### BOOMER & BOSCHERT BALING PRESSES.

These presses are of the power-driven elbow joint type. The power is taken from a countershaft by chain belt and sprocket wheels so as to largely multiply the power received. A double set of elbow or toggle joints are the agency for converting the rotary into vertical motion. The general construction is obvious. In some particulars the construction shown deserves special notice. The horizontal screw is of steel, of large size, and is driven from both ends inthe heavier presses. The screw nuts are of solid bronze, securing great strength and capability of wearing well. The beams and girts are made of the best rock maple. To secure the top and bottom beams, iron rods 2¼ inches in diameter are employed in the press shown. This insures greater strength and compactness than where wood alone is used to secure the press against the vertical strain.

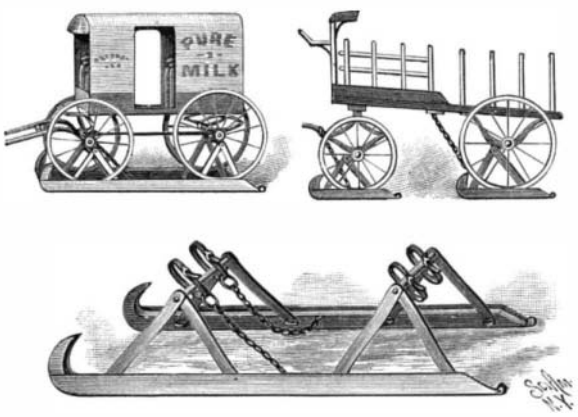
To introduce the material, the top is moved to one side. To render this easy, it is carried on rollers and is rolled to one side upon the rails extending to the rear of the top, as shown in the cut, when the press is to be filled.

Such a press as shown stands 16 feet in height, gives a movement of 5 feet to the follower, and turns out a bale 24 by 30 by 48 inches for smaller sizes, up to 28 by 36 by 60 inches for larger sizes. This press is designed especially for rags, cotton waste, etc. Many other kinds including hydraulic and screw presses are made by the same firm, adapted for almost every use requiring great pressure.

For fuller particulars the Boomer & Boschert Press Company, 354 West Water St., Syracuse, N. Y., may be addressed.

### RADLEY'S REMOVABLE SLEIGH-RUNNER.

Owners of wagons of every description, and who wish they had sleighs instead when snow is on the ground, will be interested in the special construction of sleigh runners shown in the accompanying illustration, which forms the subject of a patent recently issued to Mr. John Radley, of No. 104 Manhattan Avenue, Jersey City Heights, N. J. The parts are designed to be readily separated or put together without the use of tools, and may be conveniently carried in the vehicle to which they are to be applied. Besides the usual tires, the runners have each a side shield, extending slightly above the surface of the runner, and in the runners are set threaded blocks, in which are removably secured, by means of thumb-screws, the lower



