

PROGRESS OF THE GREAT SUSPENSION BRIDGE BETWEEN NEW YORK AND BROOKLYN.

[Continued from first page.]

strain of the over-floor stays. The longitudinal trusses are six in number, dividing the bridge floor into five sections. The two outside sections, 18 feet 6 inches in width, are for vehicles. A tramway will also be laid down in each, in case it may ever be desirable to run street cars across the bridge. Inside the carriageways will be two railways for cars to be propelled by an endless iron rope, operated by a stationary engine. Between the railways, and elevated 12 feet above them, will be a footwalk, 15 feet wide. This promenade will be the first part of the structure completed, since it will be needed for the workmen upon other parts of the superstructure. On both sides of the river the masonry of the approaches to the bridge is substantially finished.

An idea of the magnitude of the work already accomplished may be had from the following figures, which are furnished by Mr. E. E. Farrington, master mechanic of the bridge:

Length of the main span.....	1,595½ feet.
“ “ land spans, 930 ft. ea., total	1,860 “
“ “ New York approach.....	1,562½ “
“ “ Brooklyn approach.....	971 “
Height of main span above water.....	135½ “
Depth of N. Y. foundation below high water.....	78½ “
Depth of Brooklyn foundation below high water.....	44½ “
Size of N. Y. caisson (for foundation).....	172x102 “
“ “ Brooklyn “.....	168x102 “
Cubic yards of masonry, N. Y. tower.....	46,945
“ “ “ “ Brooklyn tower.....	38,214
Size of towers at high water mark.....	140x59 feet.
“ “ “ “ top.....	136x53 “
Total height of tower above high water.....	271½ “
Height of roadway at towers.....	119 “
“ “ arches above roadway.....	117 “
“ “ towers “ “.....	159 “
Width of openings through towers.....	33¾ “
Size of anchorages at base.....	129x119 “
“ “ “ “ top.....	117x104 “
Height in front.....	85 feet.
“ “ rear.....	80 “
Width of flooring.....	85 “
Grade of roadway.....	3¼ ft. in 100
Number of cables.....	4
Diameter of cables.....	15½ in.
Length of each cable.....	3,578½ feet.
Wrapping wire on each cable.....	243 miles 943 “
Number of wires in each cable.....	5,434
Total length of wire in each cable.....	3,515 miles.
Number of suspenders—	
Each cable, main span, 208; in all.....	832
“ “ each land span, 86; in all.....	688
Total.....	1,520
Number of post bands—each land span, each cable, 35; in all.....	280
Number of double floor beams supported by cables.....	450
Strength of each suspender.....	140,000 lb.
Sustaining power of each cable.....	12,000 tons.
Greatest weight on a single suspender.....	20,000 lb.
“ “ “ “ cable.....	3,000 tons.

NOVEL OIL SEPARATOR.

We give an engraving of a machine for separating oil from metal chips, such as turnings, drillings, chips from bolt and screw machines, and from small articles such as screws, bolts, and nuts, which in their manufacture are necessarily coated with oil, much of which is commonly lost. By the use of this machine the oil carried by the chips, crews, etc., is very quickly separated from the metal by centrifugal action, leaving only a slight film, which is beneficial rather than otherwise.

