the motors through an overhead wire. In Europe there are several successful examples of electric tramways in mines, and lately Messrs. Immisch & Co. have built a new mine-locomotive from the designs of Mr. Reckenzaun. Storage-cells are employed for supplying current, and a single motor of four-horse power. The gearing is peculiar. On the armature-spindle is a small phosphor-bronze pinion. This gears into four steel pinions placed in the same plane, and 90° distant from each other. These pinions are bushed with gun-metal, and run on steel pins carried on a cast-iron disk. The disk revolves on a journal turned outside of the end of the motor-bearing. Outside of, but in the same plane with, these pinions, is fixed an annular casting of gun-metal, with teeth cut on the inside. The steel pinions gear into the ring, which forms a fulcrum on which they revolve when the motor-spindle turns. The power is transmitted from the cast-iron disk by a sprocket-pinion keyed to it on the inside next to the motor, and a steel chain connects this sprocket-pinion to a suitable wheel mounted on one of the axles, while the other axle is connected to this by coupling-rods. The storage-battery consists of forty-four modified Tatham cells, each box being 10 inches by $6\frac{1}{2}$ inches, by 11 inches high. The boxes are lead-lined, and arranged in sections of three in wooden trays. Each box contains nineteen plates 7 inches by $4\frac{1}{4}$ inches, by $\frac{7}{32}$ of an inch thick, and has a capacity of 150 ampère hours, the weight being 53 pounds. The rate of discharge varies from 25 to 50 ampères, and sometimes, on starting, this increases to 65 ampères. Taking 40 ampères as the average rate, the weight of these cells for a discharge equivalent to one horse-power is nearly 500 pounds, and per horse-power-hour storage-capacity, 134 pounds. The Messrs. Immisch are now working on some improvements by which the capacity will be increased. This locomotive, on a grade of 1 in 70, would just move, with a load of twenty loaded cars equivalent to eleven tons. With fifteen cars, weighing eight tons and a half, the speed was three miles per hour, the current being 45 ampères at 100 volts pressure. On a grade of 1 in 40 the maximum load was eight cars, and on 1 in 25 it was six cars, the speed being a little over two miles an hour. On the level the locomotive could draw thirty cars, the current employed being 45 ampères.

FELLING TREES BY ELECTRICITY. — Hitherto machines for felling trees have been driven by steam-power, but this is sometimes inconvenient, especially in thick woods; and now the London *Times* reports that electric power has recently been adopted in the Galician forests. Usually in such machines the trunk is sawed, but in this case it is drilled. When the wood is of a soft nature, the drill has a sweeping motion, and cuts into the trunk by means of cutting edges on its sides. The drill is actuated by an electric motor mounted on a carriage, which is brought up close to the tree and shackled to it. The motor is capable of turning round its vertical axis; and the drill is geared to it in such a manner that it can turn through an arc of a circle and make a sweeping cut into the trunk. The first cut made, the drill is advanced a few inches, and another section of the wood removed in the same way, until the trunk is half severed. It is then clamped to keep the cut from closing, and the operation continued until it would be unsafe to go on. The remainder is finished by a hand-saw or an axe. The current is conveyed to the motor by insulated leads brought through the forest from a generator placed in some convenient site.

HEALTH MATTERS.

Public Inspection of Food.

THE following resolutions were offered by Dr. George Strawbridge at a recent meeting of the Philadelphia County Medical Society: —

"The Philadelphia County Medical Society begs to call the earnest attention of city councils and the Legislature of Pennsylvania to the pressing need of provision for the inspection of all meat and milk used as food, with a view of furnishing sound meat and milk to the people.

"The society would also urge the necessity of killing and destroying all animals afflicted with tuberculosis, and the owner should be indemnified by the State.

"The society also recommends that a committee of five be appointed by the president of the society, whose duty it shall be to represent the society with a view of obtaining further information, and to confer with other bodies acting in this matter."

Dr. Strawbridge, in introducing his resolutions, said: "Statistics as reliable as can be obtained make the statement not too broad, that in Philadelphia, about the present time, there is from three to three and one-half per cent of tuberculosed meat used, and from six to eight per cent of tuberculosed milk. Here in Philadelphia to-day there is no inspection of any kind. The best the board of health could do was to obtain an appropriation of fifteen hundred dollars for the appointment of a milk-inspector, who will probably start to the stations to see how much water goes into the milk. Anybody can dump any kind of food in Philadelphia, and we must take it; but if we refuse to eat it, we are told that we are not good citizens. Meat ought to be inspected when alive, and also during the process of slaughtering. Unless you can inspect the animal alive, and also when the internal parts can be viewed, the inspection is useless. In the inspection of milk, the principal thing is to see the cows that give it, so that they are not diseased, and to inspect it at its place of delivery."

