also a small portion extending beyond them, namely, to the correct outline of the core. The bar is generally from half an inch to one inch smaller than the core, as will be seen in the sectional end view, Fig. 177. A notch is cut out of each wing to admit of the insertion of a perforated tube on each side for ventilation. The core bar, F, and the perforated tubes, G G, are shown in Fig. 175, imbedded in the core.

Fig. 176.

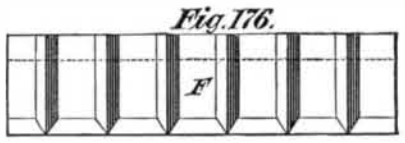


Fig. 177.

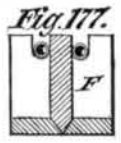
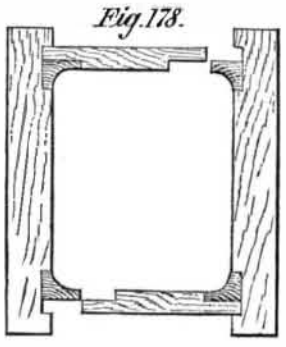


Fig. 178.



As there are not any core prints required to form the openings at the back of the column, the cores for these openings are made in a box not thicker than the intended thickness of metal in the column. Such a box is shown in Fig. 178, though, for the sake of cheapness, when the columns are not more than half an inch thick, the core box is sawn out of one piece.

Fig. 179.

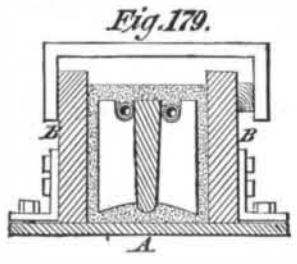


Fig. 179 is an end view of the core box, with core, shown in Fig. 175, but with the addition of the wooden binder, which serves to assist the brackets in holding the sides. B, of the core box together, which is necessary when the core box is very deep.

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

The House bill relating to infringements, referred to in a previous letter, have been postponed to next December; in consequence of so much opposition being made to it, the Committee on Patents have been authorized to sit during the recess to revise and amend the patent laws. This bill will probably receive further consideration, when it is to be hoped that the obnoxious features will be eliminated or the bill dropped altogether. I understand that, among other amendments, the committee will be requested to consider the following: Separation of the Patent Office from the control of the Interior Department. The Commissioner and other officials, down to and including the examining corps, to hold their positions for life, or during good behavior. All the receipts of the office, under proper safeguards, to be used for facilitating its business. All agents, before being admitted to practice in the Office, to pass an examination as to competency. Everything relating to transfers of patents, including licences, to be recorded within sixty days. That owners of reissued patents shall be able to sue for infringements that occurred before the reissues were granted for such points as were covered by the original patents; and that applications and oaths for reissue applications may be made by the assignees of entire interests. These amendments to the present law I believe on the whole to be good sound doctrine, and such as will commend themselves to the majority of the people, whether inventors or not.

There is another point that should be considered, and that is the question: What to do with the models, where to put the vast accumulation (some twenty thousand per year), that are constantly arriving and have to be disposed of some how? There is yet room for a gallery on one side of the south hall, if Congress would but allow the Patent Office to use some of its own funds to build it; but, even if built, there would not be more than sufficient room to properly dispose of the models now lying around loose on the floors, stacked on the tops of the cases, and piled up one upon another on the shelves of the model cabinets until the under ones become broken from the superincumbent weight, and from the handling they receive in taking them in and out of the cases to make examinations. So many models have been destroyed by this method of storing in times past that there are cartloads of broken pieces stowed away in out-of-the-way corners.

If a little "more light" could be let in through the ceilings of the north and west halls, there is room for an additional gallery in each of them; but even these, if built, would soon be filled at the present rate of increase. In view of this, why not in future dispense with the models in such cases as do not actually require one to illustrate the invention? As the law now stands, the Commissioner can dispense with the model if he chooses, and for a year or so there were many patents issued without models being required; but for four or five years past, models have been required in all cases in which a model could be used. In the majority of applications models are not necessary to show the invention, and the only use for them in such cases is that they may be placed in the model room in order that inventors and others may see them when making preliminary examinations. As a printed copy of the drawing, suitably mounted on stiff cardboard and placed in the model cases or in adjacent portfolios, would answer quite as well, and not take up one hundredth part of the room, the model in nine cases out of ten might as well be dispensed with as not, and the inventor saved the expense of furnishing and the Office the expense of finding room and taking care of it.

