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NEW SERIES.

**IMPROVED EXCAVATOR**

The annexed engraving illustrates an excavating machine invented by Isaac A. Benedict and G. W. Cummings, of Conneaut, Ohio. It is designed to be drawn by oxen or other animals, taking the earth out from the middle of its track and depositing it on one side as it moves along, the machine operating in the following manner.

The machine runs upon the two large wheels, A A, and the castor, B, loosening the ground as it passes along by means of the coulters, c, and scraper, D. The loosened earth is then gathered from the scraper by means of the revolving buckets, E E, which as they rise, are tilted over, emptying the dirt at the side of the machine in the manner shown. The revolving buckets are carried around by cog wheels which are connected in the manner clearly represented in the engraving with the driving wheels, F F, a greater or less portion of the weight of the machine being thrown upon these driving wheels by carrying the shaft of the wheels, A A, up or down the geared segments, G G.

The buckets are caused to discharge at either side of the machine as may be desired, by means of the guide rods, h h, one of which is brought into play to deflect the buckets to each side. As the buckets continue their revolutions, they are brought back between the sides of the scroll, I, by the guide rods, j j. The depth to which the coulters and scraper enter the ground is regulated by varying the height of the forward part of the machine on the castor, B, by means of the screw, K. As the depth of the ditch increases the machine is let down below the level of the axle of the wheels, A A, by turning down the cogged segments, G G, and the position of the machine laterally is determined by sliding the axle of the wheels, A A, in the sleeve through which it passes for this purpose, the position of the forward end of the machine being controlled by the inclined roller, L.

The buckets, E E, are attached to the shaft about which they revolve, in such manner that they may yield inward toward the center on encountering any rigid obstacle. This mode of securing the buckets is clearly shown in Figs. 2 and 3, the arms being pressed outward by spiral springs.

This machine is as well adapted for excavating and dredging, as it is for ditching.

The patent for this invention was granted on the 15th of May, 1860, and further information in relation to it may be obtained by addressing the patentees, at Conneaut, Ohio.

**SCALE IN STEAM BOILERS.**

The scale in steam boilers almost always consists of either the sulphate or the carbonate of lime, and as a general rule, it forms only when water is used containing one of these salts in solution. The mode in which the sulphate of lime is deposited is this: It requires

450 pounds of boiling water to dissolve one pound of the sulphate of lime, and, though the water when placed in the boiler may not contain this proportion of the sulphate, yet, as evaporation proceeds, a portion of the water is carried off, while the salt not being volatile, all remains in the boiler, constantly increasing the strength of the solution until the water becomes saturated, when any further evaporation causes the salt to assume the solid form. The sulphate of lime thus precipitated, is drawn by a mysterious law to attach itself to any solid substance with which the water may be in contact, hence the formation of the scale on the boiler. The precipitation of the carbonate of lime is pro-

duced by just the right quantity of lime. But this is a delicate operation and would be hardly likely to succeed, except in the hands of a skillful and experienced chemist.

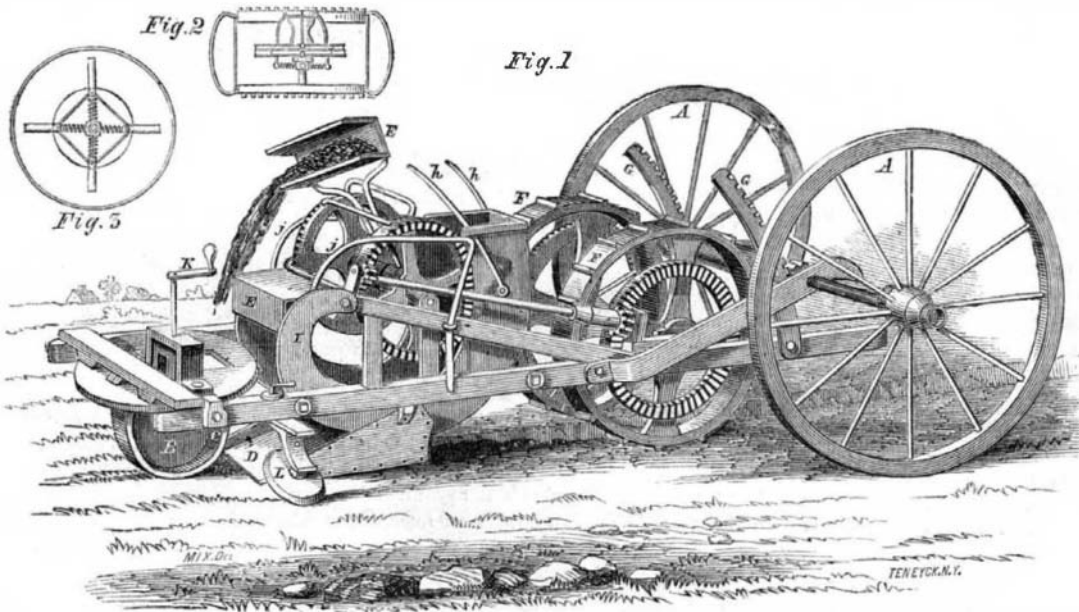
The best of all modes for preventing the formation of scale, is to use pure water where this can be obtained.