The resolutions were adopted, and a committee was appointed consisting of Drs. Leffman, Huidekoper, Shakespeare, Osler, and Cleeman.

CHOLERA CONTAGION IN DRINKING-WATER. — F. G. McKean, chief engineer in the United States Navy, states that during ten days in 1885, nine hundred persons died of cholera on the island of Takashima in Japan, and that the disease often appears on the island. Suspicion was drawn to the drinking-water, which was brought from the mainland. During 1888 the use of this water for drinking-purposes was abandoned, and distilled water was used instead. Although cholera prevailed on the neighboring islands, Takashima was entirely exempt. This exemption may have been but a coincidence; still, it is more than probable, from our knowledge of this disease, that the purity of the drinking-water is to be credited with the immunity which the population of the island enjoyed. To be absolutely certain of this, will, however, require more continued observation.

NOTES AND NEWS.

IN the "Sixth Biennial Report of the State Board of Agriculture of Kansas," Mr. E. B. Cowgill, in the report on the sorghum-sugar industry, says: "The season of 1888 has been looked upon as the one which should settle the question as to the financial success of the sorghum-sugar industry, and, fortunately for the incoming industry, the answer must be taken as an affirmative one. It is true that not all of the factories in Kansas are able to show balances of profit. The fact, however, that the favorable results obtained in 1887 at Fort Scott have been more than repeated at that place in 1888; that a factory at Topeka has demonstrated the practicability of the sugar industry at that place; and the further fact that Conway Springs and Douglass, in the face of adverse circumstances, have shown the industry to be independent of all patented processes and machinery, — will go far toward assuring all diligent inquirers of the success of the Northern sugar industry. Indeed, upon the most careful study of the subject, I have no hesitation in saying that the sorghum-sugar industry is now on such a footing as to invite the investment of capital, where such investment is placed under good business management, efficient, practical skill, and competent, scientific direction."

— A recent invention of Messrs. Randall & Carter, for the preservation of freestone from the effects of weather, was exhibited by them at the Cannon Street Hotel, London, on Feb. 15, in the presence of a large number of architects and builders. Several specimens of well-known oolitic freestones, which had been treated by this process in such a manner as to make their surfaces quite hard enough to be polished, were shown. The process consists of treating the stone with a compound of milk of lime, acetic acid, and cane-sugar (or molasses), which, when applied, soaks into it for a depth of about half an inch, and produces a slight chemical change, materially hardening it. The stone may either be entirely im-

mersed in this solution, or the latter may be applied to its surface with a brush. The surface is then rubbed to a face with fine grit, and allowed to dry, after which it is subjected to a diffused dry heat of from 130° to 160° F. in an oven. When the stone to be treated is fixed in position, as in a building, it is stated that the compound may be applied with a brush, either with or without heat subsequently. Although it is admitted that by heating the stone its durability is greatly increased, the London *Builder* thinks it questionable whether this is practicable on a large scale after it is built up. But even supposing it were practicable, it is very doubtful whether the hardened surface would protect the stone for any great length of time. Experience has shown, that, where only a hardened coating has been formed, moisture soaks in, either through the cracks in the masonry or through portions of the surface of the stone itself, rendered vulnerable by the defective application of the preparation, whatever it may consist of. The moisture collects behind the hard coating, and produces a line of weakness, in consequence of which the thin crust flakes off. Moreover, it is wrong to suppose, that, because a lime solution hardens a stone, the latter thoroughly resists decay, as has often been suggested. The mere fact of the stone being hardened does not add much to its durability from a chemical point of view, unless the hardening material be acid-resisting. The only effect of the hardening is to render the stone less absorbent, and therefore slightly more durable, for a few years at most.

— Lord Wolseley, who is not often caught tripping in making hasty statements, writes as follows in the current number of the *Fortnightly Review*: "The battles of the future will be very different from even those of 1870. . . . One remarkable change will be the absence of nearly all that terrific noise which the discharge of five or six hundred field-guns, and the roar of musketry, caused in all great battles. . . . The sound of cannon will be slight, and will no longer indicate to distant troops where their comrades are engaged, or the point to which they should consequently march. Our sentries and advanced posts can no longer alarm the main body upon the approach of the enemy by the discharge of their rifles. The camp or bivouac will no longer be disturbed at night by the spluttering fire of picquets in contact with the enemy. Different arrangements for giving the alarm upon the approach of hostile columns will have to be resorted to. The main column on the march cannot in future be warned, by the shots of flanking parties, of the enemy's proximity, and a battle might possibly be raging within a few miles of it without that fact becoming at once apparent." *Nature* asks that some competent member of the "Scientific Corps" will kindly explain.

