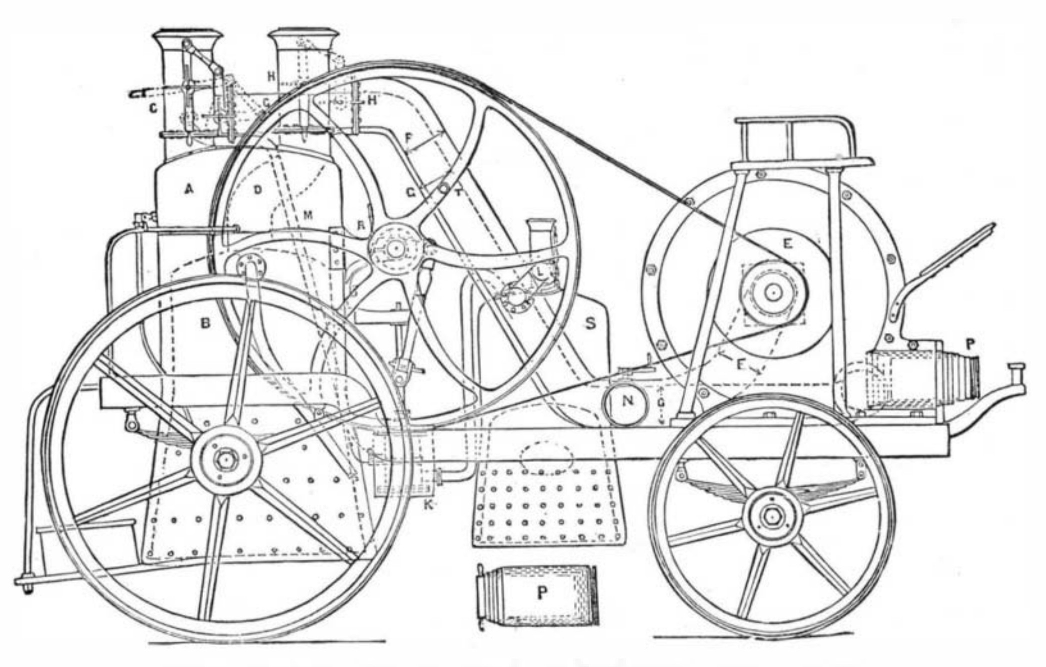
THE CARBON BLAST.

We have recently had brought under our notice a new principle of extinguishing fires. It is the invention of Mr. John K. J. Foster, and is being introduced in London.

In our engraving, A is a boiler or the jacket of a firebox, B, in which a fire is burnt for the purpose of vitiating air. It has an uptake, C, for steam from the boiler or jacket, and another, D, for the products of combustion from the fire box, B. E is a fan drawing the products of combustion from the firebox, B, through a pipe, F, connecting the uptake, D, with the fan casing. G is a similar pipe connecting the steam uptake, C, with the discharge outlet of the fan. H H¹ are throttle valves coupled so that when H closes the outlet through the chimney, H¹ opens a passage through F to the fan, and *vice versa*. A similar pair of coupled valves, I I¹, control C and G. S is a small high pressure boiler supplying steam to an engine, K, which drives the fan. Its chimney is connected with pipe, F, by a pipe, L, and a similar pair of coupled valves is provided to control the communication. M is the exhaust pipe of the engine leading to the uptake, C, below the valve, I. N is an opening in the suction pipe, F, of the fan closed by a throttle valve, which is only opened when ordinary pure air is to be admitted to the fan to clear a room of the vitiated air after a fire. P is the delivery pipe of the fan, made of metal in short lengths, fitted together telescopically. Other similar telescopic pipes, P¹, may be added on by screw couplings, or the delivery pipe may be otherwise constructed. The fly wheel of the engine is connected to the crank shaft by a clutch, so that it may be thrown in and out of gear by a handle, *r*, to enable the fan to be driven by hand at first by a handle, T, on the fly wheel, for the purpose of creating a draught in the furnace of boiler, S, the valve, I¹, then being shut, and the fan drawing air through the pipe, L.



THE CARBON BLAST FOR EXTINGUISHING FIRES.

We thus have what theoretically appears to be a very perfect means of extinguishing fires, and which we hope soon to see tried in practice. Our engraving shows an engine adapted for fire brigades, but for mills and factories generally the fan may be so adjusted to the furnace of the ordinary boiler as to be ready at any moment. Steam may be allowed to mix with the vitiated ai if advisable.