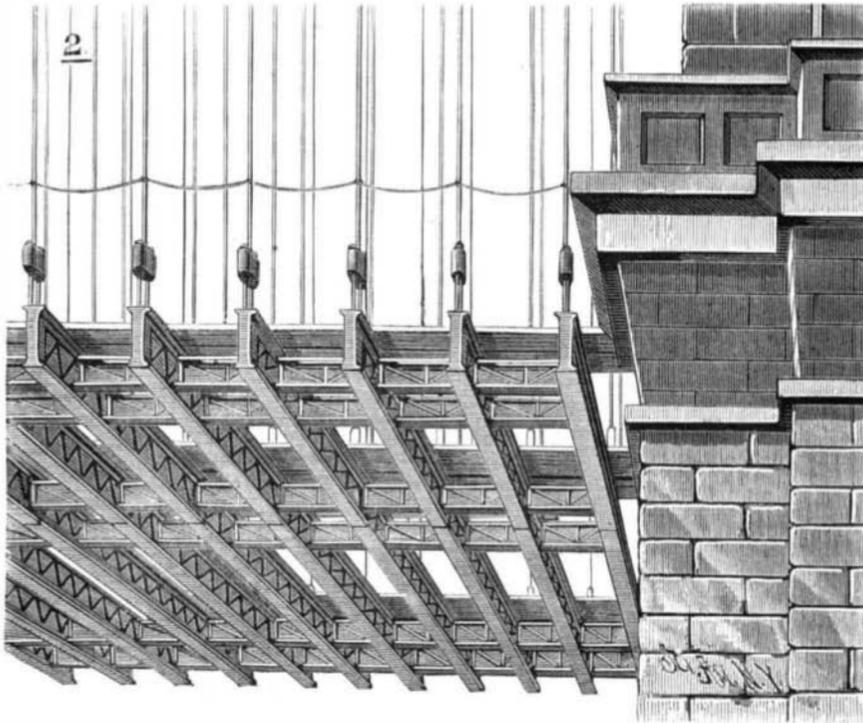
The article from which the oil is to be separated is placed in a removable conical pan in the revolving drum, and confined by a metal cover fastened securely over the top of the drum by the lock nut shown in Fig. 2. The machine shown in the illustration is about thirty inches high and requires a floor space about twenty inches square. It revolves at a speed of 2,000 revolutions a minute, and is noiseless and free from jar. The machine is well made, carefully finished, and is accompanied by a shaft and hangers. It is in use in several of our largest and best machine shops, giving complete satisfaction.

Further information in regard to this useful invention may be obtained by addressing Mr. C. F. Roper, P. O. Box 1211, Boston, Mass., or Hartford, Conn.

Making Old Rails into New.

But few people are aware, says the *Indianapolis Journal*, of the immense amount of handling that it requires to convert an old iron rail into a new one. From the time it arrives in the yard at the Indianapolis rolling mill until it is shipped out, a rail is handled thirty-one times. The process is as follows: It is first unloaded from the car, then picked up and run on a set of rolls to the shears, then cut up, when cut piled into fagots, then loaded on to a barrow and charged into furnace, heated to a welding heat, then

hauled out and placed on iron buggies, run to weighing rolls, handled six times, until finished to a bloom, then returned to the buggy, carried to a repeating furnace, brought to a welding heat, then returned to the rolls on a buggy, passed through the rolls nine times, then run to saws where both ends are put off at once, then laid on the cooling bed; when cold, placed under the straightener, which takes out all minor crooks. The burr on the ends is then filed off, when the rail is inspected, then taken to the punching machine and fitted for splice bars, thence to the slotting



THE FLOOR BEAMS FROM BELOW.

machine, where it is slotted for the spikes; then the rail goes on the benches in the yards and from thence to the cars.

MISCELLANEOUS INVENTIONS.

Mr. Charles T. Sands, Jr., of Nassau, New Providence, West Indies, has patented a cheap, simple, and convenient device for enabling persons to escape with safety from burning buildings. It consists, in combination with a fire escape, of novel devices for arresting or regulating the descent of the basket or cage of the fire escape.

An improved holder for nuts and dies has been patented by Mr. Edward Squires, of Beaverton, Oregon. The invention consists of a frame or box for holding dies or nuts, and is provided with a sliding perforated bottom and an adjusting screw, and is held between the forked end of a rod or hand brace.

An improved means for preventing escape of sewer gas from waste pipes has been patented by Mr. Willis Knowlton, of New York city. Heretofore cocks have been applied to waste pipes for closing such pipes when not in use, but no provision has been made for preventing overflow, or else the

arrangements have been complicated and liable to get out of order. The object of this invention is to provide the waste pipe with a valve whereby it can be closed, and to combine with this device valves in the water pipes and means for operating them, whereby the waste pipe shall be automatically closed, and the overflow pipe of the basin opened simultaneously with the water pipe.

