Communications.

Novel Discoveries in Aerial Propulsion.

To the Editor of the Scientific American :

I recently picked up the *Galaxy* for April, 1872, and my attention was drawn to an article entitled, "Flight a Screw Propulsion." Glancing over it, I came to the following: "In 1867, Dr. J. Bell Pettigrew, of the Edinburgh University, before the Royal Institution of Great Britain, first propounded the now celebrated theory of the figure of 8 wave motion of the animal wing, and this has since been confirmed by the observations of Marcy."

"Pettigrew himself, before giving his conclusions to the public, had, with commendable caution, subjected them to careful verification."

"He continued his researches, and in 1868 published an elaborate memoir on the mechanical appliances by which flight is attained in the animal kingdom."

"During the wing's vibrations, it twists and untwists, so that it acts as a reversing, reciprocating screw, and resembles the blade of an ordinary screw propeller."

"The twisted configuration of the wing, and its screwing action, are due to the presence of figure of 8 looped curves on its anterior and posterior margins," and "Dr. Pettigrew has derived his ideas of the structure and movements of wings from careful anatomical study, and the most patient observation and experiment with winged animals themselves; and in view of these facts, he does not hesitate to avow the opinion that a thorough knowledge of this branch of animal mechanics will yet give man the power of artificial flight."

At considerable length the remarkable discovery by Pettigrew is entered into, and would seem to have been the result of years of observation, and promises still to be its object until man shall fly away on the strength of it. But it is evidently supposed by the great scientist that the mainspring of flight not only consists in the figure of 8 described by the extremity of the wing, but involves the necessity of particular muscles and sinews especially provided to give it the required twist.

In the first place, so far as regards the novelty of the idea that flight is accomplished by the screw propulsion of the wing, he has but to find himself forestalled by the Scientific American (in 1853, I think somewhere about October), wherein are two engravings of the propeller for which a patent was granted to Charles T. P. Ware, consisting of two elastic blades or wings, adjusted to an oscillating shaft, and which have their submerged reciprocating sweeps in an arbitrary plane perpendicular to the line of propulsion, forming a screw at each sweep. This arrangement, the inventor says that he adopted from his closest observations of the wing action in the swiftest of birds and insects, as well as the two-bladed tail of the East Indian swordfish. Indeed, the wings of the dragon-fly are so fixed in that position that they cannot be actuated in any other way. The idea, then, of screw propulsion in the animal wing would not seem to be quite so original with Dr. Pettigrew as he might have supposed, and to which he lends such weighty importance as a "discovery" long held secret until verified!

In conclusion, the screw action is not due to the figure of 8 configuration, the latter not being a cause, but an effect or consequence, of the propulsive movement of the wing. The very fact of the blade, or wing, being elastic, with the forward edge rigid and tapering, and the sweep forced rapidly and directly from upward to downward and *vice versa*, it could not impinge on the resisting medium (air or water) without describing at the tip that double loop from the points where it takes its start for every return stroke. This latter discovery, which is necessarily embodied and referred to as a feature demonstrated in practice, in Ware's patent, is therefore not only no novelty from the Doctor who is said to have first propounded the now celebrated theory, but shows that no mechanical appliances need be resorted to by inventive genius to twist the action into figures of 8, since, whether that be the secret of the motive force or not, it is already supplied by the simple action of the wing arbitrarily confined to a plane perpendicular to the direction of flight.

It therefore appears that, in the matter of the two great foregoing startling novelties, the Scientific American is at least about fifteen years ahead of Pettigrew and the Royal Institution of Great Britain! Lecteur Constant.

Aeronautics.

To the Editor of the Scientific American :

I have noticed in some of your recent issues several articles on flying machines. The subject is one in which I have taken a great deal of interest; and as the conclusions at which I have arrived differ altogether from those of your correspondents, it is just possible they may give a new direction to the discussion.