The fan would draw the atmosphere through the fire box, the oxygen would be destroyed, and could be conveyed into any room in the factory at will by a fixed sheet iron conductor of sufficient dimensions, having branches with valves to communicate with every room. In case of fire the fan could be turned by manual labor, when, on the valve leading from main flue into the room that is on fire being opened, in two minutes the room would be filled with vitiated air and the fire extinguished.

This same appliance, by simply opening one valve and shutting another (automatically), could be used to exhaust the warm, fœtid air out of any or all the rooms in the factory, or to force fresh air into the rooms at will. The whole of this apparatus would be of little cost, and when applied in the case of small fires, could not do harm as in the case of extinction by water; 20,000 feet of cubic air per minute can be put into circulation by hand power alone. The apparatus in this connection would be stationary, and independent of any other appliance.

For use by railroad companies the hose could be attached to the funnel of an ordinary locomotive engine. In case of fire at a station or goods department, all that would be required would be to run the engine near the fire, attach the tail pipe of the fan to the funnel of the engine; the air drawn through the fire would be vitiated or deprived of oxygen, and conducted by the blast conducting pipe into the burning building, and the fire would be got under at once. Another important application is that of ships. For steamships the fan could in case of fire be attached to the funnel exactly as for locomotives. With Foster's carbon blast the vitiated air could easily be conveyed into any part of a ship's hold. If the hold, or any room in a vessel, was filled with vitiated air and steam, no fire could live many minutes. For ventilation purposes the apparatus would also prove very useful. In short, there appears to be a wide field of usefulness for this invention, and we look forward with interest to its practical introduction.—*Iron.*

THE making of large lenses is a matter of many difficulties, as may be inferred from the fact that there have been nineteen failures to cast the thirty-six inch glass for the great Lick telescope to be mounted in California.

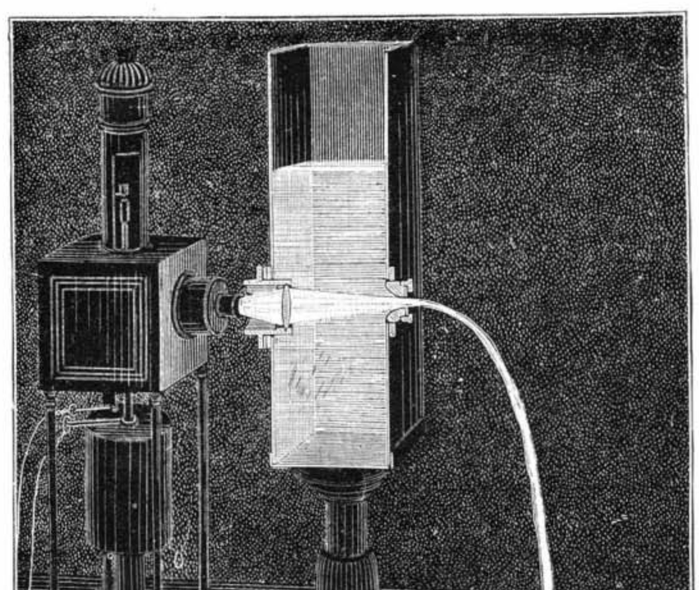
Centenarian Women.

Mrs. Phœbe Brockway died at Union Springs, N. Y., on the 14th of November, 1884, at the remarkable age of 112 years. She had four children, of whom three are still living, Mrs. Marshall Whipple, aged 80, Mrs. Menzie, and William Brockway. Mrs. Brockway was well known as a strong and active woman, who enjoyed excellent health until within a short period of her decease.

At Beaver Brook, Mass., on November 14, 1884, the 100th year of the life of Mrs. Elizabeth Putnam was celebrated by her children. The aged lady is still very vigorous, memory and all faculties in good condition. She has had twelve children, six sons and six daughters, all of whom grew up and were married. Two sons and three daughters still live. All the children lived to be over 66 years of age except two, one of whom died at 30 and the other 34. There have been 42 grandchildren and 24 great-grandchildren, many of whom are living.

Yellow Dye.

