seldom, if ever, have the intensity, profundity, and wide extension of the true decennial crises.

The conclusion which the author draws from his speculation is that "if there is any truth in all these sun spot speculations, there must be a periodic variation in the sun's rays, of which the sun spots are a mere sign, and perhaps an unsatisfactory one. It is possible that the real variations are more regular than the sun spot variations, and thus may perhaps be explained the curious fact that the decennial crises recur more regularly on the whole than the maxima and minima of sun spots."

To determine this mooted question, then, he suggests the importance of at once undertaking direct observations upon the varying power and character of the sun's rays; and to this end solar observatories should be established in every country where the sun can be observed most free from atmospheric opacity. If from such observations it be found, as will probably be the case, that the sun does vary, "the time will come when the most important news for the commercial world contained in the *Times* will be cablegrams concerning the solar power." And he adds that certainly an empire upon which the sun never sets cannot wisely neglect to keep a watch on that great fountain of energy, since "from it we derive our strength and our weakness, our success and our failures, our elation in commercial mania, and our despondency and ruin in commercial collapse."

PROGRESS OF THE SWEDISH ARCTIC EXPEDITION.

There is a strong probability that the Swedish Exploring Expedition, under Professor Nordenskjöld, has by this time proved the existence of an available northern passage from the Atlantic to the Pacific. In 1876 and 1877, Professor Nordenskjöld succeeded in reaching the mouths of the Siberian rivers Obi and Yenisei by way of the Kara Sea, a feat never before accomplished, thus establishing a new commercial road to the regions which those streams water. During the past summer, the expedition which sailed from Hammerfest, Norway, in July, successfully traversed the Kara Sea in the forepart of August, and arrived at Dickson's port, at the mouth of the Yenisei, on the 6th. Four days later the expedition, comprising two small but strong steamers, the Lena and the Vega, began the exploration of the hitherto untried sea to the north and east. By August 20, the northernmost point of Asia was passed, and in a week more the mouth of the Lena was safely reached. Here the steamers parted company, the Lena to ascend the river to Yakutsk, the Vega to continue the exploration of the Siberian coast, hoping within a few months to reach Japan by the way of Behring Strait. The greater part of the coast from the Lena to Behring Strait has already been explored by sailing vessels, so that the probability of the successful passage of the Vega is very great. Should it prove feasible to navigate those seas even during a few months of each summer, the commercial advantage of the new route between Europe and Eastern Asia and Western America will be considera ble. Besides, it would open up to trade the northern half of the vast continent of Asia, by way of the great rivers Obi, Yenisei, and Lena.

Professor Nordenskjöld has already shown that trading vessels carrying profitable cargoes can reach the north of the Yenisei in August and September, and return with marketable freight before the Kara Sea is closed by ice. Should the entire route by way of the Arctic Sea prove practicable, the summer voyage from Europe to the East would be shortened about one fourth; but that advantage would be offset by the disadvantage of being closed by ice ten months in the year.

In any case the new Siberian regions opened up are likely to prove of great benefit to Europe, both in furnishing large supplies of food stuffs and raw materials, and in offering a market for manufactures. Siberia has made enormous progress in material development during recent years, and improved trade connections would give a great impetus to the new settlements. Fortunately American manufactures are highly esteemed in Siberia; and if a proper effort is made a large share of the new trade may fall to us. On the other hand Siberia is likely to become a serious rival to us as a producer of breadstuffs. Vast regions there are admirably suited for the cultivation of grain; and they will make themselves felt in the markets of the world as soon as means are provided for transporting the crops cheaply.

THE TRADEMARKS QUANDARY.

The attempts to better the law of trademarks by statutes have evidently muddled the subject. A Maryland judge has pronounced the law of Congress unquestionably constitutional; and jurists will generally agree that, if it is so, it has superseded State laws. But a Wisconsin judge is just as clear that the National law is a nullity; and one consequence of this decision, if sustained, would be that State laws are revived. Meanwhile the manufacturer cannot know under which law to act.