Another point that should be considered by the Patent Commissioner is the necessity of having a complete system of digests published, after the style of the English abridgements. Some of the examiners have prepared partial digests of various subdivisions of their classes for their own use, but these are not accessible to most people; and some three or four such digests have been published, but at such high prices that the majority of inventors cannot purchase them, and they are therefore comparatively useless as compared with the great good that such publication would do if they could be issued at about the cost of printing, to say nothing of the advantage such digests would be to the examiners themselves in making their researches.

In my last, I stated that a bill had been passed appropriating money to build a national museum. I have since found, however, that my information was incorrect, and that it had only passed one House. It therefore failed to become a law, and the immense collection of Centennial exhibits will have to be stored for a year or so longer, and many of the articles be irretrievably ruined, and some of them may be withdrawn altogether. The collection is a very large one, and should be properly displayed and taken care of. The following is a list of the more important donations:

Argentine Republic: Almost the whole of the exhibit in Agricultural Hall, and the most of that in the Main Building, comprising ores, metals, pottery, tiles, stuffed animals, woods, fibers, leather, agricultural and fishery products.

Brazil Specimens of iron, coal, hides, leather, tiles, pottery, woods, vegetable fibers, food substances, gums, resins, etc.

Chili: A collection of minerals, artificial stones, tiles, terra cotta, and an extensive variety of grains, seeds, and other vegetable products.

China: The entire collection made by the Commissioner of Customs, including a complete representation of the manners and customs of the Chinese, having numerous full-sized figures beautifully executed and suitably dressed. Many hundreds of clay figures about one foot high representing the different classes and races of the empire, with specimens of their food, medicines, domestic utensils, musical instruments, samples of their manufactures, buildings, etc.

Egypt: Collection of minerals, tiles, pottery, garden products, woods, and a large collection of objects illustrating the manners and customs of the natives of Soudan, Nubia, and Abyssinia.

France: Messrs. Havilland, of Limoges, presented a pair of Centennial memorial vases valued at $17,000.

Germany: Tiles, cements, asphalt work, and manufactures in metals. Krupp, the great iron manufacturer, presented an extensive display, illustrating the mineralogy and metallurgy of Germany, with samples of his different manufactures.

Japan: Pottery and tiles, and a large exhibit of fishery products and apparatus, skins and hides of animals, food preparations, and a series illustrating the manufacture of tea, silk, and bamboo articles.

Mexico: Minerals, ores of gold and silver, obsidian, woods, fibers, pottery, and terra cotta, an iron meteorite weighing 4,000 lbs., etc.

Norway: A large collection of ores and other specimens exhibiting the metallurgy of iron, copper, nickel, etc., and a collection of the eatable fishes of Northern Europe, food preparations, etc.

Portugal: A very extensive exhibit of ores, minerals, etc., samples of industrial and vegetable products.

Russia: An enormous collection exhibiting the metallurgy of copper and iron, a very valuable collection of the minerals of Siberia, samples pottery, tiles, cements, etc.

Spain: A large collection illustrating the mines and mining of the kingdom, also its manufacturing and agricultural products.

Sweden: The entire exhibit of this country in the Agricultural Hall and photographs of arctic scenery.

Turkey: Illustrations of its metal work, mines, minerals, tiles, pottery, domestic and household utensils, etc.

Great Britain: A very large collection of the private exhibits of tiles, terra cotta, pottery, mosaic work, from Minton & Hollins, Doulton, and others. Among these are some very large vases, a terra cotta pulpit, and a group showing an allegorical representation of America, embracing several colossal figures, valued at $15,000. A complete collection, embracing over 300 varieties of wool from all parts of the world.

In addition to these, smaller collections from nearly all the other countries in the world that had exhibits in the Centennial have been received, making a most complete series of illustrations by which the manners, customs, manufactures, minerals, etc., of the different peoples of the world can be studied, the whole of which it is estimated to be worth over a million of dollars, and comprising a considerable section of the Centennial Exposition which may be examined by ourselves, our children, or children's children at leisure and without cost.

Congress, before adjourning, passed several acts authorizing the extensions of patents, but I have been unable to get a list of them yet, although I have made many attempts to obtain them. There is no accessible list of the bills that are passed, and no way of finding out until all the bills are printed.

