been that certain things ought to be learned, and we hear, accordingly, that everybody should know how to read, write, and cipher. The new idea seems rather to start with the pupil, and ask what a given brain and sensory power or capacity should be taught in order to develop to the best advantage, both to the individual and to the society to which it belongs. It is owing to this newer way of looking at the educational problem that we find exact knowledge or science coming to be preferred to ancient languages, for instance, or, generally, to metaphysics. At the present time it is needful to insist upon the value of science in general culture. Nothing else leads to firmer and yet less prejudiced thoughts, while the material and moral advancement of the nation must always ultimately depend upon the exactitude of its information. The committee of the association on the teaching of science has a work before it of which we trust it will not be neglectful. In his vice-presidential address at St. Louis, Professor Aug. R. Grote, who was chiefly instrumental in the formation of the committee, says: "The demand has come up from teachers throughout the country that they should be better informed as to the manner in which the sciences may be introduced into the schools and the matter to be taught. It is the duty of this association to furnish the information. If we have not sympathized with this inquiry in the past, let us assist it in the future. It is quite evident that the sooner this association commits itself as a matter of principle to the furtherance of science among the people the more following it will have and the greater influence. And if it does not it will fall behind its peculiar duty and out of the line of advance in human thought. This association must be prepared to demand more time for scientific studies from the public school authorities, and it must show to every one that education is a matter which not only falls properly under its cognizance, but which it is also prepared to take hold of. This association should no longer delay to bring all its forces to bear upon the question of science as applied to education. While it does not do so, it will always seem to shirk a duty and ignore one chief end of its existence."

We may informally point out at the present time some of the directions for improvement in our common school system:

First.—The establishment of primary schools for children between five and nine years of age, where no books are to be used, and object teaching is to be relied on for instruction in the several branches. The hours for tuition to be less than is now the practice in teaching children between these ages.

Second.—The introduction of physical, natural, and social science in the common schools, while the present teaching of grammar, geography, and declamation may be curtailed, and, in part, discontinued. The outlines of mechanics and industrial arts received in the public schools will assist the pupils in their after lives.

Third.—The establishment of a higher grade of schools in which an outline at least of the university course be pursued. The tuition to be by demonstrative lectures, and degrees to be conferred which will carry weight in professional and governmental examinations.

Fourth.—The entirely secular administration of the schools and the teaching of morality without being associated with any system of theology. This reform we seem to clearly owe to the spirit of our republican government and to a national sense of justice.

The time is at hand when our public school system must be extended in its practice, or fail of its legitimate results. The people not only demand better, fuller, and more practically useful tuition, but from an outside point of view it is evident that we need as a nation that liberal thought which only comes from a rounded knowledge. If the association can assist this development through its permanent committee on the introduction of science into the schools it will earn the gratitude of all thinking people in the community.

At its St. Louis meeting last year the American Association elected a limited number of fellows, choosing among its members Mr. Thomas A. Edison, of Menlo Park, N. J., and of world-wide fame as an inventor, for that honor. Its president for the Saratoga meeting is Prof. Geo. A. Barker, of Philadelphia, whose reputation as a physicist and chemist is already extended. The Saratoga meeting will listen to an address from its retiring president, Prof. O. C. Marsh, of Yale College, which will be heard with interest, in addition to addresses from the two vice-presidents of the meeting, Prof. Langley, of Alleghany, and Major J. W. Powell, of Washington. The papers to be presented bid fair to be of more than average interest in many departments, and the most noteworthy will be reported in the SCIENTIFIC AMERICAN.

SANDAL WOOD.

Dr. Berthold Seemann, the eminent botanist, in calling attention to the commercial importance of sandal wood, remarks that "the trade in this fragrant wood has been going on since the dawn of history, and will probably not cease until the connection between sandal trees and idolaters, existing from time immemorial, shall have been broken up by either the one or the other becoming as extinct a race as the Archyopteryx, the Moa, or the Dodo. The religious sentiment of millions of human beings is still intimately associated with this wood. When the Hindoo or Buddhist beholds its smoke curling heavenwards he feels that he has acted up to his religious duties, and that the perfume smelling sweetly in the nostrils of his deity will cover a multitude of sins."

