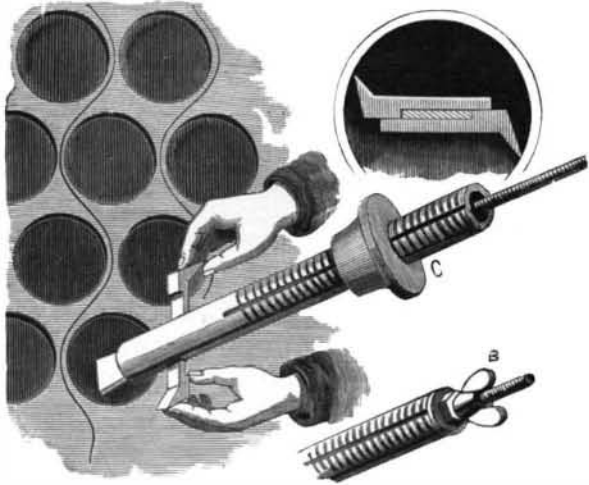


treaties are of great importance in modifying the conditions under which this war is conducted, but no tariff can keep out the highest productions of art or make up for the disadvantages that exist in the lack of a population of artisans thoroughly trained in eye and hand. There are over \$100,000,000 worth of textiles imported into this country every year, all of which

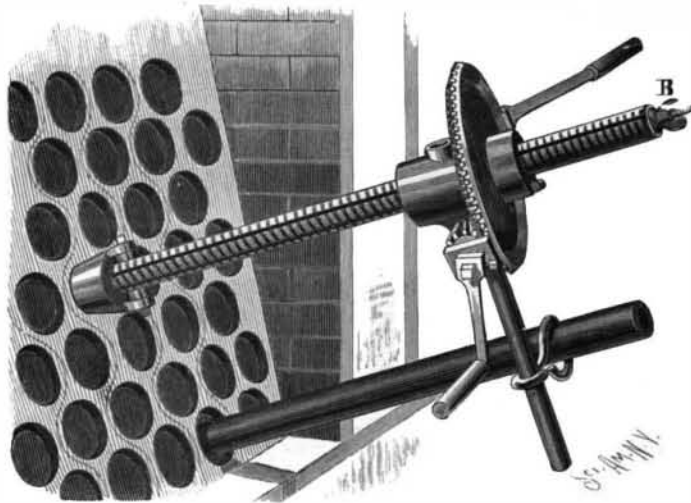


BOILER TUBE CLEANER.—FIG. 2.

represent special advantages that are possessed by no other country, and principally the advantage of a highly trained industrial population. All the leading European nations are spending fabulous sums in the establishment of trade schools of all kinds, not necessarily all in textiles, but in every branch of industry they realize the great advantage that nations like Germany have received in the possession of specialized trade schools in their midst during the last twenty years.

AN IMPROVED BOILER TUBE CLEANER.

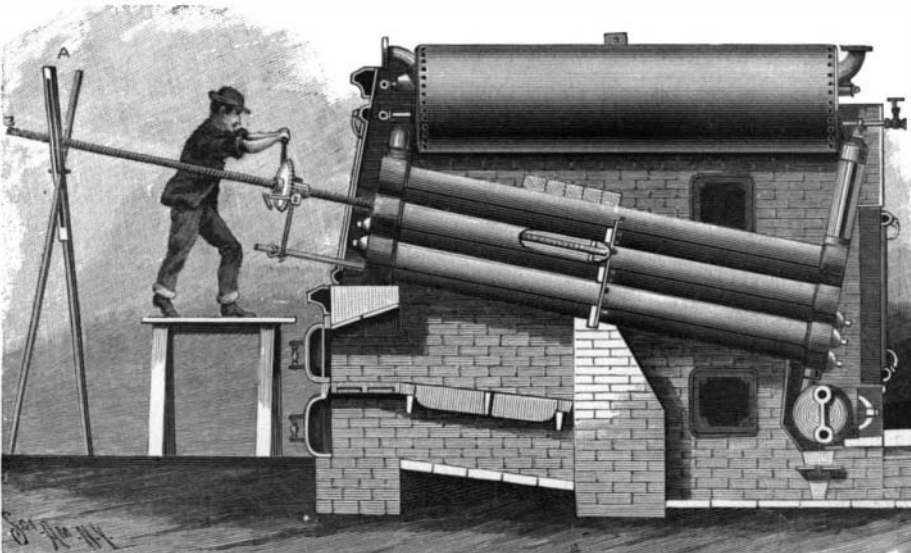
The illustrations represent a boiler tube cleaner so constructed that the tool may be readily loosened in the tube, and its cutting edges brought into greater