A. Poirrier, of Paris, has taken the first step in the direction of producing a yellow dye, to compete with Persian berries; this is the *Jaune solide*, an azo color fixed with acetate of chromium. Poirrier has shown that it can be used like the Persian berry yellow, and that it can be sold cheaper. If fixed alone, the *Jaune solide* gives fine orange-yellow tints of much solidity, and resisting soap and light. —*Manchester Textile Recorder.*



COLLADON'S FOUNTAIN.

THE COLLADON FOUNTAIN.

In my lecture courses I have often endeavored to render visible to all the pupils assembled in the amphitheater the different forms that are assumed by a stream of water issuing from various orifices, and it was for this purpose that I was led to illuminate internally a stream placed in a dark space. I have found that such an arrangement is well adapted to meet the object I had in view, and that, moreover, it offers in its results one of the most beautiful and curious experiments that can be performed during a course of lectures on optics.

The apparatus that I use for these experiments consists of an oblong vessel, about three feet in height, in one of whose sides, a little above the base, there is an aperture into which are screwed different diaphragms in order to vary the size and form of the jet. This latter escapes from the vessel in a horizontal direction. In order to illuminate it internally, an aperture is formed in the back of the vessel, and to this there is fitted a convex lens, while outside of the vessel there is added a short, horizontal, internally blackened tube designed to prevent the rays that are oblique with respect to the axis from entering the vessel.

The apparatus is placed in a dark room, one of the window shutters of the latter may be provided with an aperture for adapting the blackened tube to, and a fascicle of solar light may, by means of a mirror, be thrown parallel with the tube's axis. One may also employ with advantage an oxyhydrogen or electric lamp which throws a fascicle of horizontal light, as shown in the engraving. The luminous rays traverse the lens and the liquid, and converge in the aperture through which the stream is escaping; and when once they have entered the latter, they meet its surface at a sufficiently small angle to cause them to undergo a total internal reflection. The same effect is produced at every new point of incidence, so that the light circulates in the transparent jet as in a pipe, and follows all its inflections.

If the water be perfectly limpid, and the aperture of the diaphragm very sharp, the jet will be scarcely visible, although a very intense light is circulating within it. But at every point where the jet meets a solid body that interrupts it, the light which it contains escapes, and the points of contact become luminous. So, upon the jet being received in a vessel that stands horizontally, the bottom of such vessel will be illuminated by the light that issues from the apparatus through the jet. If the stream is falling from a great height, or if its diameter is but a few millimeters, it will be reduced to drops at its lower part, and it will be there only that the liquid will be illuminated, and every point of rupture of the jet will throw out a bright light. If a continuous jet is falling upon a surface capable of a certain number of vibrations, the vibratory motion will be communicated to the liquid, and the latter will then be broken to some height above the vibrating plate. This experiment of Savart, as well as several others that he has studied, and described in the *Annales de Chimie*, may be repeated and rendered visible by this new process. It will be understood, moreover, that it would be just as easy, by means of reflectors, to illuminate a jet that had any other direction, or to illuminate the interior of the jet with all the colors of the prism by interposing colored glasses between the lamp and blackened tube exterior to the apparatus. The only essential precaution to take is to use water at the temperature of the room in which one is operating, in order that no moisture may be deposited upon the lens. In experiments designed to render the jet visible near the orifice, in order to study the contractions of the stream, it is indispensable to render the liquid turbid by means of some solution or other or by dust. The light will thus be dispersed at the jet's exit from the orifice, and the liquid will become luminous at the upper part.

A fact that may be always observed with this apparatus is that slight blows against the vessel, near the orifice, made with a hard body, break the jet in the very plane of the orifice and produce therein true fissures, which are easily seen and which are very brilliant. Sometimes these fissures do not close immediately, but continue in the stream for some instants.—*D. Colladon, in La Nature.*

CANVAS bags, it is said, can be made as impervious to moisture as leather by steeping it in a decoction of one pound of oak bark with fourteen pounds of boiling water, this quantity being sufficient for eight yards of stuff. The cloth from which the bags are made has to soak twenty-four hours, when it is taken out, passed through running water, and hung up to dry.

Old Furniture and New.

The present rage for old articles of household use, table decoration, and personal adornment is a whim of fashion, in many instances the coveted articles having no element of propriety in our modern life. Very few of them are valuable in the light of sentiment, having no association with beloved friends or with historical events.

