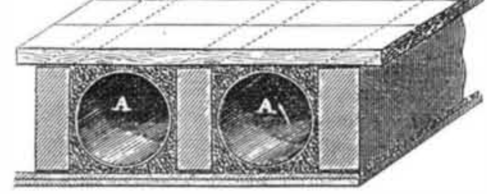
PROTECTION OF BUILDINGS AGAINST FIRES.

The guarding of buildings against the destructive agency of fire, is a subject worthy the attention of builders and property owners, and, in fact, important to all, especially those who dwell in thickly settled neighborhoods. Confining the fire to the floor or floors in which it originates, will frequently prevent an extensive destruction of property and the danger to life so often experienced in our crowded cities. The well known firm of R. Hoe & Co., manufacturers of printing presses and materials, in New York city, have been lately experimenting on a new plan of constructing ceilings and floors, intended primarily to ascertain the best method of preventing conflagration in the new building now in course of erection by the company, and calculated also to be of value to future builders.

Fig. 1



One of the firm says: "Many years since, I saw a store on fire in the Rue Vivienne, Paris, and was not a little surprised to see persons looking out of the windows in the story above the fire, quietly observing the labors of the firemen engaged in extinguishing the flames. Knowing that fires were rare in Paris, I was interested in examining the method of construction of buildings which inspired such confidence. I found that the floors were filled in solid with plaster of Paris.

"About ten years ago," he says, "our firm had occasion to enlarge our iron foundery, and it could be done only by carrying the extension under our carpenter and pattern shop. I caused the ceiling to be covered with sheet iron, and as each sheet was nailed up, it was covered between the beams with lime and sand mortar from three quarters to one inch in thickness. This was considered quite a security by our fire

Fig. 2

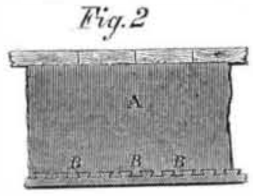
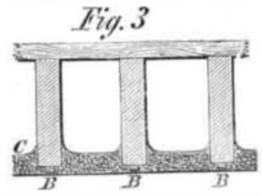


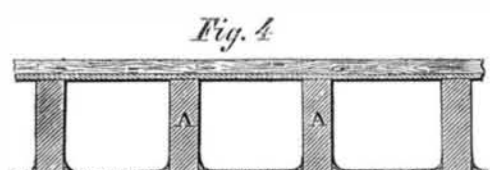
Fig. 3



insurance surveyors; but it was never quite satisfactory to me as a perfect protection. Last year, our firm had determined to erect a fireproof addition to our factory, and I was considering how we could, at a moderate expense, make the old portion of our works comparatively fireproof. In conversation with Mr. R. G. Hatfield, architect, he suggested that to reduce the weight it would be well to put in iron pipes between the beams, and fill in with plaster of Paris; this made the basis of my first experiment, seen in Fig. 1. Other experiments have been made, as shown by the remaining figures."

Fig. 1 is a representation of the construction of floors for the experiment referred to above. Upon the under side and across the beams were nailed strips of pine half an inch thick, and dovetail in section, serving to retain a ceiling of plaster of Paris, spread under the beams on the strips to the thickness of one quarter of an inch, and on their tops, between the beams, to a thickness of one half an inch. Upon

Fig. 4



this were placed, between the beams, tubes, A, of thin sheet iron, in this case of a circular section, or they may be made oval or rectangular, according to the spaces between the beams. The remaining space was filled in with plaster of Paris, completely enveloping the tubes. After the plaster had set, the flooring boards were fixed, and the plaster allowed to become perfectly dry and hard. A fierce fire was then lighted, within four feet of the ceiling, and kept up for four and a half hours. The result was, the plaster had cracked off in places, and the dovetailed strips were charred, but the beams were not injured, the fire having scarcely blackened them, and the floor above was never so heated but that a person could have stood on it barefoot without discomfort.

Fig. 2 represents a second experiment. Upon the under side of the beams, A, were nailed sheets of thin iron, crimped in a form to present dovetails, B, with the large parts downward. This was plastered with a "scratch" coat of sand and lime, and on this was placed a coat of one quarter of an inch of plaster of Paris. When dry and hard, a fire was lighted and kept up for two and a half hours, when the plaster cracked off and the beams began to burn.

In Fig. 3, strips of pine, B, one half inch square, were secured to the center of the beam, throughout their length. Plates of sheet iron, No. 21 wire gage, were nailed upon the strips, which kept the iron half an inch from the beams. Plaster of Paris was poured on the sheet iron to the depth of one and a quarter inches, and the sides and tops of the beams smeared with it, and rounded up at C, to some two inches on the sides. After the plaster had set, the floor boards were fixed, the fire lighted and kept burning for four and a half hours. The result was, in a few places a smoked appearance of the beams, but no other indications of fire.

Fig. 4 is a modification of Fig. 3, with the addition of thin sheets of iron on the tops of the beams, coated with plaster of Paris one quarter of an inch thick, on which the flooring was laid. The experiment with this device we witnessed a short time since, and for three hours a raging fire was kept burning under the ceiling, and for three hours more a fire was kept burning on the floor itself. The result was that no damage was done, and the floor proved to be entirely fireproof.