Mr. James Corr, of Jamaica, N. Y., has patented an improved cigar holder, constructed to inclose the cigar entirely while it is being smoked, thus avoiding danger of fire and preventing the ashes from being an annoyance.

An improved metallic sole for boots and shoes has been patented by Mr. William T. Burrows, of East Dubuque, Ill. The object of this invention is to increase the durability of the boot or shoe sole, and it consists of a plate of metal of the shape of the sole, and designed to be secured thereon, made with parallel cuts or slits, that alternately begin at the opposite edges and extend nearly across the plate, thereby forming, in effect, a series of parallel end-connected crossbars.

A device whereby the driving reins will be securely held and can be easily and quickly inserted and detached, has been patented by Mr. Jonathan S. Pitcher, of San Diego, Cal. It consists in posts having one or more cams hinged to them, the cams being held forward by springs pressing against pins attached to the cams and prevented from being forced too far forward by stops attached to the clamp. The device is intended for attachment to the dashboard of the vehicle.

A cheap and strong ear for earthen pots and pans, attached so that it does not interfere with the cover, and so that the strain upon it will not break it loose from its fastening, has been patented by Mr. Milton T. Geren, of New Brighton, Pa.

An improved horse power for gins, etc., has been patented by Mr. Willis H. Harvey, of Somerville, Tenn. The invention relates to an apparatus for transmitting motion from a prime motive power to the machinery intended to be driven by it, the object being to reduce the cost of construction, to adapt it to any present gin house room, and to economize in space and in power.

An improved governor for vulcanizing apparatus has been patented by Mr. William E. Gwyer, of New York city. This governor is for regulating the flow of gas to the steam generators of vulcanizing apparatus, by which the temperature in the vulcanizing chamber is maintained at a uniform point, the object being to utilize an ordinary pressure diaphragm for that purpose, and also to allow escape from the steam space or steam generator of expanded air, which, when allowed to remain, interferes with the indication pressure.

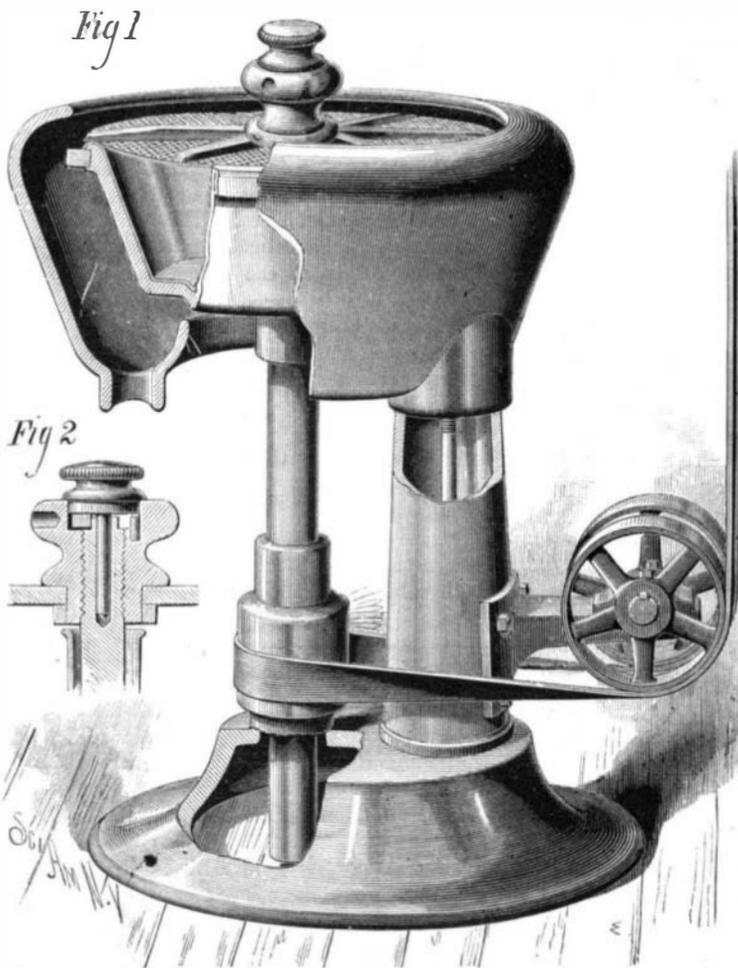
An improved truss, which is simple, durable, convenient, and effective, has been patented by Mr. Henry E. Garst, of Cincinnati, Ohio. The truss is provided with two pads adjustably attached to a spring bar, which is pivoted to one end of the truss spring by a pin passing through a slot in the end of the truss spring, and the other end of the spring is attached in a like manner to the truss cushion, to which the belt is fastened.