But apart from these considerations the love for genuine old relics of furniture, especially, has an excellent reason for its being. There are really valuable and useful articles of household economy which unreasoning style has relegated to the second-hand furniture store, to the attic, or tothe barn, or perhaps ruthlessly destroyed, and which have been replaced by modern articles far inferior. The present spring seat sofa with its tufted cushions and tortoise back seat is not half so inviting and restful as the old-fashioned, flat seated, broad sofa, long enough to receive the outstretched form of a six-footer, and broad enough to hold him safely if sleep overtook him. Many of these articles are of solid wood with no suspicion of veneering, and their forms are really more elegant than those of to-day. Modern veneered and upholstered furniture requires repairing every few years, or is worn beyond revamping within the recollection of a ten year old child. It is a source of regret that with the rage for antique furniture there is not also a demand for old time honesty in workmanship.

In spite of the sneer against the old style straight backed chairs, most of the old style furniture was made for convenience. There never was a more convenient article of furniture than the old desk and drawers combined—drawers below a folded-back desk, the back being pigeon holed, and the desk on hinges to be let down to form a writing shelf, and projecting far enough forward to give room for the writer's knees. The cupboard was another useful article for the kitchen or the dining room. It contained two or more wide drawers, with doors above them opening on shelves and racks, the whole standing on legs high enough to admit of sweeping under the cupboard. Memory recalls one, the framing and ends being of white walnut or hickory and the door panels and drawer fronts of cherry, both native woods, the creamy white of the hickory contrasting finely with the warm wine red of the cherry. These colors were set off by pendent pulls and door key escutcheon of polished ungilded brass that could be repolished and kept from the dilapidated appearance of the worn gilded brass of the present. Such an article of furniture would give an air of substantial comfort to any modern home.

The inferiority of modern made furniture cannot properly be attributed to machine duplicated work; it is as possible to make first class work by duplicating by machinery as by hand; else our hand tools and machine tools would be much more costly than they are. But it is undeniable that most of the furniture made within the memory of the elderly portion of the present generation compares favorably with that now made, in durability and integrity of workmanship. In these qualities it would be well if our manufacturers shared in the rage for the antique.

A Sheet of Letter Paper May Move a Ton One Mile.

The modern cargo steamer has now become a wonderfully economical freight carrier, especially as regards consumption of fuel. A freight train run under the most favorable conditions seems wasteful in comparison. The Burgos, a modern steamer especially built to carry cargo cheaply at a slow speed, lately left England for China with a cargo weighing 5,600,000 pounds. During the first part of the voyage, from Plymouth to Alexandria, the consumption of coal was 282,240 pounds, the distance being 3,380 miles. The consumption per mile was therefore only 83·5 pounds, and the consumption per ton of cargo per mile 0·028 pound. In other words, half an ounce of coal propelled one ton of cargo one mile. Assuming that paper is as efficient a fuel as coal, we have, says the *Railroad Gazette*, only to burn a letter on board this steamer to generate and utilize enough energy to transport one ton of freight one mile. It is difficult to realize that such a trifling act as burning a letter involves such a waste of useful energy, or can have any reference to the energy sufficient to perform a feat which, under less favorable circumstances, requires a couple of horses and a teamster for about half an hour.

The best locomotive performance in this country of which we can find any authentic record gives a consumption of about two ounces of coal per ton of freight hauled one mile at the rate of 13 miles an hour including stoppages. On lines having grades of from 53 to 70 feet per mile, the consumption often rises to 5 or more ounces of coal per ton of freight hauled one mile.

The engines of the Burgos are on what is termed the triple compound system, the steam being expanded in three cylinders in succession. The boiler pressure is 160 pounds per square inch. The average speed at sea in all weather is very nearly ten miles an hour.

A Beautiful Slide.