Some of the most ancient records inform us of the prominent part played by the wood in India; and since the introduction of Buddhism into China that country, destitute of sandal trees, has become the principal market for this important production. A piece of wood of the diameter of four to six inches is considered as the most acceptable offering a person can make to the idols of the temples. Large pieces are presented by the rich on particular occasions. The perfume of the sandal wood, which has been held in high esteem throughout tropical Asia for ages, is due to an essential oil residing chiefly in the heart of the tree and near the root, the outer parts of old trunks and young trees being almost destitute of scent. Hence the sandal cutters carefully remove the outer and generally lighter portion of the wood, which they term "sap." The oil is made upon the spot where the trees grow. It is wonderfully strong and penetrating, and is easily extracted, a pound of wood yielding about two drachms. In 1872–73, 10,348 pounds, valued at about $42,000, were imported into Bombay, from whence most of it was exported to other countries. The oil dissolved in spirits and sweetened with a little oil of rose, forms the handkerchief perfume—"Extrait de bois de santal." From the fact that it mixes favorably with otto of rose it is often used for adulterating that article. Within a few years past the oil has been considerably used in medical practice in the treatment of gonorrhœa. It was once used, too, as a stimulant and sudorific, but is no longer employed for such purposes.

Santal wood is the product of several species of the genus *Santalum*, of the natural order *Santalaceæ*. The genus is composed of about twenty members, spread over Asia, Australia, and Polynesia, and in habit is best compared with the myrtles. The most easterly species of the genus is *Santalum insulare*, found in the Marquesas Islands and Tahiti, where it is known as "eai;" the southernmost, *S. cunninghamii*, is found in New Zealand, and is known there as "mairi;" the northernmost, *S. pyrularium* and *S. freycinetianum*, are natives of the Sandwich Islands, where they are called "lau ala;" and the most westerly, *S. album*, is indigenous to the Indian Peninsula. All the species prefer dry, rocky localities, and, commercially speaking, degenerate in quality when they grow in moist places.

Santalum album and a marked, though inferior, variety known as *Myrtifolium*, grow on the mountains of continental India and the Indian Archipelago; Mysore, Malabar, and Canara being the principal districts The tree usually attains a height of twenty-five feet, and when it is allowed to exceed these dimensions is generally found rotten at the core. After felling the trees the bark is removed at once, the trunks are cut into billets two feet in length, and these are buried in dry ground for about two months, during which time the white ants eat away all the outer wood without touching the heart. The latter constitutes the sandal wood of commerce. The billets are afterward smoothed and sorted. The deeper the color the stronger the odor, hence merchants often divide sandal into red, yellow, and white sorts. In general, also, the nearer the root the more powerful the perfume; care is therefore taken, by removing the soil, to cut as low down as possible.

The chips and fragments removed in the process of smoothing the billets and squaring their ends, and the smaller sized billets, suit the Arabian market best; and from these is distilled the essential oil, so much esteemed in Turkey. The larger billets are sent to China, which affords the best market for this wood. In 1866 there were received at the various ports of the latter country 5,197 tons. The smaller billets are used in India. The reputation of sandal wood in Europe rests chiefly on its excellence as a material for carving, and it is manufactured into a great variety of elaborately marked card cases, work boxes, card trays, fans, walking-sticks, etc. Dr. Hunter, some years ago, showed that it was admirably adapted for wood engravings. Some blocks yielded upward of 20,000 impressions without wearing out. The best wood for the engraver's purposes is the dark colored, five inches in diameter, grown on rocky soil.

In old English works sandal wood is sometimes called "Sanders wood," but our present form, "sandal" (which is the Arabic name for it), is more correct. The Chinese call the word "tan-heong" (scented tree); on the Malabar coast it is termed "chandana cotta," while the Polynesian species go by the generic name of "ahi," which in Fijian becomes "yasi;" in Eromangan, "nassau;" and in Tanna, "nebissi."

THE SYSTÈME SÉBILLOT.

A French engineer, M. Sébillot, has developed a plan for a ship railway across the Isthmus of Panama, with an alternative scheme involving a ship canal 30 kilometers long from Aspinwall to the mountains, a railway of 33 kilometers over the mountains, and another canal of 10 kilometers on the Panama side, or about 25 miles of canal and 20 of railway.

M. Francis A. Kieffer, of Paris, representing a syndicate of Parisian bankers and speculators interested in this system, arrived in New York July 23. M. Kieffer says that as long ago as 1873 the Colombian Government granted M. Sébillot permission to construct such a ship railway over the mountains of the isthmus.