BOILER TUBE CLEANER.—FIG. 3.

or less contact with the inner surface of the tube, for removing scale or other matter, the cutting edges of the tool being adjustable from a point without the boiler. An adjustment may also be made to enable the tool to be fed lengthwise of the tubes as required, the tool having a similar cutting action to that of a like tool in a lathe, whereby the scale may be perfectly removed. This improved tube cleaner has been patented in the United States, and in Great Britain, France, Germany, Spain, Belgium and Canada, by John H. Voorhees, of the old established lumber firm of Hardy, Voorhees & Company, of Brooklyn, N. Y. Fig. 1 represents the manner of operating the cleaner, a portion of one of the boiler tubes being broken out; and Figs. 2 and 3 show enlarged details of special parts.

The device which holds the cutters, and to which



THE VOORHEES BOILER TUBE CLEANER.—FIG. 1.

power is applied, is an exteriorly threaded heavy hydraulic pipe or casing tube, of 2½ inches outside diameter, the thread being 1½ inch pitch, and the pipe having a featherway on which the gear power attachment slides. Within this pipe is located an expanding rod, the inner end of the rod having a wedge form, and being adapted, as indicated in Fig. 2, to be passed between a pair of cutters, the drawing outward of this rod thus effecting the spreading of the cutters. The adjustment of the cutters for the proper cleaning contact with the interior of the tube is effected by means of a thumb nut on the outer end of the rod, the nut bearing on a cap which closes the outer end of the casing tube, as shown at B, in Figs. 2 and 3. The chisels or cutting tools are of steel, 5/8 of an inch thick by 1½ inches wide, and they are of such shape that they are designed to sharpen themselves in use, conforming to the interior of the tube until they are almost worn out. The casing tube is inserted through an interiorly threaded nut, meshing with the thread on its exterior, as shown at C, Fig. 2, this nut being placed in position at the outer end of the boiler tube after the cap of the latter has been removed. Power is applied through a gear attachment which has a feather by means of which the casing tube and its cutters are revolved. It may be slipped up and down the pipe and placed at any convenient point to operate, usually as close to the boiler as possible. The fulcrum for the power attachment consists of a 3 inch pipe placed in any of the adjoining tubes, and the gear is driven by two small pinions moved by cranks operated by two workmen.

This cleaner is furnished with its main pipe or casing tube all in one piece, where there is room enough in front of the boiler, or it is made to be joined in two sections to operate where space is limited. The gear attachment need not be removed from the tool at any time during the operation of cleaning, after it is once in position ready for work. The only parts of the cleaner that show any wear with long use are the chisels or cutting tools, and as they last well and are inexpensive, it is evident that the machine may be in actual use for years without practically any expense beyond its first cost. The inventor has found, as a practical result of his experience with this cleaner, that a boiler of 100 horse power may thus be cleaned in three days' time, or at the rate of about twenty tubes per day.

Does Pure Water Pay?

Prof. William B. Mason, of the Troy Polytechnic Institute, has lately published a book on water supplies, and in plainly holding up to view the costliness of obtaining a new pure water supply, or of modifying and altering an old one, he demonstrates that no community can afford to rest with anything short of pure water, known of all men to be such. He cites the evils to be expected from any of the waterborne diseases, but especially writes of typhoid fever from the cool, calculating standpoint of commercial loss. He says:

"The economic value of an individual is what it has cost his family, the community or the State for his living, development and education; it is the loan which the individual has made from the social capital, in order to reach the age when he can restore it by his labor."