— The prefect of police in Paris has issued a new set of regulations with regard to the fire brigade service in theatres, which will, it is thought, reduce very much the risk of fire; so far, at least, as it can be reduced in the many theatres in Paris which have always been, and must remain, from the position they occupy, regular death-traps. A certain number of firemen are allotted to each theatre, who, under no pretence, are to be called out of the theatre, or to receive visits from friends or acquaintances. The chief of the detachment has the responsibility of seeing that all the apparatus for extinguishing a fire is in its allotted place and in proper order, and the commissary of police is to satisfy himself that this has been done before the theatre opens. During the representation the chief of the detachment must be constantly moving about to see that the men are at their posts, that no one is smoking in the corridors or carrying open lights, and that access to the reservoirs and fire-plugs is not hampered by placing any scenery or stage properties in the way. He is to examine the manometer, and, if he finds that there is a deficiency of pressure in the water-mains, he must inform the nearest post of the fact. In the event of an insignificant outbreak, recourse is to be had only to the apparatus within reach of the *foyer*; but, if the outbreak is of a more serious character, the nearest post is to be informed by telegraph. At the close of each representation the firemen are to make a round of the theatre, and see that the iron curtain is lowered, the buckets filled, and the folding doors closed, and, in the event of these not working smoothly, they must be repaired at once. The manager of the theatre is required implicitly to obey the orders of the district commissary of police, who, in the event of an outbreak of fire, assumes the sole command of the theatre until the arrival of the prefect of police or the chief officer of the fire brigade.

— *Nature* makes the following extract from a letter addressed by Mr. A. W. Tuer to a contemporary: "The melodious hum of skating was perhaps never heard to greater advantage than through the crisp air of a bitterly cold morning little more than a fortnight ago, — the first Sunday in the year. Almost as soon as Kensington Gardens were entered, one became conscious of a clearly defined musical sound coming from the direction of the Round Pond, — G as nearly as I could judge, but corrected to G sharp, when, half an hour later, I got to a piano. I had wished to compare the notes — probably lower — given forth by other and larger sheets of ice, but procrastination strangled an opportunity which perhaps others will take when it again offers. Comparing a sheet of ice to a taut string, and the countless skates to the hairs of a bow, — scientifically, a poor comparison enough, — the sound might be expected to have been like that produced by the scraping of a fiddle, but it exactly resembled the whistle of a distant locomotive."

— The following description of some of the most important features of the subsurface torpedo-boat lately submitted to the Navy Department by the Columbian Iron Works of Baltimore, and the uses for which it is intended, serve to clear up several points which might possibly have caused a misunderstanding as to the nature of the craft. The boat is cigar-shaped, and is capable of being operated under three different conditions: first, above the surface, that is, with nearly half of it above water; second, awash, that is, with only a few inches of the back exposed, together with the conning tower; third, completely submerged, that is, with nothing whatever appearing above the surface. In the last condition, which is the primary condition for torpedo warfare, the boat's means of offence is a horizontal tube directly in its axis, from which are discharged 8-inch projectiles either by pneumatic power or by powder. These projectiles are capable of giving several hundred feet range, and the gun and projectile are constructed on a principle first propounded by Lieut.-Commander Barber at the United States torpedo-station in 1873, but separately invented, and proved successful by Mr. Holland, the inventor of this boat. In lieu of this submarine gun, the boat will be fitted with any kind of locomotive torpedo that the Navy Department may desire to be fired from this or a similar tube. In addition to this tube in the axis of the boat, there is another 8-inch tube, fitted at an angle, for over-water fire at distances of 1,000 yards or thereabout. It is intended to use this tube for throwing dynamite shells, under circumstances where the boat cannot approach the enemy within torpedo range, or where it may be preferable not to try to do so. The boat has a double skin on the upper forward part, separated by about a foot of space; and this space is filled with water, which flows freely into it. Abaft of this, and forward of the gun-room, is a vertical bulkhead of several inches of iron. When, therefore, she is lying awash, and using her upper pneumatic gun (which makes no smoke), she will be almost invisible to the enemy, and, if struck by machine-gun projectiles, she is almost certain to be uninjured.

— The wine-making industry in California is the subject of an interesting article by Edwards Roberts in the supplement to *Harper's Weekly* of March 9. The article is copiously illustrated.

— The Eiffel Tower has already attained a height of 280 metres, and in a month it will be completed by the turret and the electric lantern, which will give it its greatest height of 300 metres. The Paris correspondent of the London *Builder* says, "It is curious to notice to-day how inferior is the effect produced by this enormous piece of iron-work to the idea that people had of it in advance. Seen from the environs of Paris, it overpowers the city, and appears immense by the side of the large monuments, which are reduced to very small dimensions; but the nearer one approaches it, the less is one aware of its colossal proportions, and the eye hardly sees what relation can exist between the thin termination of the tower and the gigantic arches of its base. There is an optical illusion about it which will always weaken its general effect, and disappoint the hopes of the promoters of this useless attempt to astonish the eye by its giddy height."