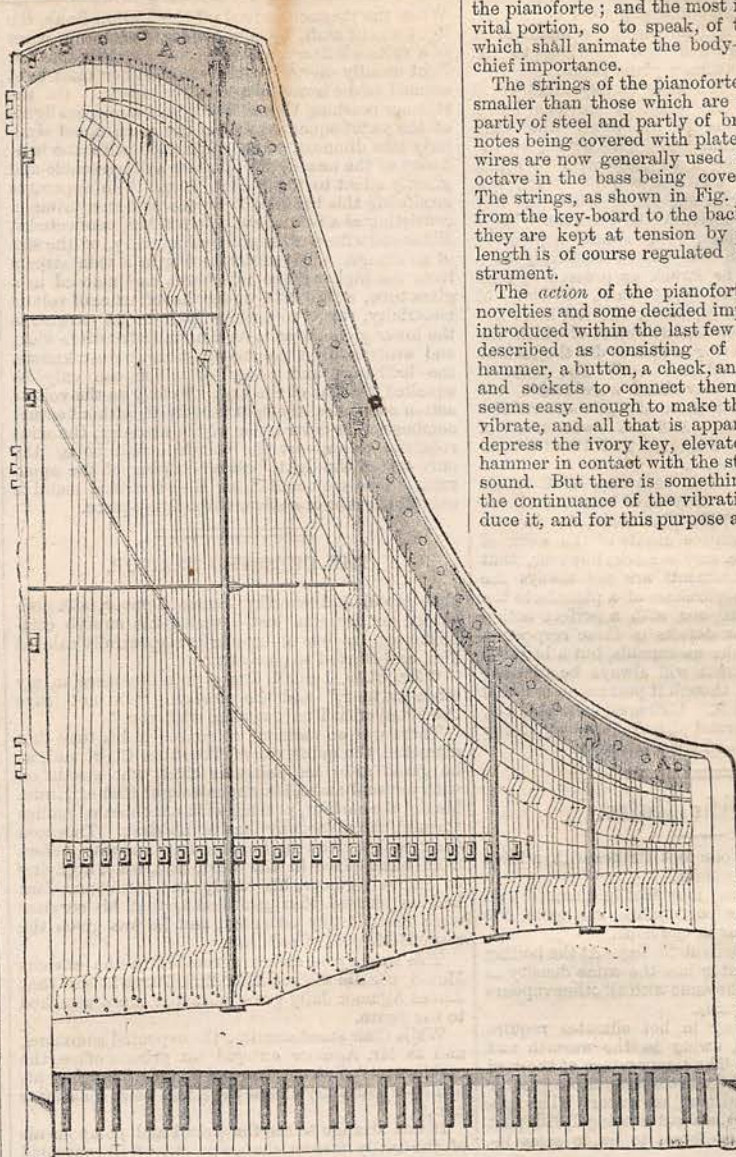


FIG. 1.—THE GRAND PIANOFORTE.

though iron is stronger, wood is more sonorous, and makers are divided as to the respective merits of these materials. The case, however, is the mere body—the mere outward form of

the pianoforte; and the most important parts—the vital portion, so to speak, of the piano—the spirit which shall animate the body—is, in reality, of the chief importance.

The strings of the pianoforte were formerly much smaller than those which are now in use, and were partly of steel and partly of brass, some of the bass notes being covered with plated copper wire. Steel wires are now generally used throughout, about an octave in the bass being covered with copper wire. The strings, as shown in Fig. 1, extend horizontally from the key-board to the back of the instrument; they are kept at tension by small pegs, and their length is of course regulated by the size of the instrument.

The action of the pianoforte—into which several novelties and some decided improvements have been introduced within the last few years—may be simply described as consisting of “a key, a lever, a hammer, a button, a check, and a damper, with rails and sockets to connect them.” At first sight, it seems easy enough to make the strings of the piano vibrate, and all that is apparently necessary is to depress the ivory key, elevate the lever, bring the hammer in contact with the string, and produce the sound. But there is something required to prevent the continuance of the vibration as well as to produce it, and for this purpose a button and check are required, and here most of those delicate variations originate, which distinguish the pianofortes of different makers.

