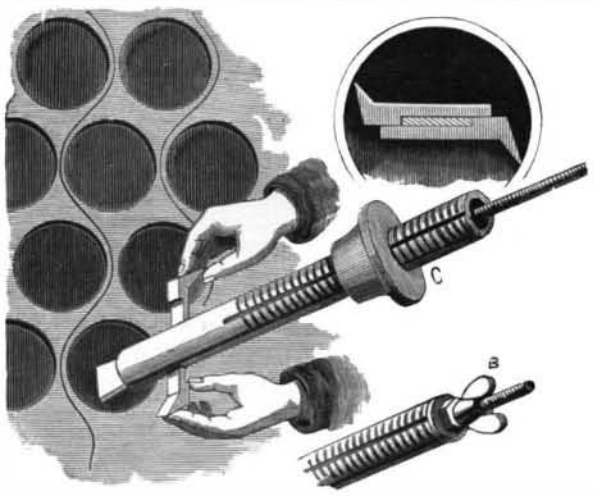
treaties are of great importance in modifying the conditions under which this war is conducted, but no tariff can keep out the highest productions of art or make up for the disadvantages that exist in the lack of a population of artisans thoroughly trained in eye and hand. There are over $100,000,000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

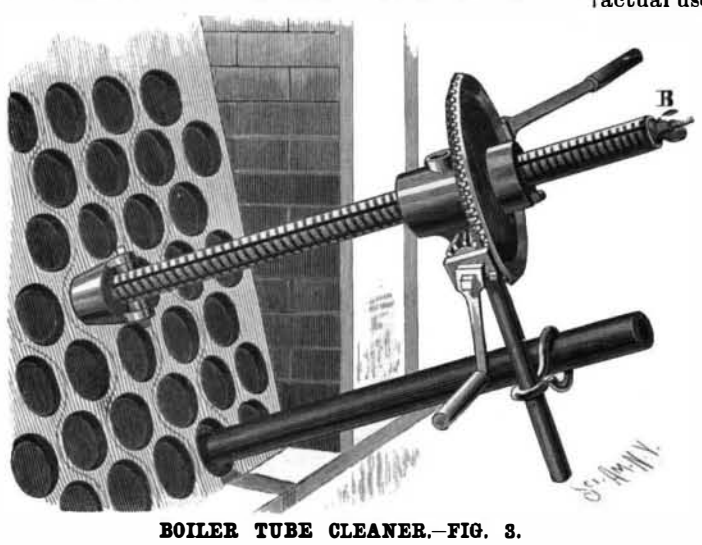


BOILER TUBE CLEANER.—FIG. 2.

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

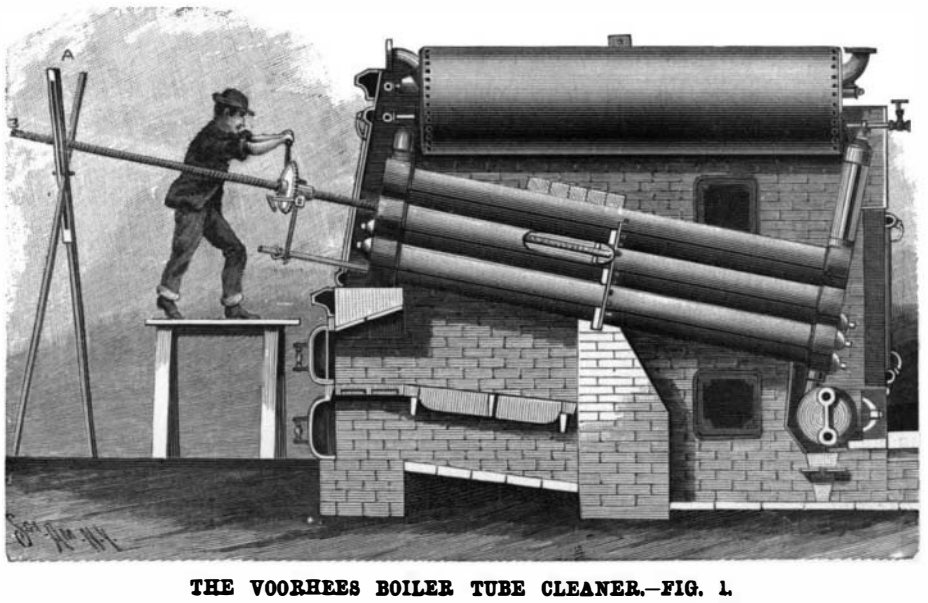


BOILER TUBE CLEANER.—FIG. 3.

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 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, ⅝ 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.



THE VOORHEES BOILER TUBE CLEANER.—FIG. 1.

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.

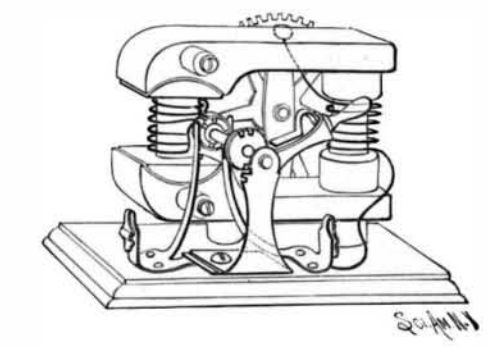
But this fever does not always kill. The mortality is reckoned at ten per cent of those attacked, and the average period of convalescence is reckoned at forty-three days. Assuming nine recoveries for one death, there are found 29,025 days lost by those who recover—over seventy-nine years; reckoning wages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