There have been many substances offered for sale at high prices for dissolving the scale after it is formed. But there is no substance known to chemical science, that will dissolve any considerable quantity of either sulphate or carbonate of lime which will not also dissolve iron. If, therefore, any person has produced such a substance, he has not only rendered a service to the

mechanic arts, but he has made a very important discovery in chemistry which will bring him fame as well as money. The scale once fastened to the boiler, we know of no way of separating the two but by means of the chisel and hammer.

**HYPNOTISM.** — The French scientific journals are full of accounts of the application of the new discovery, hypnotism. In *Cosmos* we find a detailed account of an amputation performed while the patient was under its influence in the Hotel-Dieu of Poitiers, on a man aged 34, whose left knee was

**BENEDICT & CUMINGS' PATENT EXCAVATOR.**



duced by a different process. This salt is scarcely soluble at all in pure water, but it is soluble in a mixture of water and carbonic acid, and as the first action of heat on the substances in the boiler is to drive off the carbonic acid, the water which remains is incapable of holding the carbonate in solution, and it is accordingly immediately precipitated in the solid form, cleaving like the sulphate to any solid substance with which it may come in contact. Strictly speaking, the carbonate results from the decomposition of the soluble bicarbonate.

The precipitate may be prevented from adhering to the boiler with bran, chalk or other solid substances in minute particles; when the salts of lime will form a thin scale over each of these pieces, and will be blown out when the stop cock is opened for this purpose. This is the most common method in use for preventing the formation of scale.

Another plan which has been tried in various modifications, is the arrangement of a vessel in communication with the lower part of the boiler, but not in contact with the fire, into which the solid matter may fall, and where it will remain in consequence of the water not being in ebullition. On page 178 of the current volume we published the translation of a very lively description of the re-invention in France of this old device which has been long known in England and this country. The plan for some reason does not seem to be entirely successful.

When the impurity in the water consists wholly of bicarbonate of lime, this salt may be precipitated and removed before the water is put into the boiler, by the

addition of white swelling, to nearly double the size of the right knee, and was so painful that the least movement produced the most intense suffering. The hypnotism was produced by placing a spatula about eight inches in front of the root of the nose. Looking at this he soon become insensible, in spite of the severe pain which he was in from being taken to the operating room. Insensibility was produced in ten minutes, and the amputation occupied a minute and a half. The patient made no sign of pain, and when questioned by the doctor said he thought he was in Paradise. His features were perfectly tranquil; his eyes only seemed to be wandering in search of the brilliant object which had been before them. Hypnotism is not safe for the patient. M. Giraud-Tenlon says that a lady whom he hypnotized made so free with her confidences, that he, for fear of grave results to her, was obliged to awake her. He thinks that the loss of free will and conscience, with the preservation of memory, the passions and the power of speech, does not make up a desirable state. A very singular experiment has been many times repeated in France. It consists in marking a chalk-line along a floor, and placing a hen whose beak also has been whitened with chalk in the axis of the line and nearly touching it. She soon sinks into the most complete hypnotic sleep, accompanied by insensibility and catalepsy, by blowing gently on her eyes she is awakened, and immediately shakes herself, flaps her wings, and runs away with much squawking.

The great transatlantic balloon has again burst.