The plan contemplates a railway with rails fifteen times as heavy as the ordinary T rail, to be laid twelve meters apart. Over this road vessels up to 7,000 tons burden will be transported in immense docks or cars, supported by wheels a foot thick. The driving power will be placed in the docks themselves under the bulge of the vessel, and will be applied directly to the wheels under the dock. M. Kieffer claims that these docks will be capable of a speed of fifteen to eighteen kilometers (nine to eleven miles) per hour, and that the whole distance from ocean to ocean can be traversed in five hours. The entire cost of construction he estimates at 250,000,000 francs ($50,000,000), while the ship canal favored by M. De Lesseps will demand a capital of 1,500,000,000 francs ($300,000,000). He also says that the tariff on vessels passing over this railway need not be higher than $1.50 per ton, against $3 per ton by canal, to yield a fair percentage on the capital, and that while seven years must elapse before the canal can be completed, the railway can be in operation at the end of three.

It is reported that M. Deitz Mounin, who was president of the French department in the Paris Exhibition of 1878, is at the head of the syndicate which M. Kieffer represents, and M. Emile Jupy, of the well known Parisian clock manufactory, is its secretary. M. Sébillot was the engineer-in-chief for the Martune Arsenal at Foo Choo, China.

A SANITARY CAPTAIN EADS WANTED.

The success of the jetty system at the mouth of the Mississippi makes that grand river a possible channel for a large part of the commerce of twenty States. What that commerce may amount to when the Mississippi valley harbors a hundred million people, as it is likely to in the near future, it is impossible to estimate. It is enough to foresee that it will surpass anything in the way of river traffic that the world has yet known, provided the sanitary condition of the Lower Mississippi is such as to allow commerce a safe and steady passage that way.

Captain Eads has shown how the Mississippi can be entirely freed from the physical barriers which have hitherto impeded the commercial development of that noble water-way. But, however perfect the channel, commerce will not adopt a route liable to annual interruption by pestilence. Trade cannot brook diversion or delay. No more will it subject itself to liability to interruption. Of greater importance even than thirty feet of water is freedom from sanitary risks. Sand bars are but negatively harmful; pestilence is positive. The Mississippi must be made as healthy as the Hudson before its commercial possibilities will begin to be developed. Sanitary science must complete the work which engineering has begun. The great need of the Mississippi valley, commercially as well as socially, is a sanitary Eads. May he come speedily.

The Scientific American in Italy.

One of our contemporaries says: The English Consul, Colnaghi, reporting from Florence, Italy, states that in steel rails and locomotives, and in Sheffield tools and in machinery (turning lathes, etc.), German enterprise is gradually pushing us out of the Italian market, and also endeavoring to push their goods in Italy, and to this end a newspaper called the SCIENTIFIC AMERICAN, chiefly devoted to the hardware interest, is widely distributed throughout the country.

The English Consul probably intended to say, instead of German, that American enterprise was gradually pushing goods into the foreign markets.

American Institute Exhibition.

Application for space should be forwarded at once to the General Superintendent, room 22, Cooper Union building, New York, and all details arranged through him with as little delay as possible. Persons familiar with the exhibitions annually given by this institute are aware that one of the great troubles with which the exhibitor has to contend is that of insufficient space. As all applications which comply with the rules are considered in the order of their coming, it is therefore evident that better location is secured by the early than by the late applicant. The Exhibition will open on the 17th day of September.

The Toronto Exhibition.

The Industrial Exhibition to be held at Toronto in September next, promises to surpass anything of the kind hitherto attempted in Canada. The Governor-General is patron of the association, and his Excellency, with H. R. H. the Princess Louise, have consented to open the Exhibition. Large additions are being made to the already commodious buildings on the Exhibition grounds. The Exhibition will be opened September 1, and will continue until September 20. The prizes offered aggregate $20,000.

American Cutlery in Sheffield.

A correspondent of the New York *Herald*, writing from Birmingham, England, says that recently a leading manufacturer in Sheffield showed his workmen an assortment of American made goods, and, taking up a pair of tailor's shears, offered to give the Union £50 if any one of his men, in a month, would produce one pair of shears as good as the American sample.

SUPERVISION has in it three elements—knowledge, counsel, and authority. A knowledge of each teacher's doings is the radical feature of the superintendent's office. Without that knowledge his office is practically vacated. What sort of superintendence is it, when the officer is in ignorance of the very thing he is appointed to superintend? This knowledge should be gained primarily by personal inspection, and secondly by correspondence, and thirdly by proxy.—*Superintendent Schools of Virginia.*

Another Juvenile Prodigy.

