

can, after use, place the battery out of use for an indefinite time, ready, by the expenditure of another drop of fluid, to give off the desired currents. Properly constructed, we cannot see any reason why the arrangement should not last in good power a year or more for occasional effects; and it can be completely renewed at the rate of fifty cells in one hour. One hundred and fifty cells exceed in intensity one hundred cells of Grove. The parts are all quickly replaced, no acid is used, and no gas generated.

A modification of the construction is made use of when it is wished to employ a fluid of greater energy, but which in decomposition produces gas from which the tight cell must be relieved. Insert a tube through the cover, the opening being just half way down the cell, and the surface of the fluid below. Care being used in inverting the battery, this tube orifice is always in the air space of the cell, whether upright or inverted. When, for convenience, a battery of large quantity is desired to be used occasionally, large glasses and elements are employed; but bolts are substituted for the rubber bands to bind down the zinc covers. An exceedingly convenient battery is thus formed for electric cauterization, where the operation is not too extended. The use of rubber bands, however, in batteries of high tension, is far preferable to bolts, or their equivalents. The very high insulation of this packed battery is evident from the retention of its power for forty-eight hours and more, where the exciting power is derived from a mere drop of fluid.

POSSIBILITY OF SPEECH BY THOSE HITHERTO CONSIDERED MUTES.

The majority of the unfortunate class who are deprived of speech are so, doubtless, not because their vocal organs are defective, but because from early infancy they have been devoid of hearing. To consciously imitate sounds which they cannot hear is, of course, impossible to them, yet it has been proved possible for them to acquire the vowel and consonant sounds of spoken language, by the attempt to imitate with exactness the appearance of speech in those having perfect organs. The *Cornhill Magazine* for January, of the current volume, gives a very interesting account of an institution in Brussels where the dumb are taught to speak in the manner alluded to. Of course, such persons must substitute the eye for the ear in conversation.

In the case of those in whom the vocal organs are defective, no amount of effort will suffice to produce perfect speech. Trivial defects may, perhaps, be overcome by resort to artificial means; the inordinate length of the tongue, or the loss of the front teeth, or even a portion of the palate, are examples. But the loss of the communication between the lungs and the other organs of speech, the supply of air to the larynx and the vocal chords, would seem to be so radical a defect that speech would from the time of its occurrence become utterly impossible.

In 1862, a case was reported to the Medical Society of the State of New York, of which we give a brief extract.

A young woman, aged twenty-three, attempted to take her life, while temporarily deranged, by cutting her throat with a razor. The crico-thyroid membrane, the cricoid cartilage, and the upper ring of trachea, were wounded. No large-sized blood vessel being severed, the wound was dressed in the usual way, and at the end of three weeks had entirely healed, with the exception of a small opening in the windpipe just below the cricoid cartilage. Attempts being made to close this opening, and strong symptoms of suffocation immediately manifesting themselves, it was found imperative to insert a silver tube, known to surgeons as the tracheotomy tube, into the reopened tracheal wound, and to keep it there for several days, when a second attempt was made to close it, with the same results. This time several weeks were permitted to elapse, when a third attempt to heal the opening was made, which caused such immediate and urgent difficulty in breathing that it was abandoned altogether. From that time until she died from other causes, a period of some nineteen months, she wore and breathed through the tracheotomy tube. Upon her death, a post mortem examination revealed the fact that the windpipe was completely closed at the upper portion of the lower third of the cricoid cartilage, by a perfectly-organized and firmly-attached dense white fibrous tissue.

The circumstance which renders this case remarkable, and applicable to the subject under consideration, is the fact contained in the following paragraph, which we copy verbatim from the report referred to:

"Closing the opening in the trachea with the fingers or handkerchief, would immediately cause suffocation, proving that no air could pass through the larynx, yet she could speak in an audible whisper; she improved much in articulation, and this improvement continued during life; was able to sound all the letters, and by placing the ear near her mouth, she could converse and readily convey her ideas in an audible whisper. She enjoyed excellent health up to about four days before her death."

This case was regarded as so remarkable that some subsequent experiments were made upon the possibility of speech without a supply of air to the vocal organs through the trachea from the lungs. The conclusions drawn from them have never before been made public so far as our knowledge extends, but they corroborated the account which we have given above. Upon trial it will be found quite possible to articulate in strong whispers short combinations of syllables, while the air is being drawn into the lungs through the nasal tubes. The air contained in the cavities of the mouth anterior to the arch of the palate being sufficient for the purpose. Those accustomed to the use of the blowpipe will readily understand this, as it is customary for them to keep up a continuous blast, both while inhaling and exhaling the breath

through the nasal tubes. In speech, upon this principle, the air is forced out in the same way as in the use of the blowpipe, by the contraction of the muscles which surround the mouth (principally the buccinator), and great exertion of these muscles is required, giving an appearance of violent contortion and great effort, an appearance strikingly characteristic of the case above described. The air, as it is expelled, is, by the proper shaping of the articulating organs, formed into vowel and consonant sounds.