It is difficult to compute the value of a man in dollars and cents, and yet the attempt has been made. Chadwick rated an English laborer at about \$980; Faer estimated him at \$780, while a French soldier is reckoned at \$1,200. Typhoid fever—nearly always a waterborne disease—chooses for its victims those in the prime of life, seldom attacking the very old or the very young, which has led able judges to give the valuation of \$2,000 for a man in the prime of his vigor. Mr. Mason selects as illustrative a city of 100,000 people, such as Albany, N. Y., where the deaths from typhoid have

averaged seventy-five for the last five years. Calling each man lost as worth \$2,000, it means a direct loss pecuniarily of \$150,000. Funerals range from \$20 to \$30, so taking a mean of \$25, it adds to the amount of direct loss each year \$1,875—making a total indirect loss of \$151,875.

But this fever does not always kill. The mortality is reckoned at ten per cent of those attacked, and the average period of convalescence is reckoned at forty-three days. Assuming nine recoveries for one death, there are found 29,025 days lost

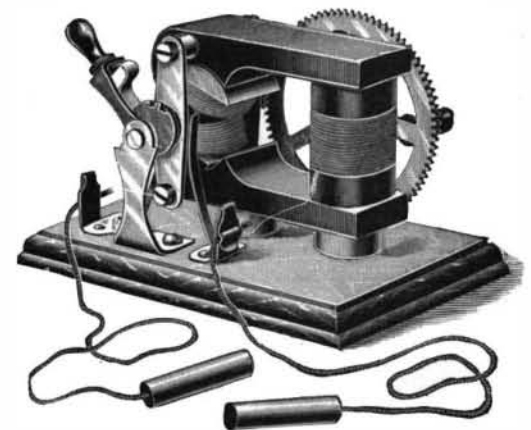
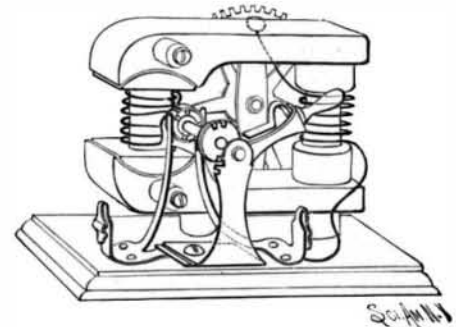
by those who recover—over seventy-nine years; reckoning wages at \$1 per day, there is a loss of \$29,025. Nursing and doctors' bills are at least \$25 per case, adding \$16,875 to the gross sum. To sum up:

75 deaths at \$2,000 each.....	\$150,000
75 funerals at \$25 each.....	1,875
Loss in wages of convalescents.....	29,025
Nursing and doctors' bills.....	16,875
Loss for one year by typhoid—total.....	\$197,775

A heavy sum to be levied on one city by typhoid in one year; and the bare statement of the facts draws its own moral, and the sum would pay the interest on costly waterworks that could in no way be characterized as "death dealing."—The Independent.

A NEW HAND DYNAMO.

Our illustrations represent an interesting novelty in the way of small electrical machines, made to sell at a low cost, and that may be used in schools as well as families. The outline view shows the machine with one of the bearing plates removed to illustrate the armature connections with the commutator. The machine represents in a most simple manner how electricity is produced for practical purposes, whether by power applied or chemically, by means of a battery, the machine being also an efficient one for many useful purposes, as for electroplating and electric decomposition, and especially for its effects on the nervous system, in connection with many lines of medical treatment. It is being brought out by R. H. Ingersoll & Brother, of No. 65 Cortlandt Street, New York. It weighs less than a pound, and is a direct current dynamo, operated by a handle on a large gear wheel, the latter meshing with a small gear to rapidly rotate the



INGERSOLL'S MAGNETO-ELECTRIC MACHINE.

armature shaft. The field is an electromagnet made to do the work of a permanent magnet, being given greater strength when in use by being centrally wound with a coil of insulated wire through which the current is passed. The magnet holds sufficient residual magnetism to start itself at all times. A simple form of commutator brushes, not liable to get out of order, is applied near one end of the armature shaft, and at one side of the shaft bearing, on one end, is a small pulley to which a belt may be applied when the device is to be used as a motor. Integral with and on the outer side of this pulley is a disk, having teeth on opposite edges, adapted to be engaged by a current interrupter, or circuit-breaking lever, which may be swung into or out of position to make and break the circuit and cause the machine to give shocks of greater or less strength as the armature shaft is rapidly revolved, one of the handles being then held in each hand. In the larger view the circuit breaker is shown in position to thus make and break the circuit, in giving shocks, but in using the machine for electroplating, electrolysis, etc., the current interrupter is swung back, as shown in the outline cut, and the two conductors are connected, positive and negative, respectively, with the anode and cathode in the plating solution. To run the dynamo as a motor, four or five cells of any kind of battery are connected with it to form the circuit, and thus operate the armature shaft instead of by turning the large gear wheel, a belt being then run from the pulley to any small machinery the battery is strong enough to work. The current afforded by this little machine can in no way be dangerous, but it is especially well adapted for therapeutic purposes, for the treatment of rheumatism, neuralgia, etc., as well as for quite a variety of experimental work, running small incandescent lamps, ringing magneto bells, etc.