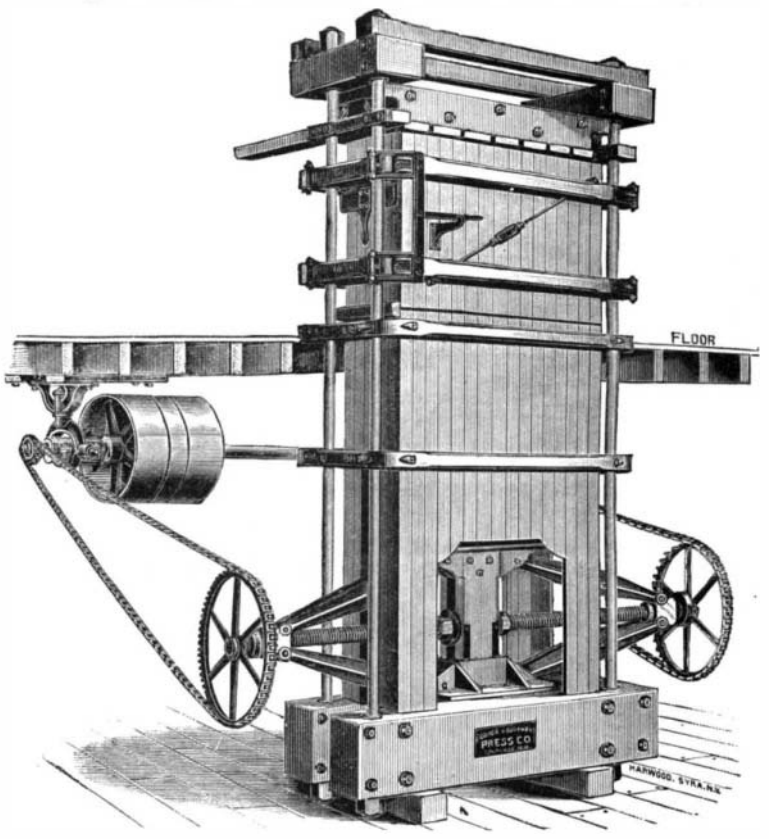

A SLEIGH-RUNNER FOR WHEEL VEHICLES.

ends of wrought iron legs, bent inwardly in their upper portion to pass clear of the hubs. The legs are designed to be all of the same length, and to be adapted to the varying heights of axles by changing their place of attachment to the runner. At the top, the legs are pivoted together in pairs respectively on each end of a cross-bar adapted to be secured to the axle, each cross-bar having loops provided with straps and buckles. For use with the front axle a chain attachment is also provided, to form a complete check on the revolving gear and fasten it more firmly to the sleigh. The double sleigh-runners are only intended for heavy trucks, to promote convenience in turning, etc., and are in all respects similar to the runners for a single sleigh. These runners can be removed from a vehicle in a few minutes, should the sleighing become poor, or they can be as readily applied when desired. Should the wagon be too heavy to pull into position on the runners, to make the attachment, the thumb-screws securing one of each pair of legs may be removed, allowing the cross-bars to drop down, when the horse may be employed to pull the vehicle on the runners.

THE Académie des Sciences has submitted a new system of musical notation in which twenty-seven characters replace the 203 symbols now employed to represent the seven notes of the gamut in the seven keys.

### Large Locomotives.

Four monster locomotives have lately been built for the St. Clair Tunnel Company by the Baldwin Locomotive Works. So far as known by the company they are the heaviest single locomotives ever built. Each of the four locomotives is expected and guaranteed by the builders to haul a load of 760 gross tons of cars and lading up a grade of 105 feet to the mile. This is




EXTRA HEAVY RAG BALING PRESS.

equivalent to a train of 25 or 30 loaded freight cars. The St. Clair Tunnel Company, for which the locomotives have been built, controls the line of railroad running through the tunnel under the St. Clair River. It is near the junction of the St. Clair River with Lake Huron and connects the towns of Port Sarnia, Ontario, and Port Huron, Michigan. The line of railroad which runs through the tunnel is the connection of the Grand Trunk Railway of Canada with its line in Michigan. The tunnel is 6,000 feet long, and the approaches are 1,950 and 2,500 respectively, making a total length of over two miles. These approaches have a grade of 105 feet to the mile, and a very heavy locomotive is required to haul heavy trains through the tunnel and up the grade of the approaches.

The locomotives are of the class known as tank locomotives, and have no tender. The tanks are on both sides of the boiler, and their capacity is 2,000 gallons. The space for the fuel, which is anthracite coal, is on the footboard. There are five pairs of driving wheels, which are the only wheels, and they are 50 inches in diameter. The wheel base is 18 feet 3 inches. The cylinders are 22 inches in diameter and have a stroke of 28 inches. The boiler is of steel, five-eighths of an inch thick, and is 6 feet 2 inches in diameter. There are 280 flues, 2¼ inches in diameter and 13 feet 6 inches long. The firebox is 11 feet long and 3½ feet wide.

The cab is placed on top of the boiler and midway between its ends. There are two sand boxes, one on the front of the boiler and one on the back, so that sand can be placed on the rails whether the locomotive is running forward or backward. There is a powerful air brake which operates on each driving wheel. There are headlights and steps at both ends, like those of a shifting engine. The locomotive will run on 100 pound rails. In working order the weight is 195,000 pounds.