I believe the invention of a machine, to fly by acting mechanically on the air, as birds do, is simply impossible if the machine, with its load, weighs more than 50 or 60 lbs. I do not say that a machine of any weight may not be constructed which shall be just a little heavier than the air displaced, and then the machine may be raised mechanically by acting on the air; but such a machine will, for reasons which follow, be little, if at all, better than a balloon. That which enables a bird to fly is the support which the pressure of the air gives to the bird's body. This support depends, I think, on the proportion between the weight and the surface exposed to the air. If the size of a bird is increased, all other things being equal, the weight increases in a greater ratio than the surface exposed to the air; so that, if with a certain amount of wing area and muscular power a bird weighing 10 lbs. could fly well, and his weight were increased to 30 lbs., with muscular power and wing area increased in the same proportion, he could not fly at all. Or if an eagle grew as big as an elephant, he could no more fly than the elephant. Let us suppose that a bird of 10 lbs. weight is a perfect flying machine. Our object is to increase the size of the machine and keep the same perfection of parts. If the weight is doubled, keeping the same proportion of all the parts and using the same material, we will find that the muscular power has not quite doubled, and the supporting surface exposed to the air has not increased in anything like the same proportion; so that a limit is soon reached where the machine ceases to have any power of flight, and that limit, where muscular force is the power used, I take to be about 30 lbs. This accounts for the fact that all the largest birds are not fliers. The ostrich, the emu, and the moa ceased to be flying birds as soon as they grew beyond a certain size, which size was determined by the proportion between their weight and the surface exposed to the air. Geology also shows that, while mammals and reptiles grew in past ages to enormous sizes, no flying animal ever appeared much larger than those now existing.

In this way only is it possible to account for the fact that small particles of iron or steel dust will float for a long time in the air. Of course each particle is as much heavier in proportion than the air as if it were a solid cube several inches in diameter. This also accounts for the fact that the wing area in small birds is not nearly so large, in proportion to weight as in the larger birds; and the wing area in proportion to weight is still further diminished in many insects, such as the common bee and many of the beetle tribe. I have seen some small animals in this country, such as the opossum and the rock wallaby, fall 50 feet on a solid rock without injury; and this first set me speculating on the why. A bullock falling under the same circumstances would have been crushed, bones and all, to a shapeless mass; and yet the wallaby is not more strongly made than the bullock. I have stated my views as shortly as possible, and if I have not made them plain to general readers, I trust some mathematician among your correspondents may take the matter up and show that according to well known mathematical laws flying (as birds fly) is impossible for men.

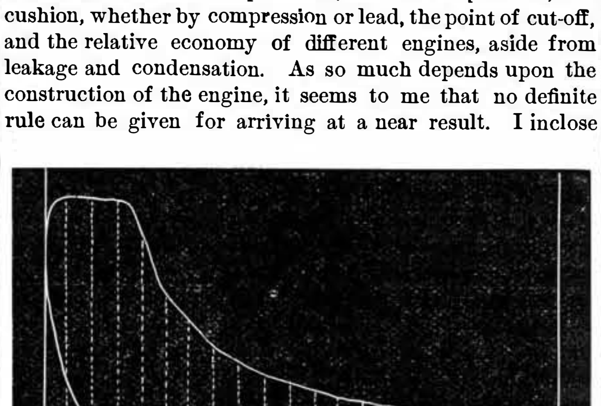
Murrurundi, New South Wales. W. E. Abbott.

Water Evaporated through Engines.

To the Editor of the Scientific American :

I have before me the circular of an engine manufacturing company, in which the proprietors explain their method of computing the water consumption per horse power per hour, of any engine, from its indicator card alone. The method is as follows: "Divide the constant number 859,375 by the mean effective pressure of any diagram, and the quotient by the volume of its total terminal or exhaust pressure, the result will be the theoretical consumption in pounds of water per horse power per hour." "The constant number used is the piston displacement for one hour, in lbs. of water, of an engine which would develop one horse power with 1 lb. pressure of water instead of steam. Then, with pressures of more than 1 lb., the amount required would be as many times less as the pressure was greater than 1 lb.; and when steam is used, the amount would be as much less as the volume of the steam at the pressure at which it is released is greater than an equal weight of water. The volumes of the pressures are taken from Forney's "Catechism" and Roder's "Handbook."

It is easy to see that if the steam in the cylinder followed, strictly, Mariotte's law of expansion, and if the valve and piston fittings were perfect, this would be a very accurate, as it is a simple, rule to go by; but as indicator cards give us but very little clue to the amount of leakage and condensation, a considerable amount of water will pass through the engine, for which the rule makes no allowance. Indicator cards are of great value in determining the initial, mean effective, and terminal pressures, the back pressure, the cushion, whether by compression or lead, the point of cut-off, and the relative economy of different engines, aside from leakage and condensation. As so much depends upon the construction of the engine, it seems to me that no definite rule can be given for arriving at a near result. I inclose



herewith a card taken from a 12x20 inch automatic cut-off engine, to which I will apply the rule, for the purpose of explaining it more fully: A A is the atmospheric line, and V V the vacuum line. The initial pressure is 72 lbs.; the mean effective pressure is $25\frac{2}{5}$ lbs.; and the total terminal about 16 lbs. (measuring from vacuum line). The cut-off is effected at about 16 per cent of the stroke. Applying the rule to this card, we have $859,375 + 25\frac{2}{5} = 33,834 + 954 = 35{\cdot}46$ lbs. of water per horse power per hour (954 being the volume of the 16 lbs. pressure).