The latest addition to the long list of juvenile prodigies, in respect to memory and mathematical accuracy, is reported from Maine. He is, says the Bangor *Commercial*, the son of a former postmaster of that place, and is now ten years of age. He is untaught, save in the art of reading, to which he appears to give more attention than wiser parents would allow. His strong point is memory. He recollects not only everything that he reads, but everything that he does, remembers on what day he did it, where he was at the time, and what were the circumstances that led him to do it. For instance, he will tell where he was on any day within the past two years, and what he was doing. Further, he remembers and can tell everything that his friends have done, providing he has seen them do it, and can tell on what date and on what day of the week they did it.

The first that his friends noticed of his precocity was about a year ago, when they accidentally discovered that he was almost infallible on any date he had ever seen or heard. Walking in company with some relatives in a cemetery it was observed that he would look at a tombstone, read the date of the death recorded, and the exact age of the person buried there, then glance up and tell on what day of the week the dead person was born. This happened on several occasions, and but little attention was paid to it. Finally one of his relatives took pains to look into an old almanac covering some of the dates he had mentioned, and found that the day of the week had been given correctly in every instance. This caused them to ask him questions, when it was discovered that he could almost instantly tell the day of the week on which any date within the last 75 years fell.

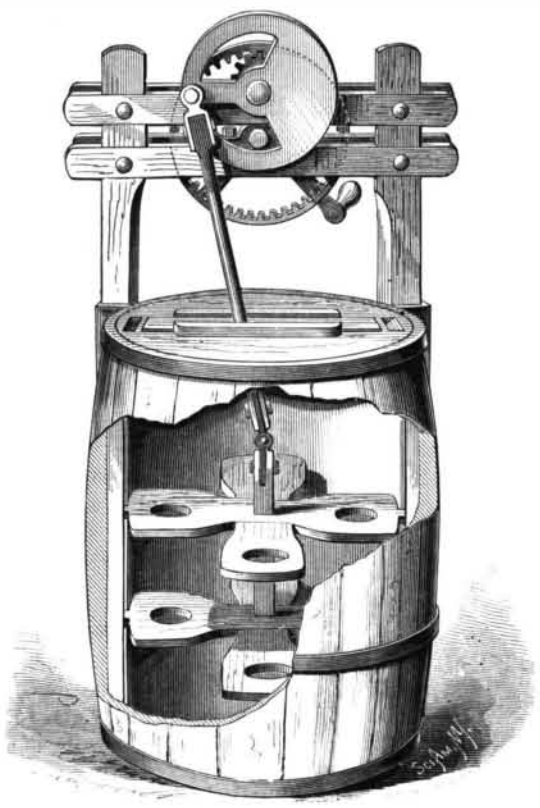
In a series of tests made by the *Commercial* writer, the boy gave the day of the week corresponding to a large number of dates between 1812 and 1840, gave it correctly in every instance, and averaged five seconds for each test. The longest time required was eight seconds, the shortest three seconds. His habits are described as "peculiar."

"He never plays with other boys, but is continually busy in reading. Oftentimes he takes an unabridged dictionary and studies it hour after hour, never seeming to consider it anything but a pleasure to do it. In fact he takes no comfort unless busying his brain about something. If there is anything he does not understand he keeps at it till he does understand it, and then it is next to impossible for him to forget it. One would naturally suppose that a child with such unusual powers would gradually fail and fade away, but, singularly enough, he is constantly growing stronger and more healthy."

It is to be hoped that the last assertion is strictly true, and that the precocious youngster will not exhaust his brain power in infancy. The chances, however, are heavily against him. His name is Charles Fuller.

AN IMPROVED CHURN.

We give herewith an engraving of an improved churn recently patented by Mr. Joseph N. Parker, of Titusville, N. J. The dasher consists of two pairs of cross arms fitted horizontally on a short dasher rod and arranged to slide in ways in the side of the churn. The dasher is reciprocated by gearing supported by a frame attached to the side of the churn. The rod that connects the dasher with the crank passes through a slide in the churn cover, and works through a slot in the cover, which is covered by the slide. The crank



PARKER'S CHURN.

is counterbalanced to insure a smooth action of the machinery. When the churn is driven by power a pulley may be placed on the crank shaft; when it is driven by hand a pinion is placed on the crank shaft, and driven by an internal gear wheel supported by the lower cross bar of the frame. The arrangement of the gearing is such that the churn cover may be readily removed without disturbing the frame that supports it. The mechanism is simple, and the inventor claims that it is very efficient.