The annexed illustration (Fig. 2) gives a representation of the key-board, and its connection with the hammers in the action of the pianoforte. As the progress of musical science and mechanical art has advanced, new powers have been called for, and new effects given to the action of the instrument. The compass is now considerably increased, and the general manufacture much improved. Grand pianofortes have generally six-and-a-half octaves—sometimes seven—which are quite sufficient for all ordi-

nary purposes of musical composition. Stops are not much employed now in pianofortes. Formerly the damper stop, which, by raising the dampers from the strings, gave continuation to the

tone, and the buff stop, which, by raising a piece of soft leather to the strings, gave it a harp-like sound, were much admired, but are now scarcely ever used. Opinion is also divided on the question of pedals, some performers regarding them as injurious to the mechanism of the instrument, others holding them in high esteem. Most objection is urged against the piano pedal, and in its

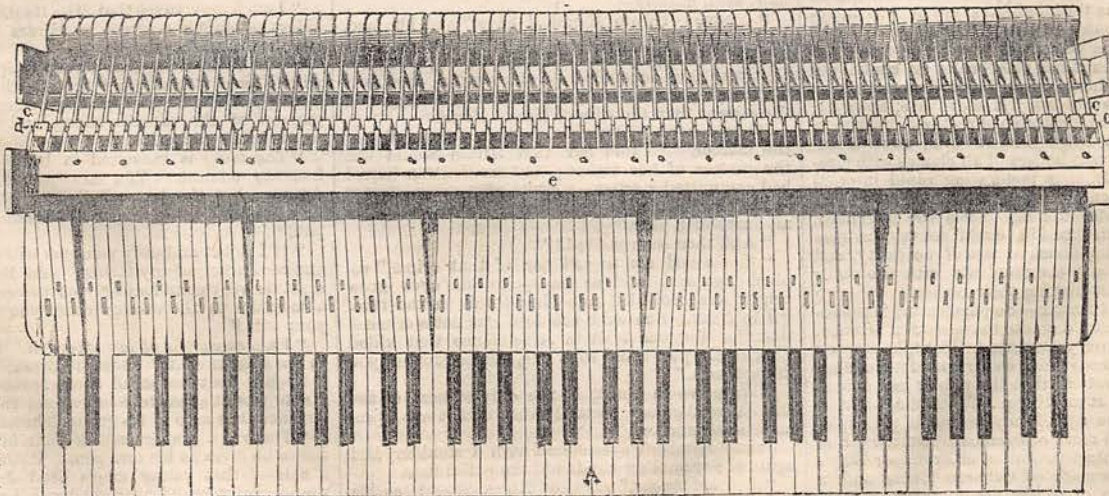


FIG. 2.—THE “OCTAVE” OF A GRAND PIANOFORTE.

place some makers introduce soft wool or leather, between the hammer and the strings, which is more agreeable to the ear, and less injurious to the instrument than the ordinary piano-pedal.

The advantages of the most simply-constructed pianoforte over the old-fashioned clavichord and harpsichord are obvious to all those who have examined those instruments. The action of the harpsichord was merely a key, attached to which by a piece of wood was a crowquill, which was brought in contact with the string when the key was in action. The "action of the clavichord," says a writer on this subject, "was simply a piece of brass pin wire, which was placed vertically at a point where it could be struck or pressed against its proper string, the right-hand division of which was free to vibrate, whilst the left-hand was muffled by a piece of cloth, the object of which was to damp or stop the string, which it did the instant the finger was taken off the key." The tones of both harpsichord and clavichord were feeble and wiry in comparison with those of our most ruddely-constructed pianofortes. And yet it was on one of the former of these instruments that Handel composed his sublime oratorios.

It is unnecessary to enter into any detail on the gradual improvements which have been introduced into the mechanism of the pianoforte, nor to pass any opinion on the relative merits of the work of different makers. We may remark, however, that the best-looking instruments are not always the best, and that in the purchase of a pianoforte the chief thing is to secure one with a perfect action and effective tone; for defects in these respects a showy exterior will make no amends, but a brilliant and well-toned instrument will always be admired by all sensible people, though it possess no outward attraction to commend it. Cottages, cabinets, &c., are now much in use, grand pianofortes being chiefly confined to orchestras and concert rooms.

### Scientific Notes.

A BODY falling only one foot strikes with a force eight times that of its weight.

ONE pair of millstones, four feet in diameter and making 120 revolutions per minute, can grind five bushels of wheat to flour in one hour.

In a vacuum, water boils at 88 deg. At the boiling point the vapour of water has the same density as the atmosphere; it is the same with all other vapours produced by boiling liquids.

STEAM vessels running in hot climates require very large condensers, owing to the warmth and saltiness of the water. The temperature of the Red Sea is about 90 deg., whilst it contains also a greater quantity of salt than ordinary sea water. The specific gravity of ordinary sea water being 1.026, that of the Red Sea has been found to be, in some instances, 1.080.