Before either law was passed courts of equity had built up a somewhat vague yet efficient system for perfecting the peculiar labels, unique designs, characteristic names, and fancy catchwords adopted by various manufacturers and dealers. Every producer of an article generally known to be good sets a value on the trademark with which it has become associated in the public mind, and will resist the employment of it by his competitors. The courts have sustained these claims; not so much, however, in the view that a trademark is property, as upon the ground of protecting the public from imposition. Any man may make and sell cologne or cocoa oil, pencils or piano-fortes, shawls or shirts; but if he sells them under the names and characteristic labels of old and distinguished dealers, the public are liable to be deceived. For the sake of the public the courts will stop such imitations by injunction, and if doing so also protects a meritorious manufacturer in the slowly-acquired reputation of his wares, so much the better. This was the old equity doctrine of trademarks. But it was a long and difficult inquiry, in many of these cases, which of the rivals was first in the use of the disputed name or emblem. To relieve this difficulty, to supply proof of the original ownership and use, is a leading object of the trademark statutes. Such statutes have been passed in England, by the Legislature of New York, and by Congress. They enable a dealer when he first adopts a trademark to register it as his own; and having done this, he can at any time appeal to the public record to establish his priority of design. Conversely, any one proposing to adopt a trademark can ascertain from the record whether the same design has been appropriated.

Our people have little concern with the English law; it is the confusion between State and National laws which needs remedy. The first National law appeared in 1870, as one chapter in a newly enacted revision of all the laws pertaining to patents and copyrights. This juxtaposition of subjects gave the impression that the law rests upon the power of Congress to secure to authors and inventors the exclusive right to their respective writings and discoveries. And now the objection is made that a trademark is not a writing or a discovery, and its designer is neither an author nor an inventor. Therefore the law is unconstitutional.

The objection is forcible. but an answer is offered that trademarks pertain to commerce, and that Congress has power to regulate commerce. Opponents of the law reply that it is commerce among the States which Congress may regulate, while trademarks belong primarily to domestic commerce, which Congress cannot control. Friends of the law contend that the National Government may make treaties, and treaties may properly stipulate for mutual protection of trademarks of subjects of one government within the dominions of another, and therefore Congress may pass a general trademark law as incidental to enforcement of treaties. And so the discussion slowly proceeds, with the effect of creating the dilemma that claims founded on either law may, at any moment, be adjudged invalid. For the power of Congress, if it exists, is exclusive; if it is disproved, then and then only are State laws operative. The New York *Tribune*, from which we select the above, concludes with everybody else interested in the matter, that the subject deserves early and final determination.

HOW TO UTILIZE OLD FRUIT CANS.

Perhaps one of the most appropriate uses of an old fruit can that can be devised is to make it contribute to the growth of new fruit to fill new cans. This is done in the following manner: The can is pierced with one or more pin holes, and then sunk in the earth near the roots of the strawberry or tomato or other plants. The pin holes are to be of such size that when the can is filled with water the fluid can only escape into the ground very slowly. Thus a quart can, properly arranged, will extend its irrigation to the plant through a period of several days; the can is then refilled. Practical trials of this method of irrigation leave no doubt of its success. Plants thus watered flourish and yield the most bounteous returns throughout the longest droughts. In all warm localities, where water is scarce, the planting of old fruit cans, as here indicated, will be found profitable as a regular gardening operation.

SENATE BILL 300.—SECTION 2.

In all discussions of patent rights with reference to Mr. Wadleigh's bill for the amendment of the patent law, it is needful to bear in mind the broad principle that Congress is empowered by the Constitution to grant to inventors the "exclusive" right to the manufacture and sale of the article or process patented. The right is limited in time, but it cannot be limited in scope. In other words Congress has no power to come between the patentee and his invention, to say what he shall do with it. Whether this provision of the Constitution is wise or not is beside the question. In our opinion it is eminently wise; but wise or foolish, there it stands, and can be got rid of only by an amendment of the Constitution, not by any change in the wording of the patent law.

The fatal objection to Section 2 of Mr. Wadleigh's bill is that it undertakes to limit the scope of the patentee's right. It provides that if the patentee chooses for any reason to share his right with A and B, giving them a license to use his invention or discovery, C, D, and all the rest of the alphabet may come in and enjoy the privilege on the same terms. Still worse, if the patentee elects to retain the entire control of his invention, his purpose may be thwarted, the penalty for the infringement being a license fee "determined from all the evidence in the case."