An improved shovel handle has been patented by Mr. Wm. H. Johnson, of Industry, Maine. This invention relates to that class of wooden handles for shovels, and similar implements, which are bifurcated and the parts curved in opposite directions to receive the round or hand gripe between them at their ends. In the improved handle the round or hand gripe is firmly secured between the curved arms in such a manner that it cannot revolve.

An improvement in pool tables has been patented by Mr. John Jefferson, of Columbus, O. This invention relates to that class of billiard or pool tables which are provided with pockets; it is a device for conducting the balls from the pockets to a large pouch or pocket at the foot of the table. It can be attached to old tables, using the same pockets without changing the external appearance.

A simple, convenient, and efficient device for cleaning knives and forks has been patented by Mr. Benjamin J. Howe, of Sing Sing, N. Y. The invention consists of a scouring table mounted on a box which is open at both ends of the table, and of a sliding rubbing block guided by or in grooves for applying the polishing powder to the knives or forks.

Mr. Charles W. Stiff, of Foxborough, Mass., has patented an improved lamp extinguisher, by means of which a lamp can be extinguished immediately at any desired time, and which also operates automatically if the lamp is accidentally upset. The invention consists in a lamp burner having two extinguishing caps pivoted to the wick tube, or some other suitable part of the burner, in such a manner that they can close over the top of the wick tube and thus extinguish the flame.



ROPER'S OIL SEPARATOR.

Mr. Richard Kersey, of Lexington, Ky., has patented a simple and compact middlings purifier that will thoroughly separate the flour and bran from the middlings without creating dust in the mill, and that will enable the operator to grade the middlings at will.

An improved heating apparatus for sanitary purposes has been patented by Mr. William R. Macdonald, of Allegheny City, Pa. The object of this invention is to supply at small cost an effective apparatus of simple construction for the sanitary uses of heating, ventilation, and disinfection of buildings—public and private—sewers, drains, and vaults, isolated, sick, or other apartments, water closets, and mines, to be used either solely as a heater or as a heater, disinfector, and ventilator, or for outdoor use as a disinfecting ventilator or alone.

A machine which will receive labels or other sheets or prints as they are delivered from a varnishing or enameling machine, and keep them in slow motion through the air for a sufficient length of time to dry the varnished surfaces, without smearing them or making contact between the varnished sheets till they are dry, has been patented by Mr. Joseph E. Hinds, of Brooklyn, N. Y.

An improved machine for grinding glassware, such as tumblers, goblets, and similar articles, has been patented by Mr. Emmanuel Hutter, of Rive de Gier, France. It is simple in construction and operation, and can conveniently be adjusted and regulated to suit the various forms and sizes of the articles and the grinding stones.

The Electricity of Atoms.

The most novel conclusion of Professor Helmholtz, in his recent Faraday lecture, is to the effect that the atom of every chemical element is always united with a definite unvarying quantity of electricity. This quantity stands in close connection with the combining power of the atom which modern chemistry has termed quantivalence. For if the amount of electricity belonging to the monad atom be taken as the unit, then that of the dyad is two, that of the triad three, and so on. "If," says Professor Helmholtz, "we conclude from the facts that every unit of affinity of every atom is charged always with one equivalent either of positive or of negative electricity, they can form compounds, being electrically neutral, only if every unit charged positively unite under the influence of a mighty electric attraction with another unit charged negatively. You will see that this ought to produce compounds in which every unit of affinity of every atom is connected with one—and only with one—other unit of another atom. This is, indeed, the modern chemical theory of quantivalence, comprising all the saturated compounds."