Nationality and Scenery.

In the introduction to an article in the *Deutsche Rundschau*, descriptive of the German landscape, Herr Friedrich Ratzel shows by a few well directed allusions how the intrinsic character of the scenery of a region, even in its apparently most natural features, is affected by the nationality that occupies it, and reflects the character of that nationality. The allusions are local, but the principle they illustrate is general. A country with such a history as Germany's can have no purely natural landscape, says the *Popular Science Monthly*. The people and their land are the resultant of a long material development. When the Romans knew Germany—a barbarian region with few inhabitants—the works of man were less in evidence, and nature prevailed. The effects of cultivation have worked in two principal directions: First, the woods are cleared up, the water is confined within limits, the habitations of men are multiplied and enlarged and made more durable, and new plants and animals are brought in. Then un contemplated changes step in, which proceed of themselves from the works of cultivation. With the drying of the soil the climate is modified. The introduction of new plants and animals imposes new features upon the conditions of life. Where before only stretches of heath, moor, and swamp formed natural openings in the predominant forest, extensive woodless regions arise through the labors of man, from which the shade-loving plants and animals that were protected by the forest gloom disappear, and other inhabitants are at home in the cultivated fields. The variations in the particular shaping of these changes are more especially marked where the boundaries run through mountain regions. In the Saxon Erzgebirge the forests have lost all their wildness, and plantations of firs and oaks grow in regular order, all nearly of a height, with no trees towering into prominence, and the mountain has the trimmed and symmetrical appearance of a nursery. The brooks are tamed, dammed, and made to earn their right to be as the servants of the mills. Passing over the mountains and going down the Bohemian side, we are in the woods again, with the valleys free and irregular, and the brooks running according to their own will. The contrast is seen again, but less marked, in going up from Bohemia and down into Bavaria. Within Germany itself the garden tilled plots near the industrial centers and the little rectangular holdings of the southwestern and middle districts, each distinctly marked off from its neighbor, and making the whole look like a party-colored checker-board, impress one very differently from the immense fields devoted to single crops and the commodious barns of the north. Other differences may be seen on the upper Rhine, where the inhabitants of both sides were originally the same people, but have been subjected to different influences in the course of their history. The French have made their marks all over the Alsatian territory and in the towns of quite another character from the native German aspects of the Baden side.

Brought in Ballast.

A sailing vessel arrived at the port of New York a short time ago from South Africa, and a layman who asked the captain what he brought was surprised to hear that the cargo consisted chiefly of sand. "We brought it," said the captain, "not for its commercial value, but for ballast. Our cargo for this port was light, and to give the ship proper immersion we had to load her with African earth."

There are many articles in the line of raw material which may be brought into American ports free of duty, and these articles are frequently taken at ridiculously low freight rates, sometimes at only a trifle more than the cost of handling at both ends of the voyage, and they are practically ballast; but when there is nothing to transport, shipmasters frequently take earth, as in the case of the African vessel. The popular ballast, though, is stone. This is sometimes sold to contractors after the ship has come to port, and enough is realized in some instances to pay for the handling.

"Often," said a sailing master, "we begin to discharge our ballast when we get near port if the weather is favorable, and if we have no fear that we shall be too high out of the water, and by the time we tie up we have nothing aboard in that line. There are stones and all sorts of rubbish just outside of New York Harbor from all ends of the earth that came in just that way and were thrown overboard. Water ballast is carried in compartments below the floors, but it is shipped merely to stiffen the ship, while other burdens must be added to give the ship the proper immersion."