A BODY projected into the air, like a bullet from a gun, occupies the same time in its ascent as in its descent to the level from which it started. The greatest range which can be obtained from a gun is had when the piece is inclined at an angle of 45 deg.

ELECTRIC COMMUNICATIONS. — As a considerable time elapsed after the first application of coal-gas to lighting the public thoroughfares, ere it was introduced into our houses to cheer the domestic circle, so will the electric telegraph have fully developed its value only when it has been made to contribute to our comfort at home, as well as to commercial or national purposes abroad. A move has, however, been made in that desirable direction. A firm in the Rue Neuve St. Augustine, at Paris, now undertakes to fit up private houses of all classes with electric wires and bells, thus facilitating rapid internal communication; and, if required, to connect them with distant points outside. Thus the merchant, without leaving his fireside, could convey instructions to his counting-house in case of necessity, and others could similarly communicate with the outer world without relinquishing their repose.

WAY'S ELECTRIC LIGHT. — So persevering is the research of the present day into the secrets of science, that each new discovery, however brilliant, is eclipsed by that which succeeds; such continuous demands are made on its admiration, that the public has almost ceased to wonder at anything. The Lime Light is superseded by one equally mysterious in principle, more brilliant, and more economical. On the 6th of August an interesting exhibition of Professor Way's Electric Light was made off Osborne House and in Cowes Roads, Isle of Wight, preliminary to certain experiments about to be instituted by Government.

When the steamer arrived off the Mother Bank, the light was lit aloft, by connecting it with the wires of a voltaic battery, and so powerful was it that the light usually carried by the vessel at her mast-head seemed to die away to a dim red spark. On the steamer reaching Cowes Roads, the numerous lights of the yacht squadron and of the town faded similarly into dimness, when contrasted with the brilliancy of the new light. It gave a disagreeable and ghastly effect to the human face. The apparatus producing this brilliant light was extremely simple, consisting of a pair of oval glass tubes, connected at either end with a glass globe of mercury, of the size of an orange. The metal flowing in a thin stream from the higher globe falls into a cup inclosed in a glass tube, where it is, under the influence of voltaic electricity, raised to a white heat in its passage to the lower globe, so as to form an indestructible wick, and evolve a light the strongest and purest known, the brilliancy and power of which can only be equalled by that of the sun. So long as the voltaic action continues, the light is evolved, without actual combustion or destruction of the mercury, the acids requisite to support the voltaic action being the only cost of the light, beside the wear of the apparatus. The cup containing the electrified metal is only of the size of a silver threepenny-piece.

### THE DETECTED TRAITOR.

THE proud and wealthy James Agmoor, silk-and-velvet mercer, was just entering his superb establishment, as one of his clerks respectfully saluted him, and started to pass out.

"Mr. Clair, I shall desire your presence in my office ere long," said the mercer. "Do not leave the house until I have spoken with you."

There was an ominous sternness in his tone that attracted the quick ear of Thornton Clair, and, as he gazed after his pompous chief, who strode on with unusual haste, his glance caught that of Hiram Mould, the cashier, peering with unconcealed malice through the mahogany bars of his desk. Thornton Clair had arrived in London four months before from some place in the west, and, upon applying to James Agmoor, his manly and intelligent face had so pleased that gentleman, that his services were immediately accepted, and he was given the responsible post of collector.

This was by no means agreeable to the envious Mould, nor did his vexation diminish as he saw that James Agmoor daily grew more and more attached to the youth.

While Clair stood awaiting the expected summons, and as Mr. Agmoor entered his private office, the cashier moved from his seat, and following his principal, carefully closed the green baize door after him.

It was strange to see the proud and pompous air of the lordly mercer change to one of ill-concealed fear and disgust as the cashier bade him good-day and seated himself near him, facing him, and having the office-table between them.

"You have considered my propositions, James Agmoor," said he, in a smooth soft voice, sleek and silky as the skin that gilds a venomous serpent.

James Agmoor buried his face in his hands for a moment, and then sweeping back his snow-white hair, said, huskily—

"I have! Hiram Mould, I have," and his face, pale and red by turns, again sought the covert of his trembling hands. "I have told my daughter that you have demanded her for a wife. She told me to tell you that she would rather be a beggar in the streets than the wife of Hiram Mould."

"I told her all," burst from the quivering lips of the mercer. "I told her that Hiram Mould was the master of her father; that ere she was born I had committed a crime—a crime whose ever-present guilt has blanched my hair before I have numbered my forty-fifth year."

