

on the bottom to be crushed is made by means of a catch which permits the drill to fall, the lower part of the instrument being provided with a heavy weight. In that manner the force which is necessary to operate the auger at a depth of 2,624 feet, 2,952 feet, or 3,280 feet is no greater than at 328 feet. It is only necessary to remove the instrument from the bottom of the hole in case of some accident.

It was Eynhausen who first conceived the idea of balancing a portion of the drill, and this was the first step in the application of the free fall, which is now in use in a great number of the systems that are constantly being improved.

The instruments to be used in driving artesian wells form almost an arsenal. Our engraving (Fig. 2) reproduces the principal types of these cyclopean instruments which are used for boring, for cleaning, for extracting the rubbish, for enlarging the bore, etc.

The reader will find in the description placed under the cuts the necessary explanations. By means of samples, the large cylindrical blocks of rock which are brought to the surface, it is possible, with the help of science and past researches, to form geological charts giving the exact position of the strata traversed by the boring instrument. The drill, by alternating and repeated blows, crushes and grinds the hard rock at the bottom of the boring. The rubbish is brought to the surface by a cleaning instrument. When a friable stratum is met with, it is sustained by iron tubes, and when the artesian supply is reached the tubes which serve to conduct the water to the surface are put in place.

The tubing is run in large iron sections, 3, 9, 12, and 7 feet in length, riveted together in such a way as to form a smooth interior bore and constitute a single rigid column from the top to the bottom of the well. The thickness of the tubes varies from 0.118 to 0.787 in., according to the diameter of the bore. It is curious to see the tubes superposed one above the other with perfect precision, while in their interior the enormous drill works with regularity and almost noiselessly. The instrument employed at the Place Hebert weighs 8,000 pounds, but those used by Mr. Lippmann in the wells at Konigsborn and Gelsenkirchen weighed 50,000 pounds. The drill is lifted from 1 foot to 1 foot and 6 inches, ten or fifteen times a minute, and falls by its own weight on to the bed, which it reduces to powder.

Sometimes accidents happen, and the tubes are crushed and flattened out at enormous depths. It is

then necessary to withdraw them and bring them to the surface. It required nine years to remove tubing 328 feet long and weighing 120,000 pounds, which had been placed in the well in the Place Hebert.

Sometimes dynamite is used for breaking the forma-

die, the bar being normally upheld by a spring. Above the bar is a double-faced eccentric, having a rigid handle made integral therewith, the eccentric being pivotally supported by a bolt extending through the upper portions of the side plates. A bracket is adjustably connected to the right hand side of the body, so that it may be moved toward or from the front of the gummer, the bracket forming a support for a gauge, upon the point of which is a toe to enter the recesses between the saw teeth and regulate their size and slant as they are formed by the gummer. The construction is such that the gummer may be readily secured to a bench or other stationary support, and allow the saw body to be swung over the bench when the dies are used for shearing, giving a greater range of motion than would be possible if the gummer were supported at points above the die.

AN IMPROVED CARTRIDGE LOADER.

A combination tool for loading the ordinary form of paper shell cartridges, and which will load both No. 10 and No. 12 shells, is illustrated herewith, and has been patented by Mr. Francis P. Devens, of No. 1306 Forest Avenue, Kansas City, Mo., the invention covering an improvement on a cartridge loader by the same inventor described in our issue of April 21. Upon the main standard is mounted a cylinder, above which is a centrally divided hopper, with one compartment for shot and the other for powder, the internal mechanism of the cylinder being such that, by the raising of the bifurcated lever a certain distance, a regulated discharge of powder will be effected and, the lever having been lowered and again raised in like manner, a similar discharge of shot will be made. The base of the shell tube is adapted to slide on a plate extending forwardly from the clamp, and having an elongated aperture, through

which the shell to be filled is passed into the shell tube, the latter being then moved to the position beneath the hopper where it is shown in the illustration. The powder having been supplied, the tube, as it is drawn forward, engages a tongue at the lower end of the wad tube, whereby a wad is placed on the powder, and the shell tube with its partially filled cartridge is moved further forward to a position just beneath the plunger, when a depression of the lever forces the wad home upon the powder. The same operation is then repeated in loading the shell with shot. A capping and decapping device, adapted to screw into the lower end of the plunger, has a convex face on one end for capping and a pin projection on the other end to remove an exploded primer. The crimper, beneath the forward end of the clamp plate, has an annular groove



Fig. 2.—INSTRUMENTS USED FOR BORING THE ARTESIAN WELL IN THE PLACE HEBERT, PARIS.