The ballast question has been a serious one for the salt producers of the United States in the course of the last few years, says the *New York Tribune*. The laws of the country provide that salt may be brought free of duty from any country into which American salt may be shipped free, and the consequence has been that for the year ending June 30, 1896, 546,753,181 pounds of salt came to various ports of the United States free of duty. The United States exported in the same time only 9,765,532 pounds, and, while the imports amounted to \$745,743,

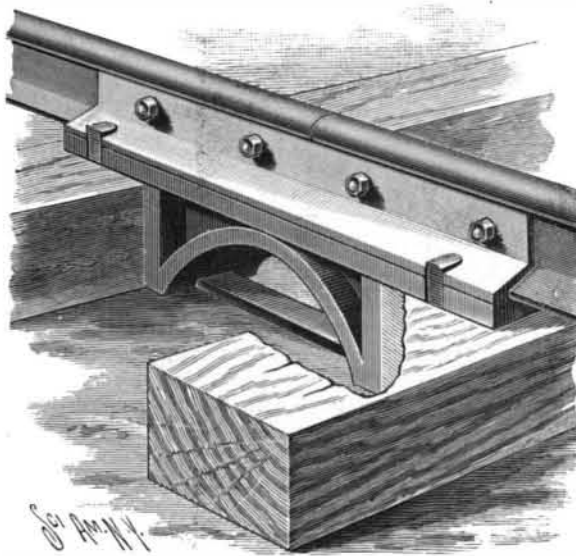
the exports brought American producers only \$40,542. The salt came principally from the West Indian Islands, and was landed at many ports. Boston received 83,000,000 pounds, and among the other large amounts were the following:

	Pounds.
New York.....	71,000,000
Philadelphia.....	44,000,000
New Orleans.....	41,000,000
Gloucester, Mass.....	38,000,000
Baltimore.....	36,000,000
Galveston.....	34,000,000
Savannah, Ga.....	31,000,000
Beaufort, S. C.....	21,000,000
Mobile.....	18,000,000
San Francisco.....	16,000,000
Portland, Me.....	13,000,000

It was explained at the Custom House that much of this salt was used by packers of meats and fish and that a large quantity went back to the countries from which it came in a different form.

A RAIL JOINT SUPPORT AND BEARING PLATE.

The illustration represents a support for railway rails at their joints, designed to prevent the ends of the rails from becoming battered, and thus, also, adding to the life of the rolling stock. The improvement has been patented by Woodley Brugler, of Columbia, N. J. The fish plates are of the angled type, engaging the web and flange of the rail, and the rails and fish plates are supported upon a bearing plate which extends from one tie to the other beneath the joint, the same spikes holding the fish plates, rails and bearing plates in position on the ties. To strengthen the bearing plate, however, an arch support is provided, extending between the ties, the support having integral end plates which bear against the sides of the ties as well as against the under side of the bearing plate, while the

**BRUGLER'S RAIL JOINT SUPPORT.**

central portion of the arch bears directly against the under side of the bearing plate. The arch is strongly made, so that it will not spread under pressure, a cross bar connecting the ends of the arch at the bottom, and the rails being thus supported to form a continuous, even tread surface at the joints.

Air and Athletics.

What the man of to-day needs most is not athletics in a gymnasium, but plenty of fresh air in his lungs. Instead of a quantity of violent exercise that leaves him weak for several hours afterward, he needs to learn to breathe right, stand right and sit right. And if the woman who spends so much time and strength getting out into the air would dress loosely and breathe deeply and so get the air into her, she would have new strength and vigor, and soon be freed from many aches and pains and miseries.—H. L. Hastings, in the *Phrenological Journal*.

"Is there such a thing as intrinsic value?" the *Mining and Scientific Press* asks. Certainly. It is intrinsic qualities which give intrinsic value. Generally, what is meant is that the article embodies in the form in which it is offered for sale, not only original intrinsic qualities, but the actual labor and expense of its production. It is a term, however, which is applied in many different ways, and often is used when "exchangeable value" is meant. An article may have intrinsic value and yet have no exchangeable value. Water is one of the necessities of life, but it is usually so easily obtained that it has no commercial value. A man will be slow to give up a thing, which has cost him labor, for water, when he simply has to dip it up or stoop down and drink. The moment, however, that water has to be forced long distances to places where it is needed, it immediately possesses both intrinsic and exchangeable value. The cost of transportation may add to the value of an article just as surely as labor.