When cushioning by compression is employed, a part of the steam is saved; so that, when greater accuracy is desired, we proceed thus: "Multiply the result obtained by the rule by the length of the dotted line, T, *t*, and divide the product by the length of line, T, *a*." I would like to hear from others on this subject.

Hinckley, Ohio. W. A. Mussen.

Decomposition of Water by Sodium Amalgam.

To the Editor of the Scientific American :

In a recent number of your valuable paper, my attention was drawn to the article by Professor Merrick entitled "Mortification and Water," taken from the *American Chemist*. As I have repeated the experiment a number of times, and have had precisely the same experience in breaking the glass vessel, I at last hit upon the method of forming an amalgam of the sodium with mercury, which not only makes the decomposition of the water to take place slowly, but, by increasing the weight of the sodium, may be conveniently kept in a small capsule of porcelain at the bottom of the jar, and the minute bubbles of hydrogen rise rapidly through the water, thus increasing the beauty of the experiment. A wire cage may be also employed for confining the sodium; and such an instrument, furnished with a handle, can be bought in our stores where philosophical and chemical apparatus are sold. A tea ball, made of wire gauze, and intended to keep the leaves of the tea together in the pot, may also be pressed into service; but of all the plans proposed I decidedly prefer the amalgam one, which will also answer, when thrown into a solution of ammonium chloride, for forming that remarkable compound which, when seen for the first time, excites so much wonder, namely, the ammonium amalgam.

Philadelphia, Pa. Isaac Norris, M.D.

[For the Scientific American.]

EXPERIMENTS WITH LOCUST EGGS, AND CONCLUSIONS DRAWN THEREFROM.

BY PROFESSOR C. V. RILEY.

There are many questions respecting the manner in which the eggs of the Rocky Mountain locust are affected under different conditions, which are of intense practical interest, and which are frequently discussed with no definite result being arrived at, or no positive conclusion drawn. Such are, for instance, the influence of temperature, moisture, and dryness upon them; the effects of exposing them to the air, of breaking open the pods, of harrowing or plowing them under at different depths, of tramping upon them. Everything, in short, that may tend to destroy them or prevent the young locusts hatching, is of vital importance. With a view of settling some of these questions, and in the hope of reaching conclusions that might prove valuable, I have carried on during the past winter a series of experiments which will be reported in detail in my 9th report, and the conclusions drawn from some of which I give you herewith:

Nine experiments, to test the

EFFECTS OF ALTERNATELY FREEZING AND THAWING,

showed that: 1st, the eggs are far less susceptible to alternate freezing and thawing than most of us, from analogy, have been inclined to believe. Those who have paid attention to the subject know full well that the large proportion of insects that hibernate on or in the ground are more injuriously affected by a mild, alternately freezing and thawing winter, than by a steadily cold and severe one; and the idea has quite generally prevailed that it was the same with regard to our locust eggs. But if so, then it is more owing to the mechanical action which, by alternate expansion and contraction of the soil, heaves the pods and exposes them, than to the effects of the varying temperatures. 2nd, that suspended development by frost may continue with impunity for varying periods, after the embryon is fully formed and the young insect is on the verge of hatching. Many persons, having in mind the well known fact that birds' eggs become addled if incubation ceases before completion when once commenced, would, from analogy, come to the same conclusion with regard to the locust eggs. But analogy here is an unsafe guide. The eggs of insects hibernate in all stages of embryonic development, and many of them with the larva fully formed and complete within. The advanced development of the locust embryo, frequently noticed in the fall, argues nothing but very early hatching as soon as spring opens. Their vitality is unimpaired by frost.