The following figures show the cost of this improvement: Cost of 10x10 ft. of fireproof flooring, prepared as per experiment, over and above the cost of ordinary flooring: Average thickness of plaster Paris, 1½ ins.—equal to 12½ cubic feet for the square of 10x10 ft., equal to three barrels of plaster, at $2 85—$8 55. Sheet iron on top and bottom, 200 square feet, No. 21 wire gage, 280 lbs. at 6c., $16 80; mason's and carpenter's time, five hours each, $4 75; total cost for square 10x10 feet, $30 10. The cost for a fireproof floor 100x25 feet, less walls, would be $678 45 more than the cost of the common combustible flooring. The cost of a brick and iron beam fireproof building is more than double the cost of a brick and wood structure.

HOW TO TEST THE PURITY OF WATER.

It is of importance to be able to test the quality of water, not only when for special purposes absolutely pure water is required, but even in cases where such purity is not requisite, it may be of great interest to ascertain of what the impurities consist. The following short notice of the tests for the most commonly occuring impurities, will be welcome and useful to many of our readers.

PURE WATER MUST SATISFY THE FOLLOWING CONDITIONS.

1. It must have no residue whatever when evaporated in a clear porcelain or platina dish.

2. It must form no precipitate with a solution of nitrate of silver, which would indicate common salt, some other chloride, or hydrochloric acid.

3. It must not precipitate with a solution of chloride of barium, which would indicate a sulphate or sulphuric acid.

4. It must form no precipitate with oxalate of ammonia, as this would indicate some soluble salt of lime.

5. It must not assume any dark or other shade of color when passing sulphureted hydrogen gas through it, or mixing it with the solution of a sulphide salt, as this would indicate the presence of lead, iron, or some other metal.

6. It must not become milky by the addition of lime water, or a clear solution of sugar of lead, as this would indicate carbonic acid.

7. It must not discolor by adding solutions of corrosive sublimate, or chloride of gold, or sulphate of zinc, which discoloring would indicate the presence of organic substances. When boiling water with chloride of gold, the least trace of organic matter will reduce the gold, and color the water brown.

RESULTS OF THESE TESTS.

1. Almost all spring waters are found to leave a residue upon evaporation.

2. Common salt is not only found in most springs and rivers, but even in rain water, many miles inland, when the wind blows from the ocean.

3. Sulphuric acid and sulphates are found in many springs, the Oak Orchard Spring, N. Y., for instance, is very rich in the free acid.

4. Waters from lime regions all contain lime in large quantities, and, in fact, this is the most common impurity of spring waters.

5. Iron is contained in large quantity in the so-called chalybeate springs; also copper and other metals are encountered; lead incidentally, by the lead tubes through which it often is made to pass.

6. Carbonic acid is the most common impurity, even distilled water is not always free from it. Water will naturally absorb carbonic acid gas from the atmosphere, which latter always contains it; its principal source of supply being derived from the exhalations of man and animals.

7. Organic substances are often found in the water of running brooks, streams and rivers, and are of course obtained from the vegetation and animal life in the water itself, and from the shores along which it floats.

REMARKS.

1. The healthfulness of water depends on the nature of the residue left after evaporation; for many chemical and other operations, where absolutely pure water is required, the leaving of residue at once proves the water unfit for use.

2. The existence of small quantities of common salt in the water is not objectionable, it being not injurious to health.

3. Sulphuric acid and sulphates may be objectionable for daily use; however, such waters are used medically to stop diarrhea and excessive tendency to perspiration.

4. Lime waters do not agree with some constitutions, producing diarrhea and diverse disturbances; very small quantities of lime, however, are not injurious.

5. Iron is healthy, and is a tonic; in fact, this metal and manganese are the only ones which may be used in large doses, not only with impunity, but even with benefit: however, there is also a limit. Over doses of iron may produce diarrhea and slight eruptions of the skin, or pimples.