The new Secretary of the Interior is fairly—or unfairly—besieged by applicants for office, but, as far as I can find out, with very poor success, and it is believed that very few changes will be made in the Patent Office. The present Commissioner, it is generally considered, is "the right man in the right place," and is likely to stay unless the President ignores the civil service reform altogether in his case.

The patent attorneys of this city have organized an association under the general incorporation act, known as the "Patent Office Bar Association of the District of Columbia." The objects of the association, as set forth in its constitution, are "to maintain the honor and dignity of our profession and increase its usefulness, promote the proper administration of the patent laws, and the protection of the rights and interests of inventors and patentees, and to secure a proper standard of character and qualification, and a prompt responsibility to public judgment among the practitioners before the Patent Office." Qualification for membership consists in being of lawful age and good moral character, and qualified by education, training, and experience to pursue properly the business of patent solicitors or attorneys. One of the objects of this association is believed to be the preventing from practising of the large number of irresponsible shysters who abound in Washington, who know nothing of patent law or practice, but who have the effrontery to advertise themselves as patent attorneys, and by offering to "put cases through" for very low fees, or on the "no patent, no pay" system, defraud their trusting clients and bring disgrace on a respectable body of gentlemen who have to suffer the obloquy of the wrong-doings of these miscreants. Several of these fellows have been debarred from practising for defrauding their clients, and it is probable the others will be shortly.

Washington, D. C. OCCASIONAL.

Lightning Rods—How the Centennial Buildings were Protected.

To the Editor of the Scientific American:

Your recent articles upon lightning rods supply much-needed information relative to the most important requisites for protection. The following system, as applied to the Centennial Machinery Hall, combines great economy with the most perfect protection and security, and may frequently be adopted with advantage for large buildings.

The tin roof of Machinery Hall has an area of 14½ acres, and this is utilized as a lightning conductor in this manner: Rising above the roof are 100 wood terminals (used as flag poles), to each of which is attached a copper wire rope ⅜ inch in diameter, its upper end rising a few inches above the top of the pole; at its lower end the wires are spread out, and 3 inches of its length is firmly soldered to the tin roof. Earth connections from this massive roof conductor are made at ten different places by soldering one end of copper ropes to the tin roof, the other end being firmly attached to 8 inch city water pipes in the ground. Thus it will be seen that every square foot of this huge building is covered and thoroughly protected by an ample conductor; and it is believed there is no building in this country so perfectly protected as this. The total cost was only one tenth the amount requisite to protect it in the usual way with rods, or less than $50 per acre.

Earth connections being all-important in all cases, I would recommend the following for country buildings: Extend the lightning rod underground, say 20 or more feet from the building; fasten and solder to its end a sheet of copper 2 by 4 feet; dig a pit 3 by 6 feet, and 4 to 6 feet deep; put 2 inches in depth of finely broken charcoal over the bottom, then put in the plate and rod, with another layer of charcoal and a few inches of earth; then fill up to surface with loose cobble stones, leaving it so that the rainfall can freely find its way down to the copper plate; water from the roof may be led into the pit. One such earth termination is of more value than half a dozen of the usual kind.

Philadelphia, Pa. J. D. RICE.

Heating with Natural Gas.

To the Editor of the Scientific American:

In your recent article on wholesale heating, you ask why some town does not immortalize itself by using natural gas as fuel. It is used extensively throughout the Pennsylvania oil regions; and this town is supplied by a well three miles distant, through a three inch pipe, which is being replaced by a five inch one, to be continued to adjacent towns. The gas is used direct from the well without a gasometer; and owing to the variation of pressure, it is somewhat dangerous in careless hands. For lighting it is but little inferior to coal gas. With a good fishtail burner, it burns without smoke, and with almost as brilliant a flame as the best artificial gas. The present pressure at the well is about 65 lbs. per square inch; and with a gasometer to equalize the pressure, it would be the best and safest fuel in use. M.

Millerstown, Pa.

An Electrical Balance.

At a recent meeting of the Institute of Mining Engineers, Dr. P. De P. Ricketts exhibited an electrical phenomenon with an analytical balance. By rubbing the glass case the balance was thrown out of adjustment, which could be restored by discharging the electricity of the glass. The possibility of errors in analysis resulting from this cause were apparent.

A Sheffield Cutlery Manufactory.