### Utilization of Sawdust and Shavings.

These practically waste substances are turned to account by M. Calmant, of Paris, for the production of a finely divided vegetable charcoal, which is intended to be applied for the removal of unpleasant flavor in ordinary French wine, otherwise unsalable as wine, although suitable for distillation. The charcoal is also available as a filtering medium, especially in distilleries, where it is said to be capable of filtering forty times its volume of alcohol, whereas the vegetable charcoal of commerce, gradually becoming scarcer and dearer, and which requires grinding and often recarbonization, will only filter about three times its volume. If not already separate, the sawdust of hard and soft woods must be separated, because the former requires a heat of 700° Centigrade, whereas 500° Centigrade suffice for carbonizing the latter. Carbonization, which lasts about an hour, is effected in fire clay, plumbago or cast iron retorts, of about 600 cubic inches capacity. But previous to this process the sawdust must be sifted, first through a coarse screen to remove splinters and extraneous matter, and then through a fine sieve, which only permits passage of the actual wood dust with the adherent calcareous matter. The product of carbonization must again be sifted to get rid of this calcareous matter which has become detached during the process, when it will, if the operation has been carefully performed, resist the action of hydrochloric acid. Shavings of either hard or soft woods, also kept separate, must be subjected to preliminary treatment (which consists in a beating, to detach the adherent dust, and then a high degree of compression in a hydraulic or other press), when they are carbonized in the same manner as the sawdust, and then ground in a mill to reduce them to the same degree of fineness. Great care must be exercised to prevent the charcoal absorbing moisture from the atmosphere, and with this object it must be inclosed in air-tight recipients till required.

### The Stanford University.

Senator Leland Stanford has chosen for president of his new university Dr. David S. Jordan, who has been president of the Indiana University for the past seven years. The term of office at Palo Alto will begin next September, the salary being $10,000 per annum and residence. Professor Jordan is a scientist of acknowledged ability and standing, and has had also abundant experience as an educator. He is a broad-minded man of great energy and activity, who should be just the one to organize and equip the new institution of learning. For several years he has been president of the Indiana State University, having been selected for the position because of his large executive capacity. He is about forty years of age.

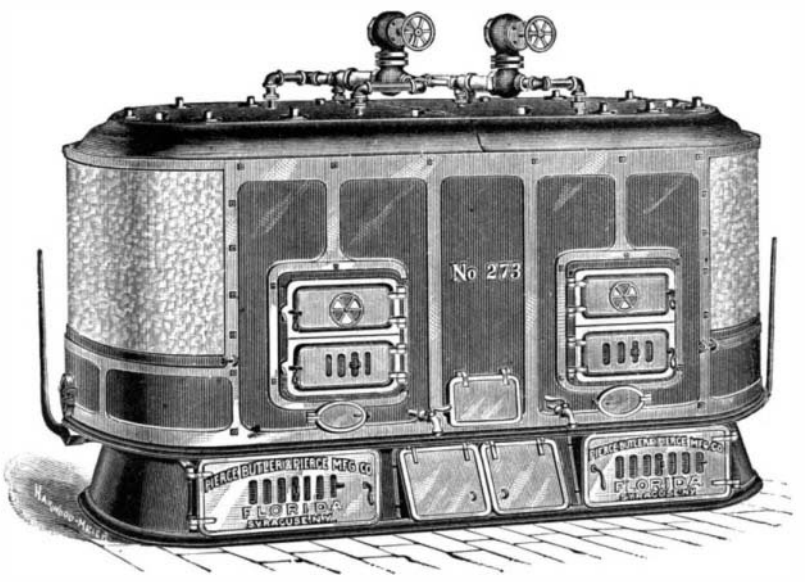
### THE "FLORIDA" HEATER FOR SOFT COAL.

The heater shown in the accompanying cut is made for warming all classes of buildings by steam or hot water circulation and is designed for soft coal combustion. The idea of its construction is by large exposure of heating surface to effect economy in fuel, and by a properly designed flue system and by surface burning to avoid smoke. It is really a substitute for the expensive and heavy tubular boiler. It is made in sections, each representing a deeply corrugated and very peculiarly shaped ring. Within a series of such annular compartments the water is contained. The sections are of such size that a couple of men can handle them and set them up. All parts are accessible for cleaning purposes. The complete set of heating chambers as set up are surrounded by a galvanized iron jacketing like any portable furnace. The jackets are also lined withasbestos, thus economizing fuel.