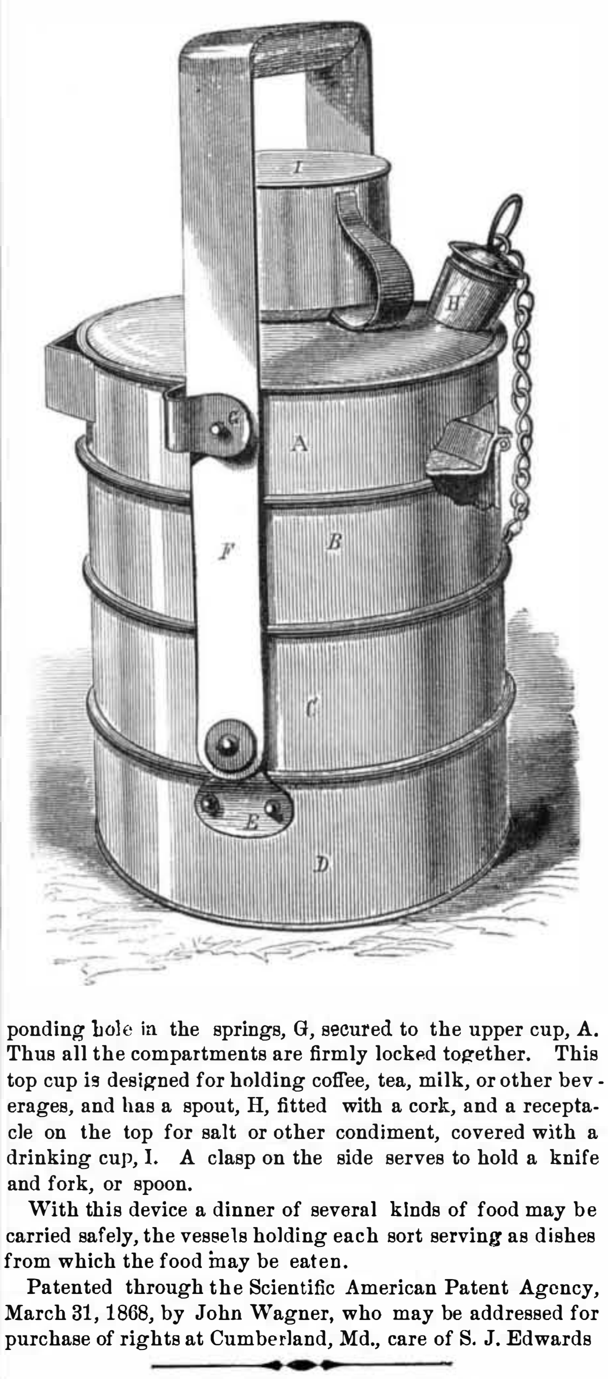
6. Carbonic acid is not objectionable when drinking the water; on the contrary, it makes it more palatable, and most mineral waters owe their reputation to this substance.

7. Organic substances are perhaps the most objectionable, principally when decaying; such waters may even propagate diseases, and require careful filtering or boiling, or both, to make them fit for internal consumption.

* There are a great number of mineral waters of diverse celebrated springs, which contain many other substances, but usually in very minute quantities; only it is beyond our present intention to go into details about substances not commonly encountered.

WAGNER'S IMPROVED DINNER PAIL.

The extent of the "tin pail brigade" which any early riser in our cities and manufacturing towns may see, comprising the honorable guild of the country's wealth producers, proves the value and importance of such a device as that shown in the accompanying engraving. The object is to furnish a handy and convenient receptacle for food, designed for workmen and tourists, and it is so constructed that the aroma of one kind of food will not affect the flavor of another. The cups, A, B, C, D, sit one upon and partly within each other, being supported in position by flanges near the bottom and projections at the top. The lower one, D, has ears, E, to which is pivoted a bail or handle, F, held in an upright position by means of a pin on each side engaging with a corres-



ponding hole in the springs, G, secured to the upper cup, A. Thus all the compartments are firmly locked together. This top cup is designed for holding coffee, tea, milk, or other beverages, and has a spout, H, fitted with a cork, and a receptacle on the top for salt or other condiment, covered with a drinking cup, I. A clasp on the side serves to hold a knife and fork, or spoon.

With this device a dinner of several kinds of food may be carried safely, the vessels holding each sort serving as dishes from which the food may be eaten.

Patented through the Scientific American Patent Agency, March 31, 1868, by John Wagner, who may be addressed for purchase of rights at Cumberland, Md., care of S. J. Edwards

An Air-tight Galvanic Battery.

Mr. Chester, electrical instrument maker, of this city, describes in the pages of a contemporary a new form of galvanic battery, the beauties of which are cleanliness, portability, and power, besides entirely dispensing with acids, preventing evaporation and the generation of gas, and obviating the removal of the exciting fluid when the battery is not in use.

The battery is made up of glass cells three inches long and one inch in diameter, inserted in a wooden block; a zinc cover is provided for each glass, and a projection from this zinc cover, running down into the glass, forms the zinc element The other element is carbon, carefully connected with platinum, and well insulated from the zinc cover. This cover has a plate of soft rubber interposed between it and the glass top, and the packing is made completely air-tight and water-tight by the pressure of two rubber springs pulling the cover firmly down. Connection from one cell to the next is quickly made by short pieces of spiral springs. The battery is charged by filling the glasses half full of water, adding some bisulphate of mercury, and a little shred of cloth is interposed between the plates so as to retain moisture. To use this battery it is necessary to invert it, and thus allow the fluid to flow over the plates and saturate the piece of cloth. Restoring the battery, the fluid leaves the plates, though a drop remains in the cloth shred, and in this state, simply from these drops of moisture, powerful intensity currents, resulting from the simple expenditure of one drop of the fluid, usefully, that we have exhausted a very small portion of the force in reserve, and it is also evident that we 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-thyroidean 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 reöpened 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 iodureted 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 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 iodureted 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 sceptics 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 sorting 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.*