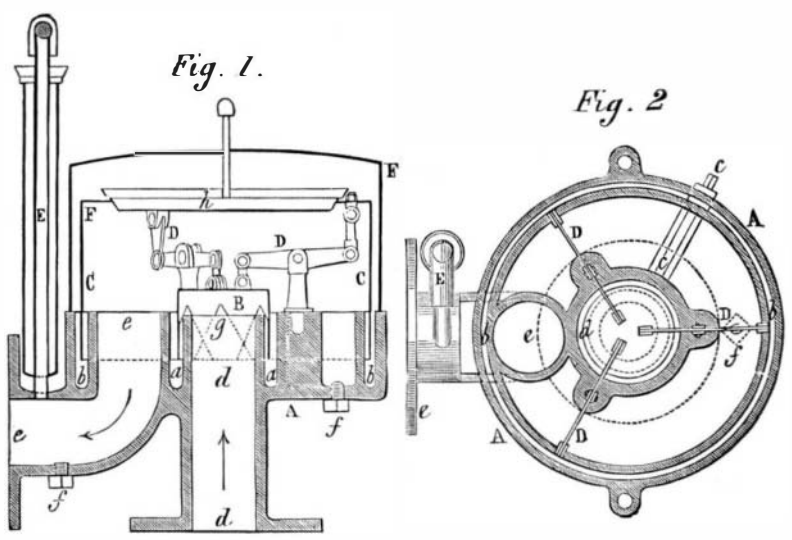
NEW GAS REGULATOR.

The annexed illustration, extracted from the *Bulletin du Musée*, represents a novel gas regulator recently devised by M. Liebda. A cast iron vessel, A, is provided with circular channels, *a* and *b*, which are filled with mercury. *c* is a conduit for emptying them. The gas enters by tube, *d*, and escapes by tube, *e*: and at *f* are screw plugs which close the apertures from which the water which accumulates in the apparatus is removed.

The entry of the gas is regulated by a valve or cover, B, the edges of which, as shown at *g*, are triangularly indented, and are plunged into the mercury in the channel, *a*. A large cover, C, is provided, the edges of which enter the mercury in channel, *b*, and at *h* access may be had to the interior. The covers, B and C, are connected together by the three double levers, D. E is a water manometer for indicating the gas pressure, and finally, F is the envelope which encloses all the working parts.

The gas, on entering *d*, passes under B, and through the triangular indentation in the edges of that valve. It then presses upon the larger cover, C, and, by raising or lowering the same, causes the reverse effect upon B, through the levers, as already noted. As the pressure increases, cover C rises and A falls, and *vice versa*, thus causing the apertures in B to widen and close just so as to admit a uniform flow of gas. To increase the pressure, weights may be disposed upon the cover, C. An economy of from 25 to 30 per cent is claimed to be gained, in the consumption of gas, through the use of this device.



LIEBDA'S GAS REGULATOR.

COTTRELL AND BABCOCK'S PERFECTING PRESS FOR WOODCUT PRINTING—FIRM'S ROTARY ATTACHMENT.

Two features are necessary to obtain a patent: First, the invention must be novel; second, it must be useful; and when these features are clearly demonstrated to the examiners, the exclusive right, for seventeen years, to manufacture, lease, sell, or otherwise dispose of it, is awarded under letters patent.

But there is another feature of importance to the patentee or his assigns, namely, the propriety of his keeping as near as may be within the beaten track of mechanical appliance in his inventions or improvements, in order that the workman, when he takes hold of the new machine, may feel a certain degree of familiarity with its mechanical principles, and thus be enabled to prosecute his labor with equal confidence as formerly, when engaged on the old and superseded machinery. During nearly half a century of careful and patient observation, we have noticed several really valuable inventions fall stillborn to the world because of a non-observance of this common sense theory. The inventor may feel satisfied that he sees clearly his means to an end, irrespective of the reasonable convenience of those for whose uses the invention is designed; but the workman cannot appreciate the value of an improvement which compels him to learn his trade over again. In such cases, it will necessarily be uphill work with the inventor to introduce his machine; and he displays a lamentable lack of knowledge of human nature if, in his disappointment, he attributes his want of success to the stupidity or stubborn prejudice of the workman. On the other hand, when improvements which are the results of new combinations of existing and well understood agencies are presented to the public—properly constructed and divested of every possible complication—they seldom fall short of usefulness and pecuniary profit to all parties concerned.