One of the glories of the present age is the amelioration of the condition of such as are born without sight, speech, or hearing, and any thing that aids in the remotest manner such a benevolent work, cannot fail to be of interest and profit.

New Views of Ozone.

That able and energetic chemist, M. Houzeau, has classed the conditions in which oxygen exists in the atmosphere under three heads: First, inactive oxygen, which produced not the slightest perceptible action upon moist iodured paper; secondly, oxygen directly active, which immediately imparts a bluish tint to the above description of paper, developing at the same time a peculiar and characteristic odor; thirdly, oxygen indirectly active, possessing no perceptible odor and requiring the aid of another body to affect the test paper. The invigorating nature of country air is presumed to be due to the presence of the second of these modifications of oxygen, which may be regarded as identical with the substance ozone. It cannot be caused by the first description of gas, since inactive oxygen does not affect iodine or its preparation, nor to the third class, since oxygen, indirectly active, requires the aid of an acid to affect the test paper. But the air of the country, although it imparts a bluish tint to slightly iodured litmus paper after the lapse of a short time, does not redden the most sensitive litmus, even after it has been submitted to its action for many hours. It effects its complete discoloration, but does not redden it. Having demonstrated that the first and third of the presumed modifications of the gas oxygen do not bestow upon country air its peculiar properties, it is but natural, and moreover reasonable, to attribute them to the presence of the second, or ozone proper. Granting this assumption, it is manifest that the odor which invariably betrays the existence of ozone should also be present in the air, and unquestionably so it is. Whenever pure air is respired in the mass, it has not only a distinct smell, but also a distinct color. It would be in vain to seek for this air in the crowded streets of a metropolis, but in the open country the lungs can appreciate the vital energy they inhale. All septs who doubt the accuracy of these statements, are advised to first of all familiarize themselves with the smell of diluted ozone or vitiated air, a thing easily accomplished, and then, after sleeping in a close room, to inhale the fresh morning air immediately after rising. They will find that the more the air in the chamber has been contaminated and infected, the stronger and more palpable will be the difference in the odor of the two currents.

In support of his theory, M. Houzeau carried out an experiment, which is at once curious, interesting, and conclusive. Being well aware of the property that flannel and other stuffs possess of condensing in their pores diluted ozone or oxygen, he caused two linen cushions to be prepared of precisely the same material and size, and placed one in the open air, and the other in a room badly ventilated and well filled with company. After the expiration of a certain time he had them both brought to him, and ascertained that the first emitted a distinct odor similar to that of ozone, while the second was completely inodorous. Fresh air in its normal state is endowed with decided powers of decoloration. Litmus and turmeric paper, exposed to its influence and sheltered from the effects of rain, dew, and sunlight, are blanched in a short time, demonstrating that ozone acts energetically as a decolorizing agent. It has long been known as a powerful disinfectant, and could means be devised for procuring it in a free state it would be of the greatest advantage in purifying vitiated atmospheres.

Japanese Coal Mining.

Coal has within the last ten or twelve years been discovered among the hills about four miles from Hiogo. I had an opportunity while there (says Mr. Locock in his report) of visiting the works, if indeed they deserve the name, which have been undertaken for procuring the coal. Here and there, wherever the coal or shale which lay over it had been seen cropping out from the hill's side, a horizontal passage had been run in, never more than twenty-five feet, and often only ten or twelve feet. In some of these burrows two or three men, crouched to the ground, were at work icking away at the sides with pointed hammers, and soring each little piece of coal with their hands before throwing it into one heap or another, according to its quality. A few coolies, in the last stage but one of nudity, collect the coal at the mouths of these burrows, and carry it to where the road admits of its being transferred to the backs of bullocks, or to three-wheeled carts, holding about half a ton each, and drawn by one beast. In this way it is brought to the Hiogo market. A great portion of it is of a very inferior quality. Here and there, however, good specimens of a kind of anthracite are brought out from the hill's side. The seam which has been discovered is about two feet thick, and runs down toward the plain at an angle of about 15 degrees, or very nearly that of the hills themselves. There is, therefore, good reason to believe that by boring in the plain below, the same, if not a better seam might be discovered. The Japanese government are not insensible to the advantages to be derived from a more scientific working of the coal of Hiogo, and it is not impossible we may, ere long, see a regular coal mine opened, worked by European machinery.

A New London Omnibus.