Joseph Rodgers & Sons' cutlery works rank the first of the kind in the world, the factory having been established above a century and a half ago. The firm has a world-wide repute, and there is no doubt that the remotest country on the globe uses Rodgers' cutlery. The extensiveness of the manufacture and trade need scarcely be mentioned. Nothing, perhaps, in the shape of household articles—with the exception of crockery, which runs hand in hand with it—is so necessary and so much used as cutlery. The factory employs a large body of workmen, and the works are divided into a number of departments, such as the forging, the grinding, the polishing, the handlemaking, and various other departments. But the number of processes which the manufacture of each single knife has to go through before it is completed and ready for sale is something incredible. The first process is the forging. The workshops are generally small—for the forging of almost every kind of knife, with the exception of carving and larger knives, requires only one man. Many of these are connected with each other, and are all on the ground floor, the upper floors being occupied by more delicate processes. Each workshop contains a forge, one or two hammers, a pair of tongs, a long narrow table—on which the length of the blade to be forged is marked—a bucket or a small tub containing water, and several other necessary tools. With these the process of forging is executed with the greatest rapidity and precision. An experienced and skillful workman is able to forge 200 blades of ordinary penknives in one day, at the average of one blade in three minutes. The steel bars used for making blades are prepared in a separate department. They are made of different widths and thicknesses, according to the various kinds of knives to be manufactured. For penknives they are, of course, thin and narrow. The process is very simple. The steel bar (at first four feet long) is put into the fire, just a little longer from the end than the intended blade. When sufficiently soft it is taken out, and the red hot end cut to the exact length indicated on the table; and immediately after the bar of steel is again heated, in order that while the workman is forging one blade the material for another may be ready by the time he has finished it. Now, with the tongs holding the red hot piece in one hand, and the hammer in the other, the workman, standing at a short distance from the anvil, which is raised to a convenient height, executes his work with astonishing rapidity, for the entire blade is formed with a succession of only a few quick raps. Such is the skill of the workmen that the eyes of an ordinary visitor can scarcely detect any difference between any two of the newly forged blades. This done, the rough blade is once more buried in the fire, and a minute after it is drawn out and plunged into the bucket of cold water, by which process the blade is hardened.

The handle part (the stock of the blade and the pointed piece inserted into the handle) of a table or carving knife is made of iron. The joining is effected by heating the piece of iron cut off from a bar for the purpose and the handle end of the blade, and then welding them together; the proper shaping, with the indispensable pointed piece, has all to be done at once. Two men are required to carry through this process. It is very amusing to watch the dexterous movements of their hammers, which seem always to hit the right part mechanically, following, as it were, the rapid turning about of the material, well held in the grip of a pair of tongs under the management of one of the men.

From the forging workshops the blades are transferred to the grinding department, which comprises a number of processes; hence one knife generally goes through more than half a dozen hands before it is ready to be handled or cased. The grindstones are the same as those in ordinary use, and are worked by machinery. They are of different sizes, and vary extremely in quality—that is, from the coarsest stone for the first process to the smoothest used in the last. We were told that the quality of the steel of all knives (at least of the same forging) is exactly the same, and it is the process of grinding that the fate of the blade—its future quality and value—are determined. Hence, if 100 penknife blades were handed from a forging shop to the grinding department, 70 of them may perhaps go through the shilling processes, while the remaining 30 may go through superior processes, and afterwards be valued at half a crown or ten shillings each. Many perhaps would be puzzled at this mode of doing business, and would probably ask: "Why are not the whole hundred knives, etc., made the value of ten shillings, for the profit would then be greater?" The answer is simple. The half crown and ten shilling blades go through a greater number of processes than the shilling ones, and more care and attention are bestowed upon the work. Care and attention mean valuable time, and valuable time signifies great expense. However, the quality and value of a knife do not entirely depend upon the grinding; for as the price of a book is very often made lower or higher according to its binding so does the value of a piece of cutlery depend in some measure upon its handle or case. For instance, we were shown two razors of the same steel and forging, and were told that one was a shilling razor and the other half a crown. Now the cause of the great difference was simply this: the shilling razor had only a cow's horn handle, while that of the other was made of ivory, and, of course, its blade was better ground.

The processes subsequent to the grinding are stamping of the name with the words, "Cutlers to Her Majesty," and the corporate mark, the putting on of the handle, and the polishing. The corporate or trade mark (* +) of the firm of Joseph Rodgers & Sons consists of a star with six points and a Maltese cross. It was granted in 1764, and is valued at $300,000. Every piece of cutlery manufactured at these works bears the name and the well known mark.