The purpose of the American patent law is to encourage the advancement of the useful arts through invention and discovery. Its object is to induce men to study and experiment and invent; and it seeks to accomplish that object by the hope held out to the inventor that by the enjoyment of the exclusive right to the manufacture and sale of a patented invention he will stand a better chance of gaining a fortune than would be otherwise possible. Once secured a patented invention is property, to be respected as other property is. The Constitution provides that during the life of the patent the owner of it shall be free from dictation or interference; so long, of course, as he uses it without direct injury to himself or others. In other words, his right is as exclusive as his right to a horse or a gun, or a house that he has reared or bought or made.

What would be thought of the wisdom of a legislative body which should enact a law to the effect that in case A lends his horse to B, for friendship or hire, any other man might use the horse on the same terms? Or in case A should decline to lend his horse, B's unauthorized use of the animal would be punishable only by the payment of the customary license fee of the livery stable? Similarly if A allows B to plant a potato patch in the corner of his farm, the whole farm shall be laid open to invasion on the same terms? Or if C wants to occupy a room in D's house he shall be allowed to do so on payment of such rental as some one else shall decide to be sufficient?

Is there any less absurdity or injustice in making parallel provisions with respect to invasions of patent rights?

As a rule it may be said that the work of inventing a novel and useful device is less arduous and costly than the work of introducing it. As a rule, too, the inventor is very apt to be without the means needful to develop and introduce an invention so as to make it pecuniarily profitable. Accordingly very favorable terms may well be offered to the first to take hold of and work up a new invention. The risks are great, and the promise of ultimate profit should be correspondingly great. Would any cautious business man be willing to assume such risk if he knew that when the profitableness of the invention came to be successfully demonstrated, any one else could step in and use the perfected invention at no greater risk than the payment of a license fee?

The great trouble with the framers of devices for facilitating the invasion of patent rights, like this second section of Mr. Wadleigh's bill, arises from their proneness to forget the grand purpose of the American patent system—the advancement of the useful arts by the encouragement of invention—and the not less vital point that the only means for the attainment of that end contemplated by the framers of the Constitution was the recognition of the inventor's exclusive right to the control of his invention or discovery during the period for which the patent should be granted.

It would no doubt be very pleasing to such as are or desire to be infringers upon patent rights, to have the inventor's exclusive right laid open to invasion. But the patent law was not framed to meet the wants of infringers, and Congress has no constitutional power to alter it in their favor.

BOILER FEEDERS FOR LOCOMOTIVES, ETC.

Among the improved appliances in this line proven by practical tests to possess superior merit, the Hancock Inspirator may be especially mentioned. The company's business announcement will be found in our advertising columns. The performances of this apparatus are in some respects remarkable. E. Howard & Co., the well known watch and clock makers, have one in use which they say draws the water from a driven well, some 75 feet distant, and a perpendicular lift of 20 feet, and also forces the water, when needed, 70 feet up into a tank at the top of the building.

For locomotives they are especially useful. Mr. James K. Taylor, master mechanic of the Old Colony Railway, states that every one of twenty-three of these feeders, now in use on the locomotives of the above company, is giving great satisfaction. Not one has had to be taken off for repairs. They supply all the water required by the engines, are found more reliable and economical than any pumps, which latter they do not hesitate to remove. They are more positive in working, less liable to clog, have greater range than any other device, and require less attention from the engineer in working them. Practical indorsements of this sort are worthy of the highest consideration.

An Economical Engine.

A compound condensing pumping engine, erected for the Buffalo (N. Y.) High Service Water Works, by the Holly Manufacturing Company, of Lockport, N. Y., recently tested under the supervision of Professor Greene, President of the Troy Polytechnic Institute, developed a duty of 80,489,638 foot pounds per 100 lbs. of coal. Following are the elements of the test:

High pressure cylinder, 1, diameter, inches	25·
Low pressure cylinders, 3, diameter, inches	25·
Double-acting pump cylinders, 4. diameter, in	15·5
Length of stroke of each cylinder, inches	33·
Total number of revolutions	25,650
Duration of test	20h. 15m.
Revolutions per minute	21·12
Piston speed per minute, in feet	106·16
Pressure on water gauge, in pounds	46·76
Pressure from reservoir supply, to be deducted in pounds	5·58
Actual water pressure, or load on the pump, in lbs.	41·18
Coal consumed, no deductions, pounds	5,400
Steam pressure, pounds	61·5
Vacuum, inches	26·5
Temperature of injection water to air pumps, degrees, Fah	48·
Temperature of water in hot well, degrees, Fah.	92·
Temperature of feed water to boilers, deg., Fah.	170·
Air pumps, two single acting, diameter, 24 in. stroke, 30 in.	
Suction and discharge pipes, diameter, 24 in.	
Fly wheel, diameter, 12 ft. 4 in.; weight, 7 tons.	
Duty in foot pounds, per 100 pounds of coal	80,489,638