A series of sixteen experiments, to test the

INFLUENCE OF MOISTURE UPON THE EGGS,

establish a few facts that were somewhat unexpected. I give one of the experiments as a sample. The insect is a denizen of the high and arid regions of the northwest, and has often been observed to prefer dry and sunny places, and to avoid wet land, for purposes of oviposition. The belief that moisture was prejudicial to the eggs has, for these reasons, very generally prevailed. The power which they exhibit of retaining vitality and of hatching under water or in saturated ground is, therefore, very remarkable—the more so when viewed in connection with the results obtained in the succeeding experiment. That the eggs should hatch after several weeks' submergence, and that the young insect should even throw off the post-natal pellicle (*ambion*) was to me quite a surprise, and argues a most wonderful toughness and tenacity. After being dried and soaked for over six weeks, under conditions that approach to those of spring, I found a good proportion of the eggs to contain full-formed and living young larvæ, which, though somewhat shrunken, and evidently too weak to have made their exit, were still capable of motion. The water evidently retards hatching. An examination of the submerged eggs that remained unhatched, long after others had hatched which had been under similar treatment up to a certain time and then transferred to earth, showed the jaws and tibial spines to be still quite soft. It is, therefore, in preventing the proper hardening of these delivering points that water doubtless retards the hatching, and prevents its accomplishment long before the embryon perishes. Yet, when once life has gone, the egg would seem to rot quicker in the water than in the ground.

The experiments, further, prove conclusively that water in winter time, when subject to be frozen, is still less injurious to the eggs. Altogether, these experiments give us very little encouragement as to the use of water as a destructive agent; and we can readily understand how eggs may hatch out, as they have been known to do, in marshy soil, or soil too wet for the plow, or even from the bottom of ponds that were overflowed during winter and spring. The only instances in which water can be profitably used is where the land can be flooded for a few days just at the period when the bulk of the eggs are hatching.

Several experiments, to test the

EFFECTS OF EXPOSURE TO THE FREE AIR,

proved very conclusively that we can do much more to destroy the eggs, by bringing into requisition the universally utilizable air, than we can by the use of water. The breaking up of the mass, and exposure of the individual eggs to the desiccating effects of the atmosphere, effectually destroys them; and when to this is added the well known fact that thus exposed they are more liable to destruction by their numerous enemies, we see at once the importance of this mode of coping with the evil.

Five experiments, to test the

EFFECTS OF BURYING AT DIFFERENT DEPTHS,

showed that, where the newly hatched insect has not the natural channel of exit prepared by the mother, it must inevitably perish if the soil be moderately compact, unless cracks, fissures, or other channels reaching to the surface, are at hand.

From the four series of experiments mentioned I draw the following deductions, which have important practical bearing: 1. Frost has no injurious effect on the eggs: its influence is beneficial rather, in weakening the outer shell. 2. Alternately freezing and thawing is far less injurious to them than we have hitherto supposed, and tends to their destruction, if at all, indirectly, by exposing them to the free air. 3. The breaking open of the egg masses, and exposure of the eggs to the atmosphere, is the most effectual way of destroying them. Hence, the importance of harrowing in the fall is obvious. 4. Moisture has altogether less effect on the vitality of the eggs than has heretofore been supposed, and will be of little use as a destructive agent except where land can be overflowed for two or three days at the time when the bulk of the young are hatching. 5. Plowing under of the eggs will be effectual in destroying them just in proportion as the surface is afterward harrowed and rolled. Its effects will also necessarily vary with the nature of the soil. Other things being equal, fall plowing will have the advantage over spring plowing, not only in retarding the hatching period, but in permitting the settling and compacting of the soil; while, where the ground is afterwards harrowed and rolled, the spring plowing will prove just as good, and, on light soils, perhaps better.

Are Moles Useful?

The season for these annoying creatures to begin their annual work is at hand; and very soon evidences of their presence will be observed on the lawns and in the gardens of many an agriculturist. The question whether moles eat vegetation, or only destroy it in search for worms, is a mooted one; and almost every season the discussion is renewed in our agricultural papers. A correspondent states, in the Ohio *Cultivator*, that the present winter, when the thermometer was down to 22° Fah. below zero, moles were found in fodder shocks, where they had collected some corn, upon which they live, and some of which was found in their stomachs, and no other food was distinguishable. Of course, moles found in different places, adds the writer, live upon different food; some on the bark or the roots of trees, etc.; and the above is corroborated by the *Rural New Yorker*, who does not care whether high or low authorities declare that ground moles eat nothing but insects, but says that the assertion is simply false, and any man who possesses skill enough to catch a live one can prove it to be so. The ground mole will devour earth or angle worms when in confinement or at liberty, and those worms are not insects. Furthermore, this worm, *lumbricus terrestris*, is the mole's principal animal food, if our own personal observation, says the *Rural* editor, has not led us far astray. But leaving the food out of the question, a vigorous ground mole will lift up and kill a row of plants in far less time than a thousand of our most noxious insects, not excepting grasshoppers and potato beetles. It is to be feared that our authorities who talk so glibly about the useful mole know little of cultivating gardens infested with these pests. One season of gardening with a dozen moles per acre would satisfy them to dispense with these secret subterraneous assistants.