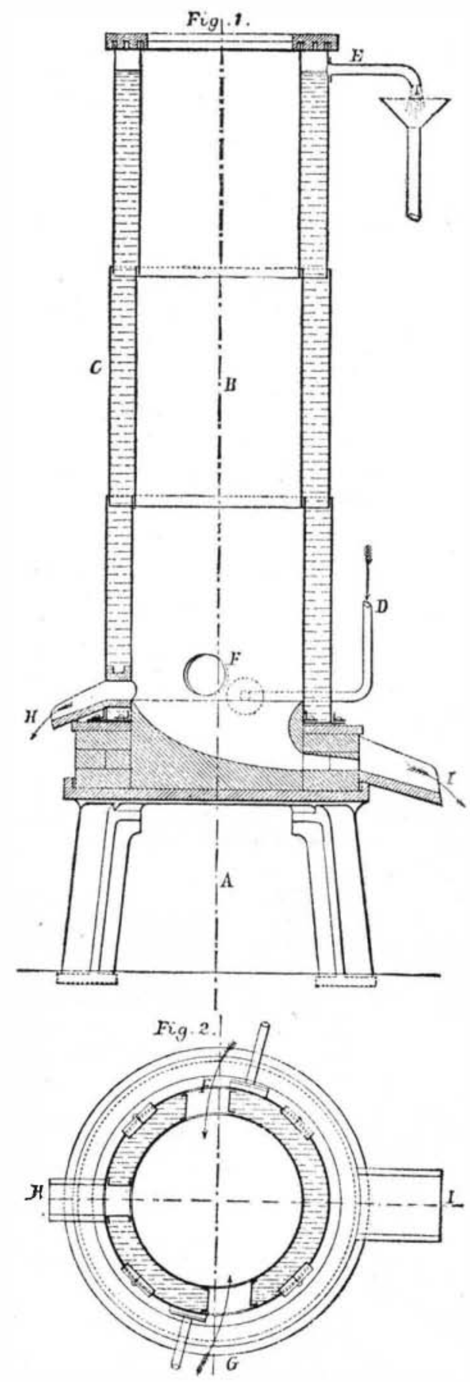
A very beautiful polariscope slide may be made, says the *Microscope*, as follows: Heat a slide until it will melt a small portion of a menthol pencil as it is drawn evenly back and forth over a perfectly clean surface. Do not use more heat than necessary to melt the material evenly. Then, as it commences to crystallize, arrest its progress frequently by passing the slide quickly over the flame of your spirit lamp; soon the crystallization will be completed, a little at a time, and a very desirable slide will be the result.

DR. OTTO GMELIN'S CUPOLA.

The cupola shown in the annexed engraving was invented by Dr. Otto Gmelin, of Buda-Pesth, for smelting iron, copper, or other metals, and has during the last few years won ground in Austro-Hungary, and is now also being introduced in Germany.

The illustration hardly requires any further explanation, considering the simplicity of the principle on which the furnace is constructed. Two concentric cylinders of boiler plates with two annular spaces between them, closed at the bottom, and open at the top, are placed on a foundation ring of brickwork. Cold water enters the annual space at the bottom, and the warmed water flows off below the upper edge of the cylinders.

The interior of the inner boiler-plate cylinder is, says *Engineering*, made rough, and is covered with fire-clay. The circular space between the two cylinders is covered over by



DR. OTTO GMELIN'S CUPOLA.

a cast-iron plate which lies loosely on the top of the two cylinders. Two circular grooves in the cast-iron top plate maintain the two cylinders at the correct distance from each other.

The outlet of the metal and of the slag takes place through tubular boiler-plate connections passing through the water space and attached to the inner and outer cylinders. The construction has lately been considerably simplified and strengthened by making the inner furnace cylinder of a welded tube, with tubes for air inlets welded on all in one piece.

The novelty of the above construction consists chiefly in the cooling of the smelting furnace by water without using an air-tight water space. The inner cylinder can expand and contract without any resistance as the temperature in the furnace changes, and the consequence is that repairs are hardly ever required. The first furnace built upon this principle has now been at work daily for the last 2¼ years without ever having required any repairs to the boiler plates of the cylinders The smelting operations can therefore also be kept up for any length of time without interruption. The energetic cooling of the inner smelting cylinder, which takes place with this system of furnace, is also stated to afford advantages as regards the saving of fuel (equal to 6 to 8 per cent) and the decrease of burnt metal as well as the good and equal quality of the castings. The upper part of the furnace never gets hot, and the coke does not begin to burn until it arrives at the lower part of the furnace, where the smelting process takes place. The carbonic acid formed here escapes unchanged without being reduced to carbonic oxide as it passes through the upper charge of the furnace. The metal thrown in at the top of the furnace arrives completely unchanged into the smelting zone, where it is brought to the smelting point at once by a very strong blast.

The furnace remains always round and smooth, which is also a very important feature with regard to economy of coke and good quality of the castings. It is likewise unaffected by chemical action, and the quality of the castings will therefore be considerably improved by the fact that this furnace admits of an addition of any quantity of basic substances without any risk of damage.