The English Parliament has refused to grant the petition of Messrs. Noble & Co., praying for a permit to lay rails and run city cars in the streets of London. The scheme, to which we have before referred at length, was killed by the omnibus companies, who, fearing the advent of so formidable a rival for public patronage, were enabled to command a powerful and successful opposition. Horse-cars being, temporarily at least, proscribed, a species of concession has been made in the adoption of a new vehicle, which promises well for the public convenience and comfort. By direction of the Home Secretary, a trial was recently made of this curious style of conveyance—which, from the description, would seem to be a cross between an omnibus and a Hansom cab or doctor's gig—and an official report will soon be forthcoming.

The chief peculiarity of the omnibus consists in its having only two wheels, and in being drawn by three horses, attached to the coach by the means of four shafts. For the purpose of preventing noise, the shafting and framework of the running frame are put together as one piece, and are composed entirely of angle and bar iron. The carriage body rests on the top of the iron frame on four india-rubber cylindrical buffer springs, and swings entirely free of the axle; the construction preventing the ordinary sharp rattle experienced in omnibuses, and allowing conversation to be carried on freely between passengers. For the latter, sixteen inside and twenty outside seats are provided. These are arranged like the teeth of a saw, each presenting a corner to the one on the opposite side, so that the occupants sit at an angle of about 60° with the side of the omnibus, and are not obliged to make such extended observations of vacancy or each other's faces during a prolonged journey. The new vehicle is pronounced, as a public carriage, superior in every respect to any conveyance now in use. We have not seen engravings of this novel carriage, but hope to obtain some for publication if it is approved.

Vitrified Surface on Cast Metal.

An invention has recently been patented by Messrs. Horsley, of London, and which has for its object improvements in the production of a glazed or vitrified surface on cast metal. In producing castings of iron or other metal, they coat the mold and core with powdered glass, furnace cinder, or enamel, or other material capable of being vitrified by the heat of the melted metal when it is poured into the mould, so as to form a glaze or enamel on the surface of the casting. The operation is as follows: Prepare a mold in the usual manner, either of common sand or red loam sand, and either with or without cores, as the case may require. When the mold is finished, paint it over with a paint-like composition prepared by grinding together gas tar and common black lead, in the proportion of about two pounds of black lead to a gallon of tar. Immediately dust over it finely-ground window-glass, or green bottle glass, or slag from a blast furnace may be used, as may also other vitreous materials or enamel compositions, such as are used for enameling articles of wrought and cast iron; but when casting iron, ground glass is preferred. Any excess of the powder is dusted or blown off, and the mold is allowed to dry, or is dried by artificial heat, until the composition on its surface is set and hard, so that it will not rub off. The metal is then run into the mold in the usual way, the heat fuses the vitreous material with which the mold is lined, and causes it to form a glaze on the surface of the casting. The paint-like composition by which the powder was made to adhere to the mold also serves as a separation when the fusion takes place, and so a smooth face is ensured. This process is more especially applicable when casting iron, but it may also be applied advantageously in some cases when casting brass and copper, the vitreous material employed being such as fuses readily with the heat of the melted metal.

The Flying Man.

At the recent meeting of the Aeronautical Society, it was announced by Mr. Wenham, that one of the members of the society, Mr. Spencer, had already constructed an apparatus, by the aid of which he had accomplished the feat of raising himself from the ground level and performing a horizontal flight of 60 feet; and it was further stated by Mr. Wenham that Mr. Spencer expected to fly the length of the Crystal Palace during the meeting of the Aeronautical Society to be held there next month. Since the above announcement was made, we have received from Mr. Spencer some particulars of the apparatus employed by him. It consists of a pair of wings of rather small size, arranged so that they can be worked by the arms, and a large fan-shaped tail of very light construction, connected to the body by basket work, so that it stands at an angle of about 3° with the horizontal. Mr. Spencer does not profess to fly in the ordinary sense of the term. He uses his apparatus by taking a short, quick run, this run being continued until, by pressure of the air against the under surface of the tail, he is raised from the ground. He then, by using the wings, maintains the momentum which he has acquired as long as possible, and is thus enabled to skim along at a short distance above the ground. Mr. Spencer commenced his operations by practicing long jumps without the aid of apparatus, and he then commenced using the wings, and finally added the tail. By continued practice, and from time to time making alterations in his apparatus, Mr. Spencer has been enabled to extend considerably his early flights or "skims," and we were informed by him a few days ago that he had lately accomplished a flight of 180 feet, starting and alighting at the ground level. Mr. Spencer is now engaged in completing a new apparatus, which he hopes to finish in time for the exhibition of the Aeronautical Society at the Crystal Palace, and we look forward with some interest to witnessing its performance.—*Engineering.*