And here comes a defence of the mole from across the water. "In some parts of Belgium," says a contemporary, "attempts have been made to extirpate the moles from the soil. At one of the chateaux in that country, surrounded by a park adorned by fine lawns, men were employed to catch and kill the animals. After a time they were killed off, and disappeared entirely, in consequence of which the velvety grass of the lawns soon withered. The cause of the mischief was a small white insect which had been killed by the moles. The proprietor of the chateau, after he had made the discovery, was obliged to stock his place with a fresh supply of moles, after which the lawn flourished as before."

Having experienced considerable annoyance from these destructive creatures, we have read with special interest whatever agricultural papers have had to say about the moles' habits, their destructiveness, and their utility; and we have arrived at probably about the same conclusion that most persons who read the above have already reached. The heading of our article may provoke a discussion in some debating society, which will determine the mole's future. A great many who have waited in vain for the agricultural writers to settle the mole's destiny will certainly rejoice if his fate be sealed.

The Sewing Machine Monopoly.

A correspondent of the *Philadelphia Enquirer* writes from Washington to that paper as follows: "A number of lobbyists, representing an immense sewing machine combination interest, have made their appearance here. Their object is to procure, by some means not now apparent, a renewal or extension of patent upon the feed motion, which is vital property, and the basis of the Wheeler & Wilson, Howe, Singer, and other sewing machine combinations. The patent has already been extended and will expire on the 8th of May. It was the original intention of the great sewing machine pool to go to Congress and procure an act enabling the Patent Office to again extend the monopoly, but the excitement of the electoral count prevented them from putting this plan into operation.

"The agents of the pool now have, it is said, a very large sum of money at their command, and will thus be able to make a persuasive argument before the Patent Office people. Their case is in an awkward shape, and will expire by default on the day above indicated unless some action can be procured from the patent officials which will give the pool the color of a claim upon which to go to Congress when it sits. It is possible, however, that an application for a new patent covering the principle, in a slightly varied form, will afford means of escape from this dilemma, if adopted by the secret workers of the monopoly.

"The enormous benefits to accrue to the public in the event of the sewing machine pool failing to buy an extension will be seen when it is considered that the manufacturing cost of an ordinary $65 sewing machine is about $6.25, while an $85 machine from the Bridgeport shops costs in the frame, ready for shipment, something under $10. As things are now, a $65 machine is put to the local agent at $25, and the agent gets $40 for his time and labor in selling and instructing. An $85 machine costs the agent $35, so on up to the fancy, full cabinet, pearl inlaid article, which costs the customer from $150 to $200. The same rule applies in about the same proportion to all machines in the combination.

"The breaking down of the monopoly which sustains these ruinous figures will enable any machine shop in the country with proper appliances to turn out sewing machines with the lock stitch and wheel or ratchet feed. Competition will thus bring down the price of machines to a legitimate figure, about one half the present rates. This, a patent official remarks, may result in curtailing the agency system to some extent, but he adds that it is a system which deserves curtailing on account of the pertinacity of competing agents in attempting to force their wares upon a forbearing public. The patent men are exhibiting pretty much the same forbearance toward the pool emissaries here that the public exhibit toward sewing machine agents, and it is quite possible that the country may for a time be cheated out of the profits of which the law entitles it."

Patent Right Notes.

A rather important decision was made in the United States District Court at Cincinnati, a few days ago, involving the standing of notes given for patent rights. Pennsylvania was, we believe, among the first States to enact a law requiring that such notes should bear upon their face the words "given for a patent right," further providing that notes so distinguished shall, in the hands of any third parties, remain subject to all the equities between the original parties. The same law was subsequently enacted in Ohio and other Western States for the purpose of stopping the frauds which have been from time to time committed by patent right dealers upon innocent and unsuspecting farmers In the case heard before Judge Swing, at Cincinnati, the defendant offered to prove that he had been defrauded, and insisted that he was not bound to pay the note, and claimed that the present owner of the note, who bought it before due, was bound, under the Ohio law, to permit such a defence to be made. Judge Swing, however, took a different view, and pronounced the Ohio law unconstitutional, saying in substance that the insertion of the words "given for a patent right" is no protection to the maker, and of no force whatever. He decided this upon the principle that such a law impaired the value of patent right property, a species of property created by the Constitution and laws of Congress, and as such entitled to all the protection given to any other property, and not properly the subject of individual discrimination. The Indiana courts have decided the same way.