1. Drill, 4 feet 6 inches in diameter, having 6 arms provided with channels, allowing a free fall. This instrument is used for sinking the well and for cutting out specimens at a depth of from 1,400 to 1,800 feet. When it is desirable to remove a sample, the large transverse blade is replaced by two small ones. 2. A drum having 7 valves serving to remove the earth which has been ground by the drill with the transverse blade. 3. Drum with an interior pump. This drum serves to remove the sand which is met with at a great depth. 4. Drum composed of 8 tubes having valves at the bottom; this is used when it is desirable to remove a specimen of a stratum. It serves to clean the annular space made by drill No. 1 without the transverse blade. 5. A specimen cut out and ready to be clamped and raised by drill No. 6. 6. This tool is used for cutting the base of the specimen and removing it from the bore. 7. Machine having 8 rollers for straightening tubes of 5 feet in diameter, and for grinding up a section of tube which has been broken.

tions which have defied the powerful weight of the tools, but dynamite does not act effectually at such great depths under the enormous pressure of water. Charges of 30 pounds of dynamite simply lift the column of water, and let it fall again, without accomplishing any useful end. A pressure of 2,000 feet of water or more is so great that a wisp of straw carried to the bottom of the well by the instrument, and then brought up to the surface by the cleaning device, was found twisted and contracted in such a way that it was as heavy as metal, and fell to the bottom of a dish of water like lead, although it preserved its original appearance and form.

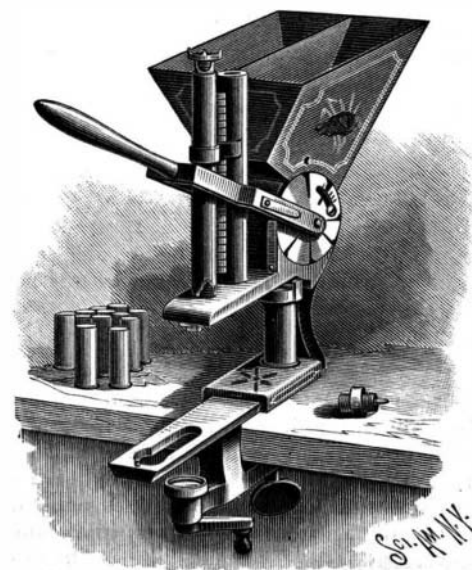
Our other drawing (Fig. 1) represents the position of the well at Place Hebert, the surroundings of which have not yet been completed. This abundant supply of hot water throws a spout 114 feet high. The water will be conducted to reservoirs, where it will be at the disposal of factories and, perhaps, employed for private purposes. Very little remains to be done to complete this important work and to gather in the fruit of success. Science and the arts will have learned many useful and important lessons, which will be of benefit to posterity.—*La Nature*.

AN IMPROVED SAW GUMMER.

A saw gummer which admits of ready adaptation and quick adjustment for work on a variety of saws is illustrated herewith, and has been patented by Messrs. John P. and Nicholas Romer, of Gowanda, N. Y. To the side faces of the lower portion of the body are riveted upwardly extending diagonal plates, above which is adjustably held a die holder, the adjusting screws holding the die in any desired position, while the die rests directly on the upper end of the diagonal braces. In the die is formed a V-shaped opening corresponding with the desired interdental spaces of the saw. Side plates are secured above the die, between which is mounted a movable bar, the lower end of which is formed to correspond with the opening in the



ROMER'S SAW GUMMER.



DEVENS' IMPROVED CARTRIDGE LOADER.