The new perfecting press which is illustrated in the above engraving seems to belong to the last mentioned class of inventions, a careful examination of which will present nothing unfamiliar to the modern pressman. It is simply a union of the rotary and drum cylinder presses, preserving the features of both with the greatest simplicity. Take off, in imagination, the type and impression cylinders and the second feed boards and piling apparatus, and we have the Cottrell improved four-roller printing machine remaining, without variation or modification. We shall proceed to describe the complete machine in a manner that will be understood by the craft for which it is designed, avoiding shop terms and speaking in the language of the pressroom.

Its foundation is the latest Cottrell and Babcock drum cylinder press, embracing the Cottrell improved air spring and governor, the whole so substantially built as to sustain the new rotary attachment without vibration, even when running at its highest rate of speed.

The patent rotary attachment consists of two cylinders—one for curved stereotype plates of the matter to be printed, the other to give the impression. These cylinders are supplied with a feed board, and revolve in harmony by the instrumentality of the usual gear wheel attachment, making two revolutions while the drum cylinder of the main press makes one, and yielding the sheet, when printed on one side from the curved stereotype plates, to a supplementary set of grippers on the drum cylinder, in perfect register, when it passes to the flat form on the bed of the main press, and is printed on the otherside and piled in the usual manner.

The type cylinder is supplied with an ordinary distributing apparatus for three form rollers; and as it revolves twice before printing, the form is necessarily rolled twice also, with a fresh supply of distributed ink each time—an excellent feature in itself. There are four vibrating rollers, which thoroughly break up and distribute the ink before it is contributed to the form rollers. The space on the type cylinder not occupied by the curved plates serves for the ink table; and a simple device raises and drops the vibrators at the right times and places, thus avoiding all contact on their part with the stereotype plates.

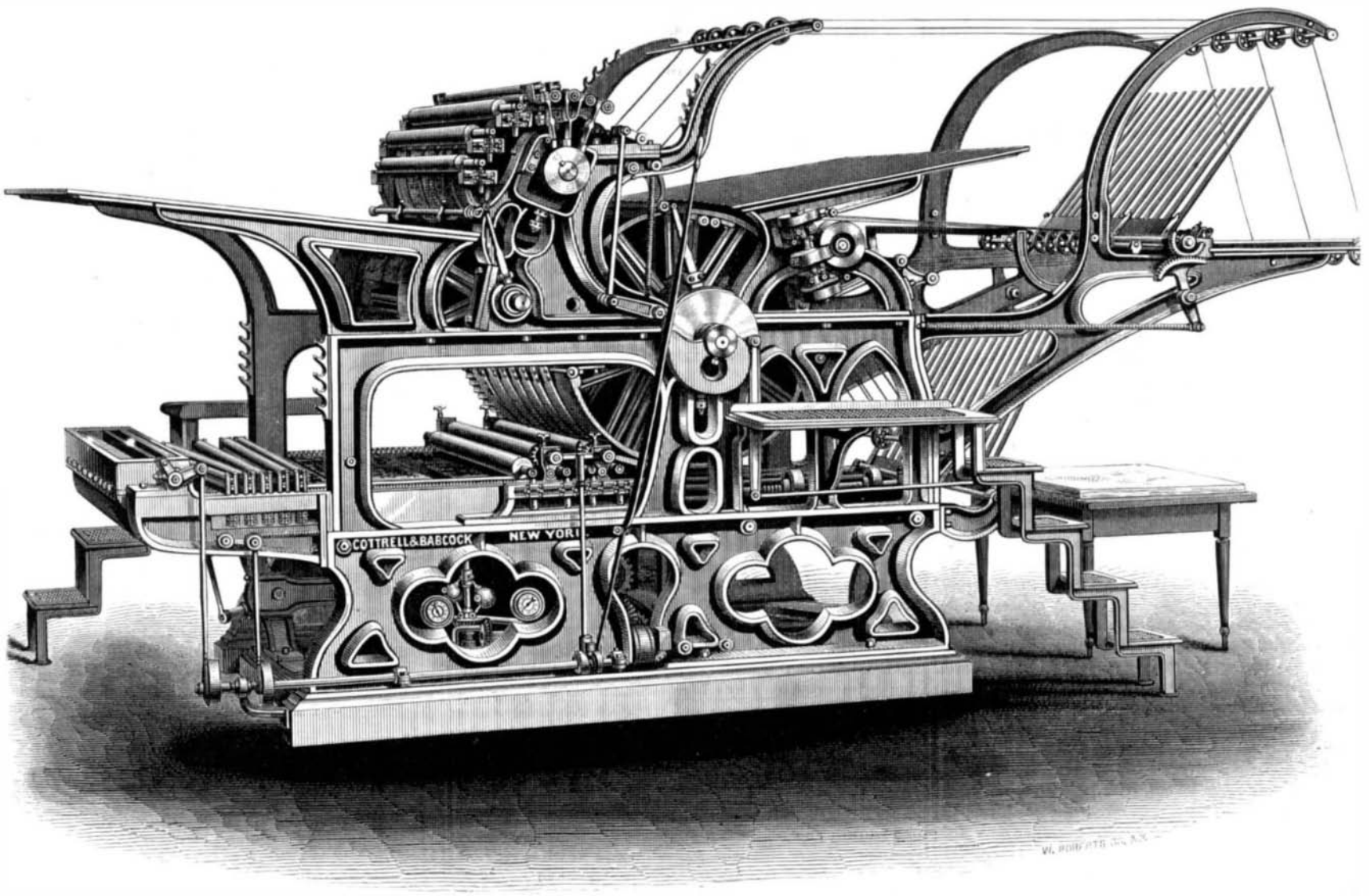
At each alternate revolution of the impression cylinder the impression is thrown off by a simple and reliable mechanical device, by which means the complete rotary attachment (as it gives the impression on its second revolution) works in harmony with the drum cylinder of the main press.