A Rare Japanese Medal.

At the late meeting of the Philadelphia Numismatic and Antiquarian Society, a member exhibited a very rare and valuable Japanese gold medal, termed "Shinroku Oban," 400 years old, which excited interest not only from the credentials accompanying it, but also from the manner in which it comes to this country. A few years ago the Japanese Ambassador at Washington asked the advice of Col. Thomas A. Scott in relation to the selection of an American engineer to superintend the construction of certain important works contemplated by the Japanese Government. Col. Scott suggested Mr. Joseph W. Crawford, of Pennsylvania, then engaged upon the Texas Pacific Railroad. Mr. Crawford sailed for Japan, and commenced the construction of an artillery road around the island of Yesso, the northernmost of the Japanese possessions, bordering on Russia. This road, although primarily constructed for the transportation of troops and cannon, was graded so that rails may be laid at any time.

Owing to the precipitous rocky cliffs, the climate, and other causes, this undertaking was regarded as exceedingly difficult to accomplish. The manner, cost, and celerity with which this road was completed proved so acceptable to the Japanese Government that Mr. Crawford was sent to this country to purchase supplies, equipment, and assistants to construct the Polonai Railroad. The road was completed and opened with formal ceremonies last November, on which occasion Mr. Crawford was decorated with the Order of the Rising Sun, and as a particular mark of favor this "Shinroku Oban" was presented to him by the government, through Gen. Koroda, Colonial Secretary and member of the Privy Council of the Mikado. The medal is supposed to be one used at the time of Hiyashiyama (a Tycoon who reigned over the empire about 400 years ago), as a reward to any person of an extraordinary merit.

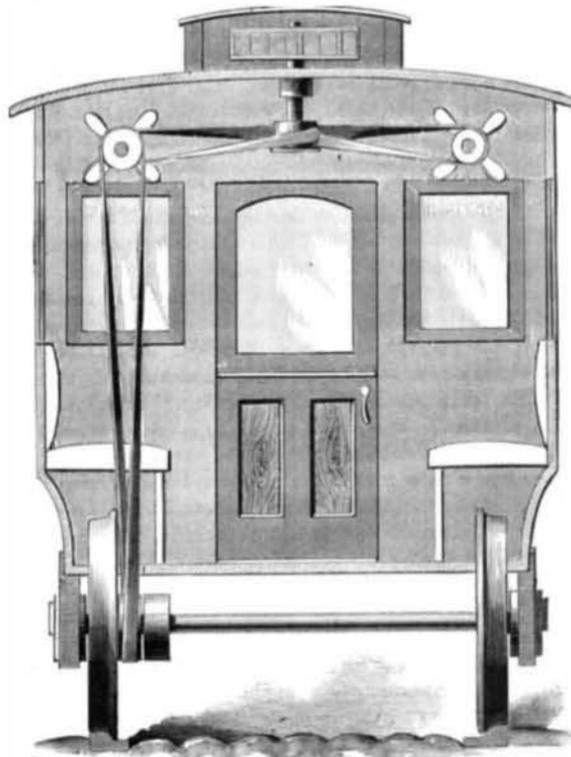
Sleigh Bells—How Made.

It has, no doubt, been a mystery to many how the iron ball inside of sleigh bells got there, and it is said to have taken considerable thought on the part of the discoverer before the idea struck him. In making sleigh bells the iron ball is put inside a sand core, just the shape of the inside of the bell. Then a mould is made just the shape of the outside of the bell. This sand core, with the jinglet inside, is placed in the mould of the outside, and the melted metal is poured in, which fills up the space between the core and mould. The hot metal burns the core so that it can be

all shaken out, leaving the ball within the shell. Ball valves, swivel joints, and many other articles are cast in the same manner.