This engine is similar to that described in the SCIENTIFIC AMERICAN, vol. XXXIX., p. 95, and in SUPPLEMENT No. 140.

A Mammoth Farm.

A correspondent of the Troy *Times*, traveling in Dakota, writes from Fargo, a town, he says, now only eight years old, containing 6,000 inhabitants, describing the cultivated farm of William Dalrymple, containing an undivided estate of 50,000 acres, extending 12 miles along the fertile bottom lands of a most beautiful river, and then back into the interior 11 miles more, the whole covering an area of over 30 square miles.

Of this, 20,000 acres were last year sown in wheat, which has yielded 250,000 bushels as reward for the husbandman's toil. The soil of this Red River farm is peculiarly rich, and adapted to the production of just the cereal cultivated. The upper surface is an alluvial deposit of great fertility, under which is a deposit of marl, containing in large quantities the phosphates and silicates needed in the formation of the berry and the stalk of wheat.

Of course it would be impossible to operate such a farm from one headquarters, so the land is apportioned into subdivisions of 2,000 acres each, every one of which is presided over by a superintendent, who is under the direction and orders of the owner. Each chief overseer has a nice house, in most cases handsomely fitted up, and finished, in several instances, in most excellent taste. Near the superintendent's house is the hands' boarding-house, where all the harvesters board. Back of these buildings are located the granaries and stables, and, a little further removed, the machine shops, engine rooms, and windmills. All the buildings follow a plain but quite attractive style of architecture, and answer every purpose intended. Each subdivision has the same set of buildings, and is operated in quite the same way.

To run the farm it requires the services of 450 men and over 300 horses and mules; to keep the accounts, 3 bookkeepers and 2 cashiers are kept constantly busy. Water is pumped by windmills several miles back into the interior from the river. 75 Wood's reapers and binders are used in the harvest, and pile up yellow sheaves at the rate of 1,000 acres per day. During the entire harvest season last year they were retarded only one half day by inclement weather. The grain is separated from the straw by 18 steam thrashers, which puts it in the bins at the rate of 1,000 bushels per day.

STRAUB'S SCIENTIFIC GRAIN MILL.

We give herewith engravings representing in different views a mill for grinding grain, middlings, minerals, and

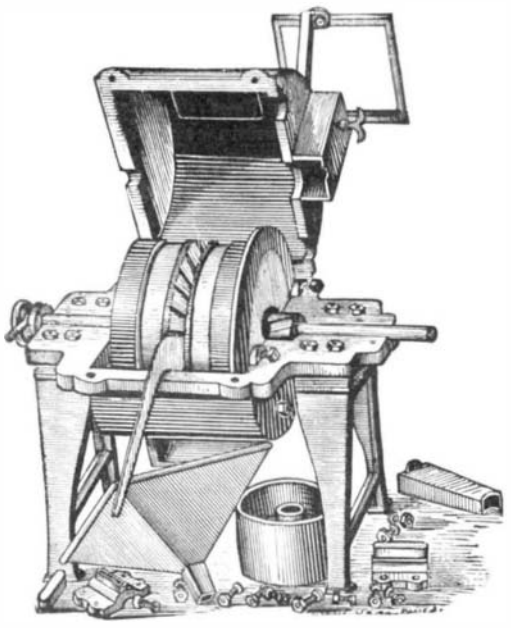

Fig. 2.—STRAUB'S MILL OPEN.

paint, which is known as Straub's Scientific Grain Mill. It is claimed by the manufacturers of this mill that burr stones revolving in a vertical plane are more effective than horizontal stones of double the diameter, running very light and steady and grinding faster and cooler than ordinary stones. The principal requirements in a mill of this character are to have the parts accurately fitted and rigidly held in position; to have a ready means of taking up wear, and to have it so simple that it can be readily understood and managed by any one likely to require such a mill. The manufacturers of the scientific grain mill claim to have met these requirements. Fig. 1 is a perspective view of the mill, giving a good idea of its external appearance. Fig. 2 shows the mill opened, with the bar between the stones which is employed to lift them from the casing and place them in position for dressing, as shown in Fig. 3.