The great difficulty that most perfecting presses have to contend with is their tendency to set off. This difficulty is thoroughly overcome in the press under consideration by the introduction of slip sheets, which are fed to the drum cylinder, the grippers which carry the slip sheets being so manipulated as to hold each sheet for two impressions before yielding it to the piling apparatus, where it is smoothly and evenly piled for future use.

These presses being designed particularly for illustrated periodicals of large circulation, the plain forms are printed by the new rotary attachment, and the cut forms on the flat bed of the main press by the drum cylinder. The superiority of the Cottrell air spring and governor attachment over the old coiled wire springs enables a press of the printing magnitude of 42 x 60 inches to keep up a durable speed of over 1,200 impressions per hour. After allowing for the time consumed in making ready forms of long numbers, and the stoppages incident to removing printed paper and supplying fresh piles to the feed boards, the manufacturers assert that an average of over 10,000 sheets per day, printed on both sides, will pass through the machine. The new patent rotary attachment accomplishes its share of the work independently, and in proper season to pass the half printed sheet to the drum cylinder to be perfected without interfering in any way with the time of the main press; so that we thus have a clear issue of more than 20,000 single impressions per day of ten hours.

The usual method of making ready this class of illustrated work is by hard packing, the overlays of the cuts being made from certain cardboard, well known to the practical cylinder press printer, and the whole finally covered by a blanket of well worn billiard cloth. On the drum cylinder of the main press, of course, the *modus operandi* is the same as on the ordinary drum cylinder machine; while the rotary attachment is supplied with the necessary conveniences for the same class of make-ready.

We have thus, we believe, given an intelligible description of this new perfecting press, from which it will be under



COTTRELL AND BABCOCK'S PERFECTING PRESS FOR WOODCUT PRINTING

stood that the invention, according to the manufacturers' statement, doubles the capacity of the drum cylinder machine, without detracting from the finished quality of the presswork.

The first of these machines is now in successful operation in one of Frank Leslie's pressrooms in this city. Messrs. Cottrell and Babcock's office is at No. 8 Spruce street, New York.

Correspondence.

Life-Saving Apparatus.

To the Editor of the Scientific American:

I am pleased to see the illustration of Mr. J. B. Rogers' life-saving apparatus in your issue of September 25. At this time, when so much is being attempted by the United States government and so much is done by foreign powers, in perfecting the means of communicating with stranded vessels, any new devices, so well illustrated, command respect. It is to be hoped that at our grand Centennial Exposition there will be ample space allotted and ample means provided for practical experiments with all known devices for rescuing shipwrecked persons.