The number of square feet of radiator surface that a single heater will supply varies with its size, ranging from 250 to 7,300 square feet.

As the heater presents every appearance of an ordinary furnace, no special provision is needed for it. It can go wherever a hot air furnace can be placed.

For further particulars as to this heater and its adaptability to particular requirements, address the manufacturers, the Pierce, Butler & Pierce Manufacturing Company, Syracuse, N. Y., U. S. A.




IMPROVED "FLORIDA" SOFT COAL HEATER.

### Items which Interested the Publishers.

To hear encouraging words from one's contemporaries is always gratifying to publishers. And probably there are few, if any, of the conductors of newspapers in this city more favored in this respect than are the publishers of this paper.

It is seldom we allude to ourselves in these columns, or to what others say of us, but we claim the indulgence of our readers for the space required to copy notices of three of our publications selected from a huge pile of similar ones taken from papers published in every State of the Union.

Of the SCIENTIFIC AMERICAN, the Toledo *Medical Compend* says: "No publication comes to our table that is more highly prized than this old substantial journal. Aside from keeping the public fully posted respecting new inventions and scientific developments, it contains a vast amount of the practical and useful. The engravings are of remarkably high order, and matter accompanying them is so tersely put that such subjects as might, under ordinary circumstances, be considered dry and heavy are not only readable, but highly enjoyable. It is the best conducted scientific journal in the United States, as well as being typographically the handsomest. Its circulation is larger than all the others of its class combined."

Of the ARCHITECT AND BUILDER EDITION of the SCIENTIFIC AMERICAN, *Light*, a newspaper published at Worcester, Mass., says: "If one could only realize all the dreams of the architect in this April number, what beautiful homes we might have! It is true that some of them are not excessively expensive, but houses that cost even a few thousand are beyond the reach of many readers of *Light*. Perhaps the most reasonable design is that of a house costing $2,700. Of this there are three views, besides plans for the two floors. Such a building is perfectly feasible to the man who is paying fifteen or twenty dollars a month rent. By the aid of our co-operative banks he could pay for the structure in a few years, and thus have a beautiful home of his own. The illustrations and description range upward to the palatial home in the great city. The April number of the ARCHITECT AND BUILDER EDITION also contains a very interesting page of cuts illustrative of English village houses."

And now comes what Colonel Church, author of the biography of Captain Ericsson, and editor of the *Army and Navy Journal*, has to say of "Experimental Science:" "It is illustrated by more than 680 engravings and is a complete encyclopedia of physics, teaching by the experimental methods and converting the dry studies which once oppressed the classroom into an exhilarating pastime. It may, indeed, serve as a substitute for the 'Boy's Own Book' of an early day, carrying the young student and experimenter as far beyond the possibilities of his father's youthful studies as modern science is in advance of the learning of an earlier day. The solution of all of the problems is within the possibilities of simple arithmetical methods. The material for the work is furnished by articles in that fascinating and useful publication, the SCIENTIFIC AMERICAN. These have been revised or rewritten with copious additions and engravings that are far superior in clearness and interest to the conventional illustrations of the ordinary text books. A lad of 16 to whom we have given the volume," the colonel adds, "finds it of unfailing interest. The variety of experiment is endless."

### Gun Cotton.

In a recent lecture on gun cotton delivered by Prof. Munroe, of the Torpedo Station at Newport, the lecturer declared that gun cotton, correctly prepared and handled according to directions, was the safest of explosives to use. It was dangerous only when the matrials had not been thoroughly purified, or the union of acid and cotton incomplete.

In proof of what could be done with it, a picture was thrown upon the screen showing the workman cutting it with chisel, jig saw, and lathe to fit it into a shell. Another illustration was the extinguishing of a block that was burning by pouring water upon it. Two thousand pounds of it had been burned in a bonfire without explosion.