This mill has a silent feed and is adapted for grinding wheat flour; regrinding middlings; grinding corn, oats, and feed; and it may be used for grinding minerals, gold quartz, rock, slate rock, fire brick, dyewood, bone, cochineal, foundry facing, and whatever can be ground by French burr stones. It is especially adapted to farm and plantation use, as the smaller size may be driven by hand or horse power.

Further particulars may be obtained by addressing the manufacturers, Messrs. A. W. Straub & Co., 2231 Wood street, Philadelphia, Pa.

[*Continued from first page.*)

conductor of heat and electricity, the purest carbon known next to the diamond, and is capable, the manufacturers claim, of being divided finer than any other known substance. Its proper color is that of a darker shade of fractured steel. Its best known use is for pencils, and the next is, perhaps, for crucibles and refractory mixtures, and then as a conducting coating for galvano-plastics. Its unchangeable character

THE RAILROAD, WITH BUNDLES OF PENCILS.

and smoothness have attracted much attention to it as a lubricator. The use of graphite for lubricating is not new. It was used for that purpose more than 200 years ago; but the want of a pure article prevented its adoption to a large extent. Within the past few years the Dixon Company have taken the matter up in earnest, and have succeeded in producing graphite of purity and free from grit, at a price that must bring it very largely into use for lubricating. Its well known properties have caused many persons to mix it with oil or grease or apply it dry to journals, and their disappointment has caused them to condemn the article, the graphite being of inferior quality. The brand of graphite prepared by the Dixon Company, known as the "Perfect Lubricator," has cured, it is stated, the step of a mill of heating when every other tried means had failed.

A grease is now being prepared by the company, for use in mills and for railroads, steamboats, cylinders, gearing, bearings, slideways, etc. The company has named the article "Dixon's Everlasting Graphite Grease." For this grade of graphite the company was awarded the gold medal at the Paris Exhibition of 1878.

The most interesting mechanical processes in the Dixon Works are to be found in the Pencil Department, which is illustrated on our first page, the large engraving showing the several operations of making the leads, gluing the pencil strips, and bundling the pencils. The smaller cut shows the machine for shaping the pencils. The graphite is divided as finely as mechanical means will permit, and is then floated through several tubs or vats, placed one above the other; the coarsest of the particles will settle in the first vat, the next coarsest in the next vat, and so on till the finest have lodged in the last, or lower vat.

A very smooth, blue clay is dissolved in the upper vat, and floated in the same manner, the finest being gathered into the lowest vat. The finest clay and the finest graphite are mixed together for the finest pencils. The proportion of clay determines the grade of hardness of the pencil when finished, the more clay the harder the "lead." After the materials are mixed together the plastic mass is placed in a "well." A screw press follower presses the material out through a hole in the bottom of the well, when it coils up like a thread under the machine, so that it may be handled like a skein of yarn.

It is then straightened out in lengths, dried, placed in a crucible, and submitted to a high heat and baked like earthenware for some hours. The "leads" are then strong enough to be handled like knitting needles. The cedar boards are sawed into suitable lengths and of a width for six pencils. They are run through a machine that planes and grooves them on one side, nimble fingers place the leads, the two halves or boards are glued together, and they are ready for the shaping machine. The little blocks enter at one side of the machine, and the pencils fall into a basket at the other side at the rate of 216 per minute. An ingenious contrivance counts them. On leaving the shaping machine the pencils are about as perfect as woodwork can be made. They pass thence into the finishing room, where they are varnished and finished in any desired color, stamped with the title and grade and packed in boxes for sale. Eighty-six thousand pencils per day are now passing through the works, made throughout by machinery, and claimed to be more perfect than is possible by hand labor.

The Dixon Company not only produced its own machinery for the manufacture of the pencils, but maintained the idea of originality by adopting a system of stamps for the different grades. The whole system of pencil manufacture is, in the Dixon Company's works, original and interesting. The machines are mainly automatic, but very simple. The finest grades of pencils for artists and draughtsmen are manufactured by this firm. The company are the only pencil manufacturers, we believe, that were awarded a gold medal at the Paris Exhibition.