Allow me to quote (from a pamphlet published by me in 1872) some of the results of experiments in casting lines by projectiles: "The Manby mortar was fully illustrated in a pamphlet published in 1826, and was for some time the popular means for getting communication with a wreck. Its weight, with its bed, was about 3 cwt., and it carried a line of 1½ inches 200 yards, by a 24 lbs. shot, and a deep sea line 270 yards against a strong wind. I give a quotation of value from Mauby's pamphlet. "It is of the first importance for a lifeboat to resemble as much as possible those which the beach men are accustomed to and have confidence in, not only because it is necessary to humor the prejudices of such men, but whatever tends to increase their confidence must increase the chance of saving life." Whatever may be said of Manby's antiquated notions, the above advice is sound. The Boxer accelerating rocket has entirely superseded the Manby mortar in England. The effect is that, when the first charge is expended, when the rocket has attained a certain elevation or range, a second charge is fired. The line used is made of Italian hemp, 500 yards length and weighing 46 lbs. After getting the line on board a vessel, other, larger lines are hauled off, and finally a hawser is set up, and communication is established by means similar to those in your illustration. The principal objections to the general use of the Boxer rocket by the United States stations, and by humane societies, lies in the fact that it is costly, and that the inventor has given the right to use it into the hands of parties who naturally desire to profit by its sale. Could we have the privilege of manufacturing it in our laboratories, the cause of humanity would be greatly advanced.

I have been informed that the German government has in use a rocket which has a range of 800 yards, which is nearly double the range of the Boxer rocket. It has also another advantage over it by reason of the staff being attached in a direct line with the body of the rocket, which insures more accurate aim, the staff of the Boxer being attached to the side of the rocket. Measures should be taken to make rockets of our own, and if possible beat our transatlantic humanitarians.

In a report by Commander Jerningham, when Comptroller of the Coast Guard, he says: "The experiment at Woolwich gives the following results: Manby mortar, caliber 5½ inches, elevation 33°, charge 10 ounces. The mean distance carried in 20 rounds was:

In fine weather, 6 thread Russia line, 245 yards. In fine weather, Manilla line, same size 285, yards. In moderate weather, with fresh breeze, hemp line, 237 yards. In moderate weather, with fresh breeze, Manilla line, 279 yards. In strong gale, squally, elevation 28°, hemp line, 211 yards. In strong gale, squally, elevation 28°, Manilla line, 243 yards.

A strong wind requires less elevation than a moderate wind. A cross wind reduces the range more than a head wind. The quality and amount of powder is of much importance. A Manilla line, laid up slack, will stand 16 ounces when 12 will break a hemp line; 120 fathoms of Manilla weighs 11 lbs. against 15½ lbs. of Russian. Lines properly balled, after the manner of spun yarn, were found less liable to foul and more portable than lines carried on racks in boxes. Manilla rope beckets attached to the shot are best; one shot was fired 27 times with the same becket. Manilla line will absorb less water and be liable to less injury from being put away wet than hemp."

For want of space I cannot more fully quote this paper of Jerningham's. He alluded to firing off a block and double line when the wreck is near enough, in the same manner as Rogers does. He also speaks of an anchor shot that he had fired, in moderate weather 210 yards, in a gale 150.

In 1870 my attention was called to Rogers' apparatus. A report of trials made by the Admiralty states, in brief, as follaws: "His anchor weighing 134 lbs., with a block and line making 200, was thrown 134 yards from an 8 inch mortar with 12 ounces powder. In another experiment the anchor was thrown from a common howitzer."

And again Captain Boys, of the Excellent training ship, fired an anchor weighing 128 lbs., with a block and line of 1 inch, 156 yards with 8 ounces powder, once 152 yards, once 163 yards, and in the fourth shot, with 12 ounces, 217 yards. Experiments were made with Rogers' anchor at Liverpool, throwing a 1 inch line 200 yards, and a smaller one 400; but in this last case, the line broke. In November, 1870, the Royal Naval Reserve Club resolved that "this meeting strongly recommended its adoption by the Royal National Lifeboat Institution." The Royal National Lifeboat Institution, through its executive agent Captain Ward, R. N., expressed the opinion in a letter to me that Rogers' apparatus would not take the place of the Boxer rocket, as he thought the anchor shot would be likely to attach itself to the wrong place; at the same time he said that Rogers had succeeded in throwing his anchor much farther than he expected. Notwithstanding the opinion of Captain Ward, I hope that the Rogers apparatus may be utilized in this country, where we have no Boxer rockets. If adopted, it may be made useful in throwing an anchor off shore to facilitate the launching of lifeboats. In cases like that of the Italian bark Giovanni, lost on Cape Cod, with all her crew save one, last March, the distance being 400 or 500 yards, the mortar of the government failed to carry a line far enough. In a case like this, the new German rocket would be very useful.