NOVEL CAR COOLER.

We give an engraving of a device lately patented by Mr. Isaac H. Fridenberg, of Philadelphia, Pa., for cooling passenger cars and for improving ventilation. The apparatus

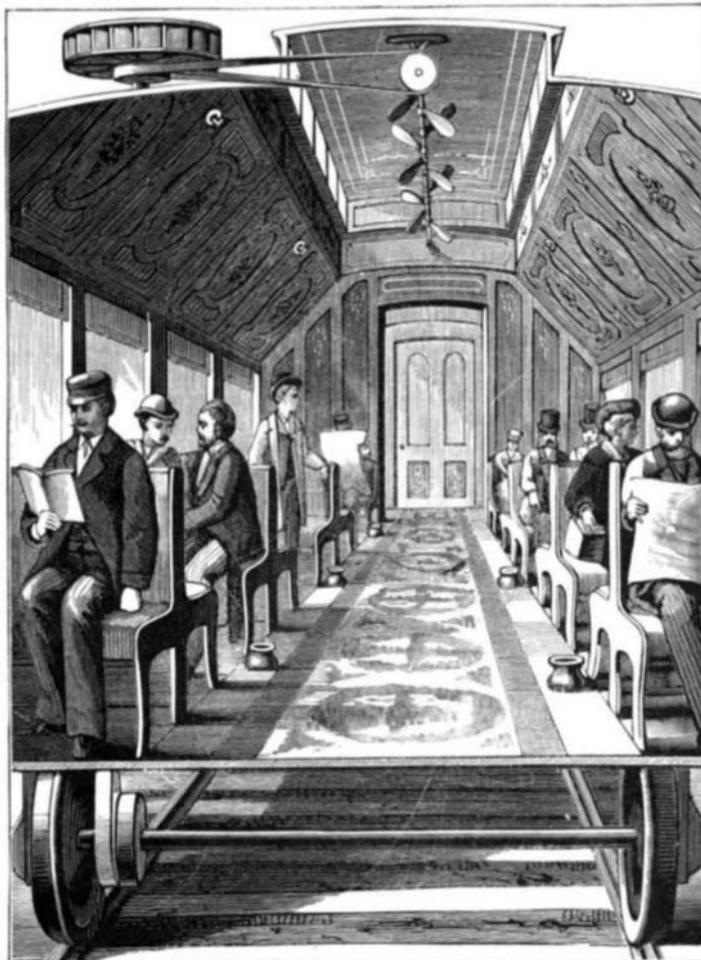


COOLER FOR HORSE CARS.

is very simple indeed, consisting of a shaft running lengthwise through the car, and carrying a number of wings like screw propeller blades, which, as they revolve, set the entire body of air in the upper part of the car in motion, and produce currents in the lower portion of the car which have a cooling effect similar to that produced by so many fans.

When the device is applied to steam cars motion is imparted to the propeller shaft by a wheel mounted on the roof of the car and driven by contact with the air as the car moves along. A belt or a shaft and-miter gears may be employed to transmit the motion. When the device is applied to horse cars the power to drive the propeller shaft is taken by a belt from one of the axles.

The discomforts of summer travel will be greatly relieved wherever this invention is applied. It has a large field in



FRIDENBERG'S CAR COOLER.

sleeping cars, where a comfortable and wholesome atmosphere is usually wanting, and in ordinary passenger cars and street cars it will insure a degree of comfort which should warrant its general application.

Further information in regard to this useful invention may be obtained by addressing Mr. I. H. Fridenberg, S. W. corner 7th and Poplar streets, Philadelphia, Pa.

Industrial Secrets.