Value of a Trade Mark.

The value of a trade mark met with a striking exemplification in Louisville, Ky., recently. Milton J. Harvey, of New York, member of the firm of P. Moorman & Co., brought suit in the United States Court to dissolve the firm. The firm have been large whisky operators, the J. H. Cutler brand being a specialty, and the New York, Boston and California markets being their principal centers for operations. This brand, or trade mark, was one of the valuable assets sold by the United States Commissioner. The first bid was for $5,000, and, after the auctioneer was three hours on the stand and nearly one thousand bids were made, Chas. P. Moorman became the purchaser for $51,050. This was probably one of the most remarkable trade-mark sales ever made in this country, and shows the value of a peculiar mark by which the manufacturer seeks to distinguish his own productions from those made by other persons. This sale further shows the importance of such a privilege, and also why laws of Great Britain and the United States have been especially framed to protect manufacturers in their rights in this respect, because no honest manufacturer will invent and apply a trade mark to his wares unless he is convinced that they possess some special excellence, which he wishes thus made known; and it is desirable the public should have the benefit of such direction in the choice of their purchases as is thereby afforded.—*Chicago Journal of Commerce.*

The Electrical Balance.

Mr. Chandler Roberts, at a recent meeting of the Physical Society, gave some results which he had obtained from an examination of certain alloys by means of the induction balance. He had been able to detect a difference of one part in 1,000 in the amount of silver in two shillings of equal weight. He also pointed out that Mathiessen divided alloys into three classes—(1) solidified solutions of one metal in another; (2) solidified solutions of one metal in an allotropic modification of another metal; (3) solidified solutions of allotropic modifications of both metals. For the first class the curve of electric conductivity is a straight line; for the second, a parabolic curve; for the third, a bent line. Mr. Roberts found that the balance gave the characteristic curve for the first class with an alloy of lead and tin, and for the second with an alloy of gold and silver. With a copper-tin alloy, which is a good example of the third class, he found the curve given by the balance to be intermediate between Alfred Risch's curve of density and Mathiessen's curve of conductivity, and considers that the balance is influenced by the density as well as the conductivity of the metal interposed.

ENGINEERING INVENTIONS.

Mr. Thomas L. Lee, of Paducah, Ky., has invented an improvement in chain propellers, which consists in the combination, with an endless chain, of the paddles, each of which is formed of two right-angular plates placed together and secured by bolts passing through their horizontal or base flanges.

Mr. Benjamin S. Benson, of Baltimore, Md., has patented a traction engine and steam plow combined. It is designed mainly to move backward and forward without turning around, but is also provided with means for turning when necessary. This invention cannot be properly described without an engraving.

Mr. James T. Bryant, of Richmond, Va., has invented an improved feed water cleaner, which consists in a strainer case having an inlet and outlet orifice, a vertical chamber containing a strainer of substantially the same diameter as said inlet and outlet orifices, and interposed between the same, in combination with a discharge valve, located below the strainer, and an independent pipe communicating with the space above the strainer.

An improved link motion for steam engines, so constructed that the motion may be readily reversed, and the throw of the valves may be easily regulated to cut off steam at any desired point of the stroke, has been patented by Mr. Daniel S. Stombs, of Stillwater, Minn.

Mr. William P. Lewis, of Oroville, Cal., has patented an improved pneumatic dredging apparatus for clearing out rivers and harbors, and for mining and other purposes. It consists in raising the solid matter by creating a vacuum in the tube, and expelling it from the vacuum chamber by the assistance of the direct action of steam.

An improvement in treenails for ships, etc., has been patented by Mr. Thomas W. Kirby, of Grand Haven, Mich. This invention relates to an improvement in fastening together the strakes of the ship's ceiling, and the fastening of the ceiling to the ship's timbers; the object is to bind the strakes together in a solid ceiling, and thus strengthen the sides of the vessel.

Mr. Henry A. Norton, of Ward City, Nev., has patented an improvement in that class of railroad switches in which the switch rails are actuated by a moving train or devices carried by the locomotive; and it consists in the construction and combination of parts, which cannot be fully described without an engraving.