"And then she relented?"

"She asked me to tell her of that crime," replied Agmoor; and as he spoke his eyes grew bright, and looked Hiram Mould full in the face. "I told her. She said the deed was not a crime—that the blow was dealt in self-defence that killed Charles Harper. And so it was, Hiram Mould; you know it was."

"Were we in court, I, the only witness of the act, James Agmoor, I would swear that it was—premeditated murder!"

James Agmoor's eyes closed with a shudder, and again the trembling hands hid the pallid face.

"I would swear," resumed Hiram Mould, as his sharp, white teeth bristled from his sneering lips, "and the jury would believe every word, that one

summer's evening, some twenty years ago, I saw James Agmoor, who had refused to fight in fair and open combat with Charles Harper, crouching amid the bushes that bordered the highway through the woods; and as Charles Harper was riding unsuspectingly by, I saw James Agmoor spring from his covert and strike him to the earth with a club; I would swear that James Agmoor then and there murdered Charles Harper, and buried the body where I could find its bones—aye, and the watch that should identify the body."

"All false!" cried the mercer, arousing himself for a moment. "Twas James Agmoor who was dragged from his horse by Charles Harper; 'twas Hiram Mould who prompted the assault for purposes of his own—because he hated each with a deadly hate. You, Hiram Mould, first made us, who were till then bosom friends, bitter enemies. He struck me; he returned the blow; he drew his knife and stabbed me; but before I fell senseless, I wrested the weapon from him and dealt him a fatal thrust that prostrated him also. We fell together, alike unconscious, I in a swoon—he dead! When sense and feeling returned to me, I was in your house. You, Hiram Mould, hid the body where you can find its remains to convict me. The public believed that Charles Harper was murdered. You created that belief; but to use me all my life, you took successful care that the finger of suspicion should not point at me, lest the law might kill the goose that lays the golden egg!"

While the tortured man was saying all this, far more incoherently than we have written it, the unmoved conspirator had rapidly sketched a picture of a gibbeted felon, and, as the mercer concluded, Hiram Mould placed the significant sketch before him.

"Such shall be your fate, if Rachel Agmoor refuses to become my wife," said he, pointing at the hideous picture, with his long, lean forefinger.

Again the merchant yielded before this terrible threat, and his head sank upon his bosom.

"Now call in Thornton Clair, and dismiss him at once," said Hiram, sternly. "He loves your daughter—she perhaps loves him. You have foolishly allowed him to visit at your house. It shall be my care that Thornton Clair shall not find another employer in this city."

"I am in your power," groaned the unhappy man, rising and opening the door; but as he did so his daughter Rachel stepped quickly from the side of Thornton Clair, with whom she was eagerly conversing, and said—

"I wish to see Hiram Mould, immediately, dear father," and gliding by her astonished parent, she entered the private office.

The merchant closed the door and turned to address his child.

Tall and queenly in person, a lovely brunette of eighteen summers, with large black eyes usually full of softness, as became her amiable and affectionate nature, but then flashing scornful fires as her red lips curled with seething contempt, Rachel Agmoor motioned to her father to pause for a moment, and bent her gaze upon Hiram Mould.

He seemed ill at ease as those superb eyes slowly scanned him from head to foot, bathing him, as it were, in ineffable scorn. He rose to his feet, and recovering his natural coolness, said—

"I am happy to see that Miss Rachel Agmoor considers so humble a person as Hiram Mould worthy of so continued a gaze."

"This is the thing that dares to hope to call me—wife!" said Rachel, and though the words were cutting, the tone and manner penetrated to the marrow of the rascal's bones, and flashed bitter words to his white lips.

"The thing is honoured in being so called, my haughty damsel. You are proud now, Rachel Agmoor, but the time shall come when you shall be as humble before me as the trembling man near you."

"If I reject and defy you, you will attack the life and reputation of my father," said Rachel. "You must be very confident of your power, to send such a message to the woman whom you wish to make your wife."

"I am conscious of my strength. Do you desire to see a proof of it?" sneered Hiram.

Rachel bent her head contemptuously. Hiram Mould was at a loss to comprehend this unexpected defiance, but sure of his ground, he said—

"There is a young man in your father's employ whom he loves as his own son. Rather than harm a hair of that young man's head, James Agmoor would gladly lop off his right hand, I verily believe, if the sacrifice could avail either. Mr. Agmoor, call in Thornton Clair."