The process of putting on handles to table and carving knives is very simple; but in the case of pen or pocket knives, where there are several blades, or any other kind of cutlery which is to be opened and shut, the work is a little more complicated, and therefore requires greater skill. In putting on the pins or rivets the workmen have to be very careful, in order that the blades may open and shut freely. The handles are made of elephants' tusks, pearl, and tortoise shell, and various kinds of wood, also stag and other horns. The former are imported from Africa and India, the African tusks being the finer and dearer. The tusks and horns are cut to the sizes of the required handles by machine saws, and afterwards they go through the more delicate processes of shaping, boring holes, etc. Lastly comes the polishing process. This is effected by applying the handles to revolving brushes, made, not of hair, but of linen stuff. The material is cut out in circular pieces of about 4 inches in diameter, with a round hole in the center; these pieces (a large number of them) are laid one on another in a cylindrical form, and the whole is then slipped on the spindle, the pieces being tightly held together by two small boards, one on each side of the spindle. These brushes are worked by machinery, and the effect of this mode of polishing is beautiful—smooth and bright; but the polish shows itself to the best advantage on dark handles, such as the ordinary shilling razor handles, which are generally made of cow's horn dyed or painted black, or variegated. This ingenious contrivance is an American invention, and is now largely used in works wherever polishing of this kind is necessary.

The men employed in this factory are paid according to their merit and capability, which plan can well be adopted with advantage in works of this kind, because it encourages them always to endeavor to do their best. It would be needless to mention the order and discipline we witnessed in Messrs. Rodgers' works, for any such attempt would be no addition to the long established fame of the firm; but it may simply be said that in this point of view no other works in England can be better conducted.

The show room, which we inspected on arriving and before leaving, was most attractive. The elegant and tasteful display of the various productions of the works—cutlery in all its forms—appeared magnificent. Penknives, table, and carving knives, scissors, razors, together with specimens of the electroplate works, are so arranged as always to be ready to attack the weak side of the liberal purchaser, especially of the fair sex. Two very curious pieces of cutlery adorn the show room. One of these is a kind of a huge "tool pocket-knife," consisting of 79 instruments—saw, corkscrew, gimlet, bradawl, file, etc.; the other has 1,876 blades to correspond with the Christian year, one blade being added to the number at the beginning of each year. These two, together with an enormous giantlike razor, are exhibited as curiosities of cutlery, and indeed they deserve that title, as they seem to be quite works of art.—*English Mechanic.*

A Novelty in Sonorous Tubes.

Our esteemed correspondent, Professor A. Ricco, sends us the following note from Modena, Italy:

"On blowing into a rubber tube having a spiral inside, such as is used for exhausting air, a note similar to that of a flute is heard, which becomes more and more acute the harder we blow. The successive harmonics up to the highest are thus obtained. By the use of a manometer, it is found that the necessary pressure of air is proportional to the square of the number expressing the order of the harmonic, or of the number of vibrations; which proves that the sound depends upon the velocity of the pulses of air striking against the turns of the helix. The notes are better when the tube is wound about itself. The diameter should not be large, and the length may be from 3 feet 3 inches to 26 feet. The long tubes give the most notes. Catching hold of one end of a tube and whirling it about like a sling, the centrifugal force produces a current of air and causes it to sound. A. RICCO, Professor.

"Modena, Italy."

Translator's note: The rubber tube referred to is one in which a wire helix has been inserted to prevent it from kinking or flattening out. This helix acts as a reed. Not having such a tube at hand, I succeeded in producing a number of distinct notes with an ordinary rubber tube; and my friend, Mr. Geyer, who is a better musician, inserted the *embouchure* of a French horn in a rubber tube a little over 5 feet long, $\frac{1}{16}$ inch thick, and having $\frac{1}{4}$ inch aperture. He then obtained a series of clear notes, which may be expressed by the following notation. Calling the lowest note produced the first harmonic (C), and the fundamental (C), we have

	C	C.	c.	e.	g.	c.
Rate of vibration,	1	2	3	4	5	6	8

C. F. K.

Digging Wells Deeper.