The cost of the Boxer rocket apparatus, as I learn from I. and A. W. Burt, London, is $625, which includes 24 rockets and sticks, 20 lights, 20 portfires, primers, lines, boxes, whip, hawser, tally boards, blocks, slings, triangle, 2 Ward belts, life lines, flags, tubes, fuzes, diagrams, and packing. Formerly Dennet's rockets were used by our society, but they were found to deteriorate by the necessary exposure on sea beaches; and they sometimes burst prematurely, so that our society has long ago discontinued their use.

The French use a different method from the English. Their lines are thrown by means of what they call *fléches* or arrows; more properly, they should be called clubs or sticks of wood, as well as of iron, which are thrown from various pieces of ordnance. The wooden ones have the advantage of floating sometimes within reach of the wreck.

A full detail of these means was given in a pamphlet published by me in 1872, to which I refer. Could we exercise as much ingenuity in devising means for saving life as we do for killing, many lives might be saved.

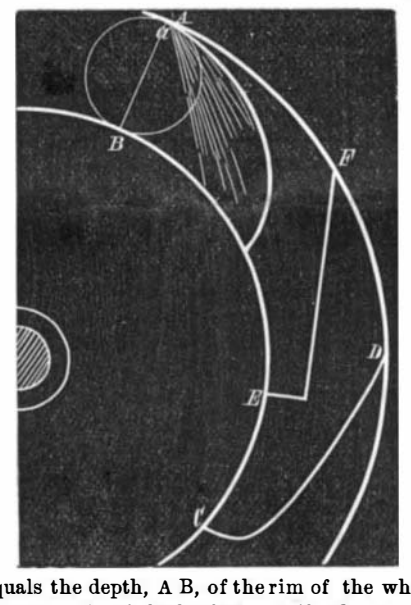
Boston, Mass. R. B. FORBES,
Chairman of Standing Committee of the Massachusetts Humane Society.

Water Wheel Buckets.

To the Editor of the Scientific American:

I give you a rule for the construction of the buckets of overshot water wheels, which I have never seen in print:

Make the inner face of the buckets in the form of an epicycloid, generated by a circle (whose diameter, *a* B, see diagram, equals the depth, A B, of the rim of the wheel, *minus* the thickness, *a* A, of the buckets) revolved upon the circle, B E C, which forms the back of the buckets. Then the outer corner, A, will be flush with the rim. As may be seen by rotating the diagram, this form of bucket retains its water better than either of the forms, C D and E F, in common use, but does not carry any too far, that is past, the lowest point of the wheel.



TOWNSEND WOLCOTT.
New York city.

American Inventions in Europe.

To the Editor of the Scientific American:

One characteristic of American exhibits, in the world's fairs held in Europe, is that they do not consist of products so much as the agents for producing. Our tools, machines, and inventions are exposed before the world in a manner that conduces much to our credit as ingenious and persevering, but with a corresponding loss to our material interests, as any one who has examined the matter carefully must know. I am fully convinced that not one in a thousand among our implement makers knows to what extent and with what success our American products become models in Europe, and it is to call some attention to the matter that this is written.

Every circumstance in our country tends to promote this exposure of our tools and processes. Our isolated position from the rest of the manufacturing world, and the prohibition of imported tools by a high tariff, prevents a knowledge of what is done by others; and while we rely solely on our own resources in devising machines and processes, other countries not only employ their own skill, but draw on us for all that is of use to them. Our skill is the base of any success we have had or can hope for, in creating a foreign market for American manufactured products. This every one knows; and yet we throw open our workshops to the inspection of every one, with a recklessness which is astonishing to people in Europe; and we seem to have no secrets worth preserving. A German, Swede, Pole, Russian, or other foreigner has, as a rule, only to present a card at the doors of our workshops to be admitted and have every process pointed out and explained. This is not so in other countries, especially in those from which we can hope to draw useful suggestions as to commercial policy.