One volume of the explosive gives 829 of the gas, and the pressure developed by combustion is 81 tons to the square inch, and by detonation 157·5 tons, the latter being in contact, however. The effect of the explosion of one particle on another is so rapid that it would take only one second for it to pass through 19,000 feet of the explosive.

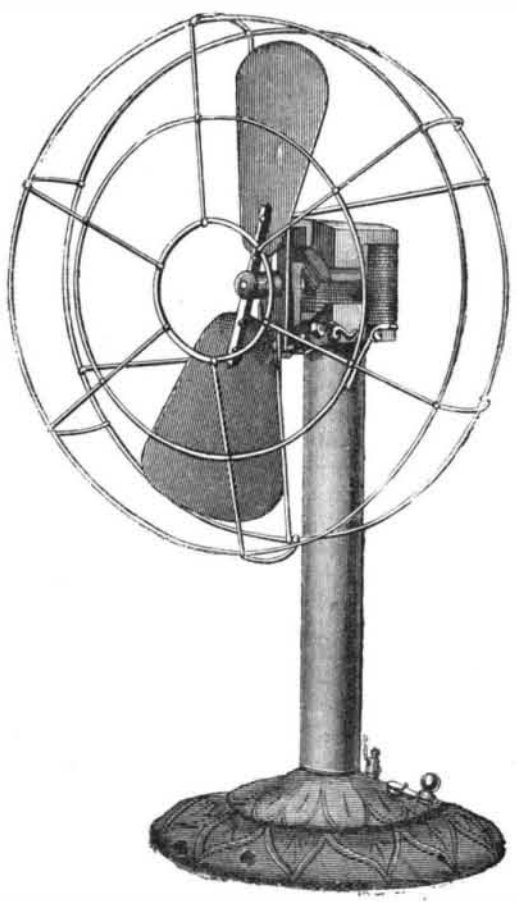
It was shown by the stereopticon that the letters U. S. N., with the date of manufacture, that are in the bottom of each block, are impressed upon an iron plate upon which the gun cotton may be exploded. It is a curious fact that, if the marks on the block are in relief, the reproduction on the iron will be raised · and if cut in, there will be an indentation on the plate. Prof. Munroe's theory is that when the letters are cut into the explosives, the gases generated in the indentations are hurled from them as a projectile from a gun. If a leaf or a delicate piece of lace be laid between the gun-cotton and the iron, its impress will be left in all the perfection of outline of the original, though the article itself is absolutely annihilated.

### AN IMPROVED VELOCIPEDE.

The machine shown in the illustration is designed to be readily propelled over heavy grades, having means for regulating the application of power therefor, and is adapted for use by ladies as well as gentlemen. It has been patented by Mr. Andrew W. Schieding, of Turner's Falls, Mass. The large driving wheel has bearings in a horizontal frame, a forward extension from which drops nearly to the ground, and in this portion is

SCHIEDING'S VELOCIPEDE.

pivoted the axle on which the forward wheels are mounted. A top, indicated by dotted lines, is designed to cover the front portion of the vehicle, which it may be made to cover wholly, with suitable doors. Mounted loosely on each end of the hub of the driving axle are skeleton pulleys, the inner flange of each pulley having a radially projecting extension, as shown in the small detail view. To each of these extensions is pivoted a spring-pressed pawl engaging the teeth of a ratchet wheel on the end of the hub. Pivoted near the front axle are treadles, which have rearwardly extending side pieces in which are pivoted pedals. On the outer side piece of each treadle are lugs to which the operating cable is attached, the lugs being so placed as to give an increased or diminished leverage. The cable extends from the lug over one of two pulleys pivoted in opposite sides of the frame just back of the seat, thence once around one of the skeleton pulleys on the driving wheel axle, thence around two pulleys pivoted at opposite sides of the machine near the ground, in front of the driving wheel, and thence around the opposite skeleton pulley on the driving wheel axle, and back over the



DESK FAN OR SMALL DENTAL MOTOR.