In some districts there is probably no remedy for dry or empty wells, especially where water is found just upon or above granite or rock foundation. When the usual supply is exhausted, there is no other recourse but to wait for the influx of water from heavy falls of rain. Such cases, however, are exceptional, and in most localities the simple remedy for lack or scarcity of water is to deepen the wells. By digging down to water in a time of drouth, a never-failing supply is usually secured—in fact, it is almost impracticable to obtain it at any other time, as an excess of it prevents going to a sufficient depth. The easiest method with which we are acquainted for reaching water in a well already dug, but dry, says the *Portland Press*, is to sink a barrel or hogshead its entire length at the bottom of the well. This barrel or hogshead should be made of ash or oak, well hooped and without heads, and of such diameter as to allow of its easy descent inside of the bricks or stones of which the well is made. The earth and water can be removed in the ordinary way, and as the amount will not be large, without the use of the more expensive methods required in digging a well from the beginning. The bottom of a well will not be found to be the coldest and most uncomfortable place in the world at this season of the year, and we presume the entire job can be done with less risk and suffering than is incurred in some morning tramp to a distant stream with a drove of farm stock. While we recommend and prefer this way on account of its economy and simplicity, and because it secures a present and future supply of water, we also advise as a temporary expedient the substitution of the iron pipes used in the drive well system. These may be very readily driven down in a dry well to the necessary depth and connected with a pump, and subsequently upon the return of high water as easily removed. We trust that none of our readers will be guilty of abusing themselves or their animals by unnecessary exposure to the cold in search of water. If practicable, they should without delay test the plans suggested, or any others that their ingenuity may devise.

The Science of Preaching.

The Rev. Dr. Swing, editor of the *Alliance*, of Chicago, says: "If a clergyman feels that something should be said to telegraphers, he should not try to find a pole and lightning in the sacred word, but should honestly confess that the Bible does not specify any of the day or night operators, and that hence he will not take a text, but will speak to men in the spirit of Christ, and not from a figure by Job or Ezekiel. This bondage to a text was well ridiculed by the story of the man who preached against lofty headdresses from the words: 'Top not come down.'

"Inasmuch as the world has become larger and fullersince the Scriptures were compiled, the clergy should not expect to find in those records any special advice to railroad men or steamboat captains, and hence would do religion more service by omitting a text than by citing Jehu as a prophecy of fast travel, or by alluding to Noah as a great captain on the high seas. Textual preaching is a good thing when there is an idea in the text to be developed; but when a preacher has a valuable lesson for a book agent or a sewing machine man, he need not soil his concordance to find what mention the Bible has made of these two forms of itineracy. Of course, he might find a remote allusion to them in the prophecy that in the latter days of the world great tribulations should come; but so many in the audience would doubt this application of the passage that it would seem better to preach to the souls of the agents and let the text go by the board. What a preacher needs most is not a doubtful text, but a real subject."

Watering Ships in Mid-Ocean.

M. Toselli, that exceedingly prolific inventor of diving machines and wreck-raising apparatus, proposes the very original idea of utilizing the springs of fresh water which are known to find their outlets on the bottom of seas, in order that vessels may always obtain a constant supply of pure water even when in mid-ocean. His mode of putting the notion into practice sounds easy enough; but we doubt whether it will prove so simple when it comes to be tried. The first thing to do is to find the springs; and that, we should imagine, would resemble a search for extremely small needles in a colossal haystack. But M. Toselli thinks that they can be found—the springs, not the needles—and he says it only remains to secure tubes to the outlets, of sufficient length to reach the surface, buoy them of course, and there are inexhaustible wells always available. There are some minor difficulties of the tubes being carried away by storms or ocean currents; but these, as well as those pertaining to the discovery, the indefatigable inventor tells the French Academy of Sciences he has overcome. We hope he has.

Poisonous Fireworks.

A correspondent, referring to our article under the above heading stating that a lady in Bristol, N. H., died from the effects of fumes from red fire, doubts whether this was the cause of her death. But if the red fire used was such an absurd composition as nitrate of strontia, black sulphide of antimony, sulphur, and chlorate of potash, it is evident that the arising gases must be injurious to health. Many recipes current in newspapers, scientific books, and even school books, are bad, and are evidently copied from some old, obsolete publication. "Properly made red fire," says our correspondent, "should contain no sulphur or antimony in any form whatever."

A PATENT has been taken out in France by M. Béranger for the cleansing of wool, woolen goods, woolen rags, etc., by means of sulphate of ammonia with heat; the stuffs to be treated are submitted for twenty minutes to the action of sulphate of ammonia and water marking 5° or 6°, then dried by means of the centrifugal machine and the stove. It is said that the color of the goods, however dyed, is never affected by this treatment.