American Competition in the Hardware and Implement Industries.

We last month, says the London *Ironmonger*, drew attention to the activity of American hardware producers in seeking to dispose of their products in this country. That activity has not, during the month, diminished. On the contrary, more diligence is noted. The number of representatives of American firms visiting our own hardware districts and the leading buying centers of Great Britain is larger now than it was a month ago. American travelers, directly representing American firms, bid fair soon to occupy a conspicuous place on the list of those who call upon English hardware merchants and wholesale ironmongers, nor can it be said that their prospects are altogether cheerless. It is true that, like most other people of their class, they carry specimens of excellent and also of indifferent goods. Goods, some cheap, others dear: goods which sell themselves and goods which need pushing.

As previously, so now, the Americans are successful in cutting and cultivating tools. Axes and spades, forks and scythes, find the most ready sale, and the thousand and one labor-saving apparatus, so handy in the kitchens of boarding houses, hotels, and the like, prove tempting at first sight, though they have not invariably the quality of endurance. While the makers of such products at home are thus vigorously elbowed at their own doors by American competitors, English engineering and light iron foundry firms have not exemption. In addition to light castings of the sort particularized last month, heavier and more complicated products of the engine shop and the foundry are presented by those same American travelers. Handy machinery required by the manipulator of metals and wood, in the turning and in the casting shop in particular, are brought under the notice of Englishmen. Nor are the makers of New World implements required by the farmer any less active than for some time they have been. Rather, more agencies of American agricultural implement firms have been formed, at the same time that business direct is being increasingly cultivated by firms who have not before done business in England, and in goods not previously offered.

More significant, however, to the British hardware and implement manufacturers is the competition of the American in the foreign markets before largely supplied from English works. In this direction even more activity and ingenuity is noticeable than in respect of Great Britain itself. If equally recent information be accurate, English agricultural implement manufacturers have cause for some apprehension as to the market for agricultural implements in Russia. The statement is that, convinced that American plows and other labor-saving farm tools are more adapted to the cultivation of the soil of Russia than goods of English make, several Russian Boards of Agriculture have appointed an agent in New York who has already given orders for tools and implements—one order being to a firm in Louisville, Kentucky, for 10,000 plows. It is added that a pattern of a mowing machine adapted to Russian soil has also been selected, and that a considerable number are being made; whilst experiments are in progress in New England to ascertain the best kind of portable engine for Russian employment. Though the account may not be wholly devoid of the exaggeration which frequently accompanies intimations of the kind, there is probably truth enough in it to make it at least unpalatable to those manufacturers in England to whom the farmers in Russia have formerly come for a supply of implements. It is not with satisfaction that we are compelled to supplement this with the statement that American plow makers have devised a plow to be drawn by native oxen, which threatens to supersede in numerous uses the Caffre mamootie, which has for so many years formed a profitable branch of British edge tool manufacture. Further, that a British hardware merchant has, during this month, been required by a Cape customer to send out, not English, but American hardwares. The consignment will be a valuable one, and it will embrace nearly all the classes of hardware which have hitherto been sent out to the same customer. In this case the order is an experimental one; but taken in connection with the foregoing, it is one to which it is our duty to direct the prominent attention of English hardware firms.

Metallic Fireproof Curtain.

A fireproof curtain for theaters, made in corrugated plate by Voss, Mitter & Co., of Berlin, is soon to be tried. It is being fitted to the theater in Dresden, now rebuilding after destruction by fire. Exposed to heat, a brisk circulation of air is set up in the sections of tubes formed by the corrugations, the heated particles ascending, and colder particles flowing in to supply their place. The latter keep down the temperature so considerably that a sweating breaks out in the plate of which the curtain, or shutter, as it is, speaking strictly, is composed. The shutter made for the Dresden theater is 40 feet high and 46 feet wide. The method of riveting the plates of which it is composed, and of raising and lowering it, are the subjects of patents.

WE have to correct an error in our article on the results of evaporation and rainfall, in our last issue. We should have said that the waters of the Caspian Sea are less, and not more, salt than those of the ocean.