A Canadian Gold Mine.

Dr. Laflamme, of the University of Laval, Quebec, favors us with a photograph, natural size, of a nugget of pure gold,

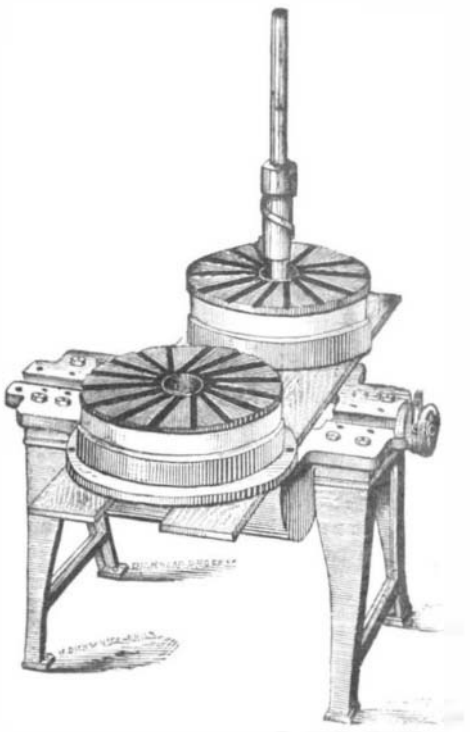

Fig. 3.—STONES IN POSITION FOR DRESSING.

weighing 38 ounces, lately found in the gold mine worked by Messrs. L. Saintrouge & Co., in Beauce County, near Quebec. The mines are said to be very rich, two weeks' work having furnished 150 ounces of gold; number of men employed not stated. The means employed, however, are described as of the most primitive character. The gold is found in bowlder clay underlying glacial drift, also in quartz accompanying the clay, but not in large quantities.

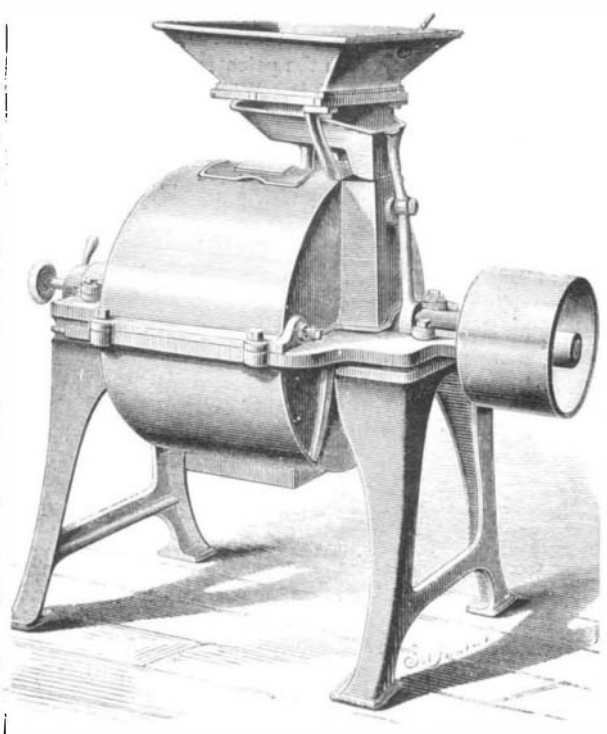

Fig. 1.—STRAUB'S SCIENTIFIC GRAIN MILL.

Recent Engineering Inventions.

An improvement in Methods of Connecting Sputs to Boilers has been patented by Mr. John Trageser, of New York city. This invention consists in a sput formed with an annular recess or cavity around its body, into which recess the edge of the opening in the boiler is calked and the joint afterward brazed

Mr. George Elliott, of New York city, (P. O. Box 2336), has patented an improved Paddle Wheel, the paddles of which are so constructed as to diminish the velocity of the middle portion of the current of water set in motion by the paddles, in order that the remaining portion of the said water may be made efficient, and the combined action of the different parts of the paddles upon the water may be more effective for the propulsion of the boat. The paddles are made in the form of rectangular parallelograms, and have elliptical apertures through the middle.