Science Notes.

Fontainebleau's great grapevine produced 7,672 pounds of grapes this year, which when recently sold at auction brought \$715.

While excavating for a pond on the farm of L. V. Harkness, near Donerail, Ky., recently, workmen discovered the bones of a mastodon.

Lord Kelvin has received from the Paris Académie des Sciences one of its Arago medals in honor of his jubilee, and M. d'Abbadie, the Abyssinian explorer, the other.

It is proposed to erect a tablet in honor of Prof. Giuseppe Sanarelli, the discoverer of the microbe of yellow fever, at the University of Sienna, of which he is an alumnus.

The Silesia Verein Chemischer Fabriken, at Woischwitz, near Breslau, provides carbonic acid water for its employes during the summer. The families of the workmen are also supplied freely with this water.

Vaccination laws are not enforced in England. At Norwich, with a population of over 100,000, the vaccination officer's fees this year amounted to about \$40; he receives 50 cents for each case.

Three Italian physicians, Drs. Lustig, Galeotti and Malenchini, have returned from Bombay with a preventive serum for the plague, which they assert is superior for the purpose to Dr. Yersin's. It is not intended to cure but to prevent the disease, is more easily prepared than Yersin's, is free from bacteria, dry and harmless to man and beast. It is introduced by injection in small doses mixed with sterilized water, producing a slight local rash, which disappears in twenty-four hours. The doctors tried it on their own persons.

That certain beetles are by no means frightened by lead foil has long been recognized, but it is rather discouraging to add one more to the number of these culprits. Ed. Stich, of Nauheim, reports that a box somewhat worm eaten was lined with lead. After awhile holes one-eighth of an inch in diameter, and distinctly spiral, were noticed, and traced to the beetle *Tetropium luridum*, Linn., which was not yet on the list of lead eaters, or rather lead destroyers. A cousin of this insect has been known to be destructive to lead chambers. There are, unfortunately, many insects and animals devoid of that sense for the sacred rights of property which we expect of everybody but ourselves.

The bones of a prehistoric monster have been discovered on a large farm about a mile south of Batavia. While Philip and George Baker, dairymen, were digging a grave for a dead horse, at a depth of about three feet the shovel struck an obstruction which, on being pried up with a rail, was broken. It turned out to be an ivory tusk in a splendid state of preservation. A portion of the tusk is of the consistency of chalk. One end of it, however, was not injured, and was of solid ivory. It is five feet in length, about five inches in diameter at the widest end, and at the point about two and a half inches. A portion of a rib, about thirty-six inches long, was also found. Dr. E. E. Snow, who has traveled extensively in Africa, pronounced the tusk that of a mastodon.

Some interesting observations concerning the physiological effects of electric currents have been made by M. Dubois. He finds that the effect depends much more upon voltage than upon intensity. With the same voltage, for instance, a fall of the resistance from 270,000 to 72,000 has no effect, at least as far as the minimum of perception is concerned. But a profound effect is produced by the insertion of external resistances, owing to their self-induction. Even the most non-inductive resistances have a marked effect. The inductance of the human body is practically zero, and hence the great difference produced by the slightest internal inductance. But the effect of an external resistance may be compensated by inserting a capacity in the circuit. In one case quoted a capacity of 0.0045 microfarad re-established the physiological effect which had been canceled by the insertion of a resistance of 600 ohms.—Dubois, C. R., No. 2, July, 1897.

The Committee on Indexing Chemical Literature has presented its fifteenth annual report, which states that a bibliography of the metals of the platinum group, 1748-1896, by Prof. James Lewis Howe, and a review and bibliography of metallic carbides, by Mr. J. A. Mathews, are ready for publication. A bibliography of basic slags has also been completed by Mr. Karl T. McElroy. The second edition of Dr. H. Carlington Bolton's catalogue of scientific and technical periodicals, 1665-1895, which contains 8,603 titles, will shortly be published, and a supplement to the select bibliography of chemistry, by Dr. Bolton, has been completed. The latter contains about 9,000 titles, including those of many chemical dissertations, and is brought down to the end of the year 1896. Progress is also being made with indexes to the literature of thorium and tantalum, a bibliography of oxygen, and a bibliography of the constitution of morphine and related alkaloids.