pulley back of the seat to attachment with a lug on the opposite treadle. On the rotating of the skeleton pulleys by the cable, as the treadles are depressed, the pawls on these pulleys engage the ratchet teeth on the hub of the driving wheel to operate the latter. To increase the power, the ends of the cable are attached to other lugs on the treadles nearer their pivotal point, the speed being correspondingly diminished. A rod extending along the sides and across the back of the seat has its rear portion formed into a crank on which a brake shoe is pivoted, in position to be conveniently applied to the rim of the driving wheel. A lever attached to a plate on the front axle extends upwardly and rearwardly toward the seat, and by turning this lever the operator can readily steer the machine to the right or left. A tug is attached to the lower forward portion of the frame, with a handle or loop, for use when the velocipede is to be driven up a steep grade, thus increasing the power to press upon the treadles. With the aid of the tug, from which a strap may be extended over the shoulders if desired, and the increase of power to be obtained by the attachment of the ends of the cable to the lugs in the central part of the treadles, very great advantages are obtained when the grade is exceptionally heavy. The machine is readily operated by a rider in either a standing or a sitting position.

### Energy.

Before the Thomson Scientific Club, at Lynn, Professor Thomson recently delivered a very interesting address on "Energy."

Formerly, he said, matter was considered as the thing that existed, and force the something that acted upon it. Energy is a term used to express something which we do not always understand. It exists everywhere so far as we know. Matter was considered indestructible. If we admit that energy can act on energy, we have no need of the old matter and force. We can see the changes in energy, though we cannot discover the thing itself. We have potential and active energy. Potential is simply stored energy, power to do work. The water in the reservoir is the same as the water a hundred feet lower, but it can do work that the other cannot, because it has energy stored in it. When that water is running down the hill and turning the wheel, it shows its actual energy. The earth revolving is another case of stored-up energy, as is also a wheel in motion. A spring is an example of elastic energy. In a boiler we have kinetic energy transformed from the heat of the fire. These are all mechanical forms of energy. The cannon ball shot into the air shows energy of motion in its ascent. When it reaches the highest point, it has energy of position. When it strikes the ground and bounds, it shows elastic energy. Besides this there is energy of temperature, which the hot cannon ball possesses. This is called molecular energy. If we could take all the heat out of anything, it would become liquid and then frozen. This has been done even to air. There is another or electric energy, another chemical and another radiant. Every form of energy is convertible into any other, sometimes at so great waste as to be impracticable for use. In converting mechanical energy into heat it is almost perfectly efficient, but in converting heat to mechanical motion ninety per cent is lost. The energy of heat is disorganized as contrasted with the organized, direct energy of motion. A disorganized army, each soldier going his own way, can do little. The tendency in nature is to degrade energy.

### DESK FAN OR SMALL DENTAL MOTOR.

A small motor of new design and high efficiency, intended particularly for nse in connection with a desk fan or dental motor, has recently been introduced. It may be used for any work requiring light power. The working parts are substantial, and not liable to wear or get out of order in any way.

It may be operated by an acid primary battery at a cost of not exceeding seven cents for ten hours' continuous service.

The motor may also be operated by a storage or secondary battery, charged from a simple and efficient primary battery. It is easily set up and requires little care. It may be located in any convenient closet or cellar, and connected with a small storage battery and the motor. A switch on the motor is arranged so that when it is thrown so as to stop the fan, it connects the primary with storage battery; the latter being, therefore, charging during all the time that the motor is not in use. A fan or light power motor is thus made available anywhere on short notice, in the sick room, in the office or library, or in any place where it can administer to the comfort or convenience of the occupant.

The same battery can be used to ring bells, operate signals, or do any similar electrical work that may be desired.

The motor and blades of fan are all finished in nickel, and the outfit will be an ornament in any location.

The motor, as fitted up for shipment, has the fan attachment, that being the service that is most often desired.

This motor is manufactured by the Novelty Electric Company, of 52 North Fourth Street, Philadelphia, Pa. It also manufactures electric motors for fans and other light power, of high efficiency, for use in incandescent light circuits, ⅛, ¼, and ½ horse power, and small dynamos, 2, 4, 8, and 20 16-candle power incandescent lamp capacity. Also annunciators, electric bells and burglar alarms.