This furnace offers special advantages in cases where scrap iron can be had cheaply, as on account of the small consumption of coal and silicium much more scrap iron than usual can be used along with the pig iron, without any fear of obtaining hard castings. The arrangement also offers advantages in cases where it is necessary to produce special qualities of castings—for example, hard castings—as the foreman can with much greater accuracy calculate the proportions of the materials to be put into the furnace to procure an even quality throughout, than he can with ordinary cupolas.

The firm of Ganz & Co., of Ofen, who have a very high reputation for their chilled rolls, is now altering all its furnaces to Dr. Gmelin's principle, and a number of other firms of high standing have also adopted Dr. Gmelin's furnace; namely, the machine factory of the Hungarian Government Railway, Buda-Pesth; the Ozterr Alpine Montangesellschaft, Vienna; the Austro-Hungarian Government Railway, Vienna; the Eisenhutte, Undine; Count Waldstein's Iron Works, Sedlec, Bohemia; and Howaldt Brothers, Kiel, Germany.

A Mexican Iron Mine.

A correspondent of the *Alta California*, describing the wonders of the Cerro del Mercado in Durango, owned by the Durango Iron Mountain Co., of Chicago, says that the vast deposit comprising it is not a mine, but a yard for storing iron ore, the floor of which is iron. Its dimensions are grander than all the combined iron ore yards of Europe, added to all that there are in the United States. It is nearly a mile in length, nearly a fourth of a mile in width, and towers 650 feet above its ponderous base. This is, I have reason to think, not one-hundredth of the ore in the property—40,000 acres—which comprises the area covered by the company's purchase, for the mountain above ground, which measures fully one billion tons of ore, is but the peak of an immeasurable mountain, which nature has, in no exceedingly remote period, formed by eruptively metamorphosing other forms of iron ores than the prevailing ones, which at present comprise the mountain. At one-fourth and one-half mile points from the base of the iron mountain, on the company's grounds, are other lesser peaks of iron. The low intervening lands are but coverings over iron ore.

The iron ore of the deposit has no intermingling rock, no debris like clinkers out of or from a huge smelting hearth. The ore is magnetic oxide, producing a forged iron equal to the best in the world and far superior to the English, because made with charcoal and because there is abundant reddish oxide of iron present, which affords a liquid very necessary for the elaboration of steel. The whole mountain undoubtedly will yield an average of 62½ per cent, or five-eighths iron of the weight of the ore. Charcoal, for the making of which there are worlds of forests, is cheap, and so is labor. The ore is in bowlders. It is already mined. This is ore that is unusually magnetized. A piece of it attracts the needle at one end and repels it at the other. There is limitless coal on the Pacific slope should any but charcoal be needed. All needed accessories for mills for working iron ore after being smelted, and for manufacturing purposes, are near at hand. There is a great abundance of both heavy and light building timber, water for power, moulding and building sand, fire-brick clay, stone, lime, and the Murga River on the grounds. Mexico, by her heavy duties on iron, shields the owners of Iron Mountain. Nails, spikes, horse-nails, wagon and other springs, are charged 5½ cents per pound. Plate iron for tin (and ores of the latter are abundant) is 6 cents per pound; steel is 3 cents; iron chain, 4½ cents; iron columns, much needed in the styles of architecture used generally, are 13 cents duty per pound; screws of all kinds and iron bedsteads, 8½ cents per pound. This grandest of all iron deposits known to man is so conveniently located, so cheaply worked, and its product so pressingly demanded by the wants of its 12,000,000 people, that in the mining and metallurgical world it is peerless as an industrial enterprise.

A Chance for American Inventors.

Senor Don Matias Romero, the Mexican Minister, has transmitted to the Secretary of State, at Washington, a decree issued by the State of Yucatan, Mexico, offering a prize of $20,000 to the inventor of a machine which shall successfully extract the fiber from henequin, under the following conditions: It must be automatic and not require skilled and experienced workmen to manage it; it must be entirely free from danger to the operators; it must require less motive force than the machines now in use with relation to its producing power; it must increase the production or extraction of the fiber within a given time, diminishing its loss, compared with the various machines in use. The reward is to remain open for three years, and is without prejudice to the right of proprietorship and of patent.—*The Iron Age.*