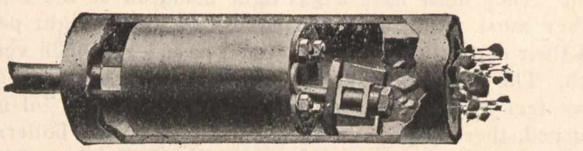
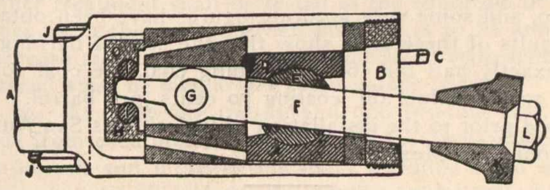
BOILER TUBE CLEANER.

One of the most difficult problems which confronts engineers in charge of steam boilers, and which gives them no little thought is how to get rid of scale formation on tubes. They know that all water in converted into steam, that all water contains certain foreign ingredients and that this foreign matter gradually, sometimes rapidly, accumulates and forms a hard scale deposit of a non-conducting property, injurious and wasteful in the generation of steam. Scale once formed generally becomes a serious detriment to effective and economical operation. It is natural for engineers to resort to all kinds of expedients for its prevention and removal. The shells of boilers and their tubes will, if prompt and efficient remedies are not taken, become coated to such an extent that firing is made more and more irksome and the consumption of fuel unduly increases. These are the simple facts known to every engineer and fireman, who are



Diamond Steam Tube Cleaner for Water Tube Boilers.

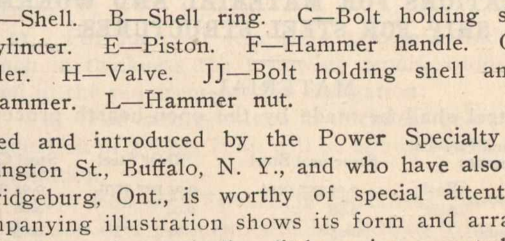
always ready to assert, and with truthfulness, that the most troublesome operation in the care of their boilers, is the cleaning of the tubes. In ordinary return tubular boilers, scale forms on the outside of the tubes, and in water tube boilers, scale forms on the inside of the tubes. In the former the tubes are so close to each other, that it is a difficult task tc clean off the whole exterior surface. Many are the contrivances in use to-day for the removal of scale, but the most efficient, known as the Diamond Steam Cleaner, con-



Sectional View of Diamond Steam Tube Cleaner.
A—Shell. B—Shell ring. C—Bolt holding shell ring. D—Cylinder. E—Piston. F—Hammer handle. G—Pin in cylinder. H—Valve. JJ—Bolt holding shell and piston. K—Hammer. L—Hammer nut.

structed and introduced by the Power Specialty Co., 361 Washington St., Buffalo, N. Y., and who have also a factory at Bridgeburg, Ont., is worthy of special attention. The accompanying illustration shows its form and arrangement.

The cleaner is practically a little engine, operated by steam or compressed air. At the end of what would be the piston rod, on a large engine, is a small iron vibrator or oscillator, made with the same curve as the tube. This vibrator has a movement like the pendulum of a clock, only of course the machine works in a horizontal position, and its movements are infinitely more rapid.



Diamond Steam Tube Cleaner for ordinary Return Tubular Boilers.

Having been connected by a steam hose with an adjacent boiler, the machine is introduced at the front end of the boiler tubes to be cleaned. The steam is turned on, the vibrator commences its oscillating movement, increasing its strokes rapidly, as the pressure is increased to 40 or 50 pounds, which is the normal steam pressure required. By this time the machine will be making from 1,000 to 1,200 strokes a minute, while the accumulation of soot and soot crust is removed and blown out by small jets of live steam. In itself this is a most valuable feature, yet of very minor consideration compared with the vastly more important results, the dislodgment of the scale. The vibration on the inside causes the scale on the outside of the tubes to fall off.

There are two ways to remove hard, thick scale in a water tube boiler, either to bore it out by some device that has a circular movement in the tube, or to give the scale a direct blow to cut and loosen it from the tube. In the former case great power is required, which is almost impossible to obtain in a tube of 3½ or 4 inches in diameter. A great complication of machinery in needed to do any sort of heavy work in this way. In the latter case, the really correct principle, it is claimed is very much simpler and does not involve the use of such immense power. The vibrator of the cleaner is changed to carry a head which is made sharp to cut and scatter the scale, yet so guarded that when the scale is removed, and the boiler is clean, the sharp edge cannot reach the iron itself or make the slightest indentation in the tube. The vibration, meanwhile, serves also to remove any soot formation on the outside of the tube.

OIL AS FUEL,

T. E. Edgar, before Nat. Electric Light Association.

The method of burning fuel oil, the changes necessary in the boilers, the style of burners, etc., are practically the same in all cases, but a brief description of the installation in the electric light plant at El Paso, Texas, may be of some interest.

The oil is stored in two steel tanks, each 30 feet long by 10 feet in diameter, made of 3-16-in steel, which are buried in the ground directly behind the plant. These tanks are buried end to end, four feet below the surface, and covered with a four-inch wood lagging treated with a wood preserver to prevent the alkali in the soil from destroying the tanks. Between the ends of the tanks is a manhole four feet wide by eight feet, into which all pipes, valves and connectious possible are made, affording easy access to make repairs. The tanks are connected together with both the supply and suction pipes and are filled and emptied both at the same time, but the piping is so arranged that it is possible to use each tank separately, affording an opportunity to clean either of them. The oil is delivered in specially-built tank cars, holding from 155 to 300 barrels of oil. A rubber hose three inches in diameter is used to convey the oil from the tank cars to the tanks, and gauges arranged on the back of the plant show the amount of oil in each tank. It takes about forty minutes to unload a car of 6,500 gallons. Each of our tanks will hold about 17,000 gallons, and under the present conditions of operation this will last about half a month, affording us a fair storage capacity. There are two $3 \times 2 \times 3$ duplex steam pumps mounted on an iron frame standing about three feet six inches high. These pumps draw the oil from the storage tanks through a one and a half-inch iron pipe, and discharge it through a one-inch pipe into a small chamber about 14 inches in diameter by two feet six inches long, placed between and slightly above the pumps. The oil enters this chamber at one end, passing through a partition of very fine wire gauze into the other end of the chamber, where it comes in contact with a heating coil heated with the exhaust steam from the pumps. This runs the temperature of the oil to about 145 degrees Fahrenheit, being the proper temperature at which the oil atomizes freely. The gauze screen or partition is used to strain the oil and keep back sand and dirt, which, if allowed to pass the burners, would in time stop up the small openings through which the oil passes. The pump being a double one gives us a reserve in case of accident.

Experiments have been made with two burners, one known as a straight-blow burner and the other known as the cross-blow burner. Thus far we have been unable to see that one burner has any special advantages over the other as regards economy or ease of manipulation. In the straight-blow burner there is a central brass casting with a small bore through which the oil passes. The outside of this casting is fluted like the rifling of a cannon, and outside of this is another brass tube. The steam passing through this space and the fluting gives it a whirling motion so that