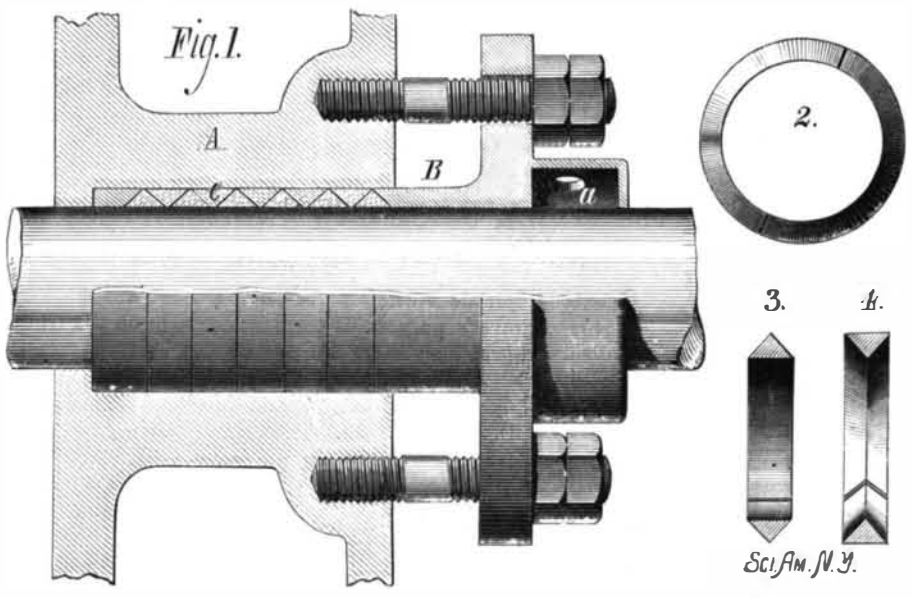
Messrs. Emory D. Toops and Joseph Braddock, of Waverly, Ohio, have patented an improved ditching machine, by which the soil slice is divided into two equal parts by the central cutter of the ditching wheel, and carried up and removed from the channels of the latter by the spirally curved wing or clearer, and by it delivered upon a traveling carrier, which consists of an endless belt passing around pulleys or drums, forming the bottom of a trough which projects laterally from the machine.

An improvement in steam engines has been patented by Mr. Henry A. Walker, of Charlotte, N. C. The object of this invention is to provide an improved piston connection with the driving wheel shaft of an engine and cylinders open at the ends, through which the piston rod passes, so that no stuffing boxes will be required, and the loss of power by friction be consequently reduced.

Mr. Oliver W. Barnes, of Fishkill, N. Y., has devised an improvement in elevated railways. The invention consists of a compound girder that is made of different superposed sections of wood, with intermediate layers of elastic material, the sections being firmly bolted together.

A NEW PISTON ROD PACKING.

We illustrate herewith a novel piston rod packing recently patented by Mr. John Hewitt, of 1323 S. Jefferson avenue, St. Louis, Mo. The invention consists, essentially, of a series of beveled rings placed in the stuffing box and retained by the gland, the rings being beveled on opposite sides. In Fig. 1, in the engraving, the stuffing box is shown in section, and the gland and packing rings are broken away to show their form more clearly. Fig. 2 shows the face of one of the rings, and Figs. 3 and 4 are diametrical sections of internally and externally beveled rings.



HEWITT'S PISTON ROD PACKING.

The stuffing box, A, is of the usual form, and the gland, B, does not differ materially from those in common use. Its inner edge that comes against the packing is beveled, and it is provided with an oil chamber, *a*. The packing, C, consists of a series of soft metal rings which are triangular in cross section, as shown in Figs. 3 and 4. One half of the rings are beveled upon the inside, the other half upon the outside. These rings alternate in position, as shown in Fig. 1. When the gland is forced against the packing thus arranged, the rings that are beveled on the outside are forced against the piston rod, while the rings that are beveled on the inside are forced against the sides of the stuffing box. In this manner the joint between the rod and the packing and between the packing and stuffing box is made perfectly steam tight. We are informed that this packing will wear a long time without adjusting the gland, and that the wear of the piston rod is less than with other kinds of packing. The oil chamber, *a*, is filled with cotton waste for the purpose of feeding oil to the piston rod.

St. Petersburg as a Seaport.

The canal from Cronstadt to St. Petersburg is progressing so rapidly that Admiral Possiett, who directs the work, assures the Russian Government that in a year's time vessels of small size will be able to pass from the sea to the Neva, and that in the summer of 1881 the canal, the depth of which is fixed at 20 feet, will have been excavated to the extent of 16 feet, enabling a goodly sized craft to reach the capital.