A century ago what a man discovered in the arts he concealed. Workmen were put upon an oath never to reveal the process used by their employers. Doors were kept closed, artisans going out were searched, visitors were rigorously excluded from admission, and false operations blinded the workmen themselves. The mysteries of every craft were hedged in by thick-set fences of empirical pretensions and judicial affirmation. The royal manufactories of porcelain, for example, were carried on in Europe with a spirit of jealous exclusiveness. His Majesty of Saxony was especially circumspect. Not content with the oath of secrecy imposed upon his workpeople, he would not abate his kingly suspicion in favor of a brother monarch. Neither king nor king's delegate might enter the tabooed walls of Meissen. What is erroneously called the Dresden porcelain—that exquisite pottery of which the world has never seen its like—was produced for two hundred years by a process so secret that neither the bribery of princes nor the garrulity of the operatives revealed it. Other discoveries have been less successfully guarded, fortunately for the world. The manufacture of tinware in England originated in a stolen secret. Few readers need be informed that tinware is simply thin iron plated with tin by being dipped into the molten metal. In theory it is an easy matter to clean the surface of iron, dip it into a bath of boiling tin, remove it enveloped with a silvery metal to a place of cooling. In practice, however, the process is one of the most difficult in the arts. It was discovered in Holland, and guarded from publicity with the utmost vigilance for more than half a century. England tried in vain to discover the secret, until James Sherman, a Cornish miner, insinuated himself master of the secret, and brought it home. The secret of manufacturing cast steel was also stealthily obtained, and is now within the reach of all artisans.

Facts about Sahara.

Recently Dr. Lenz, who has just returned from an expedition across the Sahara desert to Timbuctoo, gave a lecture before the Paris Geographical Society. Dr. Lenz decisively condemns as impracticable the project of flooding the Sahara. The fresh water fossils, which are met with in many parts, show that the Sahara is not the bottom of a dried-up sea. The temperature is not nearly so hot as might be expected; wild beasts are rare, and the most formidable enemies to be met with are the Touraeg tribes, who, according to report, have recently massacred the French Trans-Saharan Expedition. On the whole, the impression is conveyed that the Sahara is not half as black as it has been painted, and that it is entitled to an apology from the entire civilized world.

Wild Rice.

At a recent meeting of the Academy of Sciences, San Francisco, Capt. R. W. Simpson made an interesting statement detailing his efforts to acclimatize the *Zizania aquatica*, or wild rice, which grows so plentiful in some ponds, lakes, and rivers of Canada, extending north to Mackenzie River, nearly to within the Arctic circle. It grows annually from seed, and induces the presence of enormous flocks of wild fowl in the autumn, who visit these rice lakes and extensive beds for food. At Lake Erie it grows in water six to eight feet deep, and millions of reed birds, as well as ducks and other water fowl, resort there, and afford very fine shooting. Sportsmen's clubs East are taking means to extend its growth, as it attracts game of all kinds. In Rice Lake, where it grows prolifically, it has been cut before seed time by manufacturers, who find its fiber, taken from the under surface of the water to a depth of six or seven feet, to be very valuable. It affords the strongest kind of fiber known for making bank note parchment paper. The Canadian Government are now trying to cultivate and stimulate its growth all over the inland waters of the Dominion. Two friends of Capt. Simpson have each sown thirty bushels of this rice seed, in Wales' Pond, Maine, and he desires to call attention to it, as an element likely to prove very useful in improving the shooting in our State, and as such capable of contributing largely to increase our food supply. Different varieties of it are known, but they all belong to one single species, varying according to climate and location. Capt. Simpson had tried to make it grow in Oregon and California, but had failed. He now learned that the seed needed first to be soaked in lukewarm water.

EARTH FUNGUS AS FOOD.

Dr. Harkness exhibited colored drawings of a new species of earth fungus, first discovered in Golden Gate Park by Mrs. Dr. Mary Curran, which, if to be had in quantity, would prove a valuable article of food. He called it the *Octaviana*. Its spores are distributed underground, in the same manner as those of the famous luxury called truffles. He said he had hunted annually for fifteen years under the small oak groves of California, hoping to discover truffles, which in Paris are eagerly sought after as a great delicacy, and sell readily there at \$4 a pound. French scientists with whom he has conversed assure him that our State has conditions which convince them that they will undoubtedly be found here, when a large number of observers are trained to hunt for them systematically. In Europe they are often rooted up