Without ignoring in any way the influence for good which may come from the reputation gained by exhibiting our handicraft, I would beg our engineers and manufacturers to consider that such influence is a weak one compared to price when it is desired to influence a buyer. The money cost of a product is the only sure base upon which a market for it can be made; and while foreign orders may be, as they now and then are, secured, such orders will not be repeated unless we produce the article at less cost than it can be copied for in Europe. I repeat that our only power and hope of a foreign market, now so much needed, lies in two things: skill in producing superior to, and labor more effective than, those of Europe. Our boundless natural resources may be balanced against three or four thousand miles of sea carriage, if we only keep our processes to ourselves, and show finished products instead. To go to America to learn to manipulate processes in working iron and wood is becoming part of the education of young mechanics and engineers from North Europe. I could at this time give names of many who are making, or have made, this kind of tour through our workshops. Hundreds, yes thousands, come to America to become skilled, and then return home to astonish their friends with what has been learned, and to reap the result in higher wages, which for a time will be paid for their services.

I may be asked: How is this to be prevented? The answer is simple enough. Shut up the shops, admit no one not supplied with proper reference, and not then, if the object is to acquire special information. This is done in England, thoroughly and completely, and nearly as well on the continent. Why cannot it be done in America? It may be said that our tools and machines must be shown in order to sell them, and that they must be exhibited next year at Philadelphia. This is true; but there is a wide difference between showing completed tools, implements, and machines, and in exhibiting the mode and processes of constructing them. Suppose the Waltham Watch Company, who have just occupied their magnificent new premises in London, were to send over some of the Clerkenwell manufacturers' skilled men to examine the operations at Waltham, and then furnish to these men a set of machines and tools like those in use at Waltham. How long would the business of exporting watches last? Yet this is what is continually done in many branches of our manufactures. Those operations of manufacture which do not find their way into our scientific journals—little things, not scientific and seemingly unimportant—very often determine the cost of products, in a way to secure or lose sales abroad. "It is the last cent that tells," and this last cent is generally taken off by some simple little expedient which, for a stranger to see, is for him to have and for us to lose.

These things would soon be understood and appreciated if our implement makers would visit certain parts of Europe which I could point out, and see the copies of our machines and tools exhibited as "improvements on the American,' and hear (to explain the assumption) how "Americans are cunning and inventive, but without the power to apply their knowledge, because not educated," and so on. Something of this is done in England and France, but not much. These countries are not small enough and petty enough to tolerate such things; beside, we are too well known to be charged with incapacity.

A word of caution in this way will not be out of place for the coming year. Thousands in Europe are waiting for a raid on our workshops; and while nothing should be done to detract from the character of the Exposition in Philadelphia, you will excuse me for suggesting that the influence of your widespread journal could not be better used than in giving stronger expression to the present subject than is possible at the hands of OBSERVER.

Electric Force and Molecular Motion.

To the Editor of the Scientific American:

Mr. W. E. Sawyer, in his letter on "What is the Electric Force?" in your issue of October 9, says: "When one pulls a bell cord, and instantaneously a bell is rung in a distant room by the molecular transmission over or through the bell wire of the force applied at the cord, does not one realize that he is as veritably, as wonderfully, and by a similar molecular motion, transmitting that signal as though he were transmitting it by applying a battery to a telegraph wire, and thus setting the atomic particles in motion?"

I propounded the above question to myself, endeavored to realize it, and failed signally; therefore I apply to you for help, and trust it will be given, for Mr. Sawyer's explanations of the electric force seem so clear and forcible as to enable almost any one to form a good idea of the subject.

When one pulls a bell rope, causing a bell to ring at a distant point, one can readily realize the disturbance of the atomic particles from ocular demonstration. He sees the movement of the cord where the force is applied, and also where the bell lever receives it, and the only rational explanation is that of molecular transmission.

In the case of the telegraph, he sees no motion, either where the force is applied, or where it is taken off, even when the force so applied is very powerful. However, this may be deduced by reasoning, as Mr. Sawyer so ably shows, but the real difficulty is at the end, where it is utilized. The wire terminates in a coil, and inside of this coil, entirely separated from it, is a bar of metal, and entirely separated from this is the bell lever. Now it is difficult to conceive how the mere molecular disturbance of the wire causes a like disturbance in the bar, which again causes the same in the bell