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THE BATTERING RAM AS A TUNNEL BORER.

Mr. Charles Bergeron,C. E., in a recent issue of the *Engineer*, contributes a paper on the St. Gothard Tunnel, and more especially relating to the modes of drilling which have been adopted. The Dubois and François perforators, which are of more simple construtions and of higher efficiency than the similar machines employed at Mont Cenis, have been mainly employed, but more recently the McKean apparatus has been substituted. Compressed air is furnished at a pressure of from five to eight atmospheres, by means of three powerful turbines of 220 horse power each, forming a total amount of 660 horse power, at each end of the tunnel. With such powerful engines, M. Favre,the contractor expects to execute three blastings by dynamite per day, advancing each time 4·8 feet at each end of the gallery, the entire extent of which it is believed will be completed in less than five years.

Mr. Bergeron,in considering the plans of M. Favre forthe use of dynamite, points out a number of different operations, as well as objections incident to the employment of the same, and thinks that there is a way of accomplishing the work in less time and with a much smaller amount of trouble and inconvenience.

In making their long subterraneous aqueducts, it is stated that the Romans used a battering ram to pierce the way through rock. This engine consisted of a long wooden beam suspended at its center of gravity and heavily weighted. A number of men on each side, acting together, gave it a swinging motion, so that it struck with great force any obstacle in its path. When the instrument was to cut hard rocks for tunnels, the metallic head was armed with points like a stonecutter's hammer, intended to divide and reduce the stone to fragments or dust. Captain Penrice, an English engineer, some time ago conceived the idea of constructing a rock drill on the same principle, and to employ steam or compressed air for pushing,like a steam hammer, a perforator of four or five feet diameter. This was tried in the Vaugirard quarries near Paris, and made five feet advancement per hour; and since, another has been built, 3 feet 6 inches in diameter, which, it is asserted, will penetrate a distance of from two to three feet in similar time. By suitable mounting of the cylinder on the trunnions of a gun carriage, it can be made to take all the positions of a marine or siege gun, and strike the rock with blows of eight or ten tuns weight. The hammer weighs two tuns and a half. The engraving of the apparatus will render its construction clear. A is the framing, suspended on the wheels,B B. The end wheel serves to direct the carriage, and the whole is moved forward by the aid of the hand spike, Fig. 6, inserted in the holes,O O, in the wheel, B. D is the steam cylinder, mounted on trunnions, and its angle is determined by the segment, N, and pinion and handle, M. E is the valve chest; K,the hand lever by which the valve is actuated; H′ is a heavy balance weight; H is the ram head fitted with cutters, shown on an enlarged scale in Figs. 2, 3, 4, and 5. The holes ,O, are used to extract the cutters when worn. J is the air pipe, to which a flexible pipe is attached. By moving K backwards and forwards, H will be made to act as a battering ram on the face of the heading in a way that will be obvious.

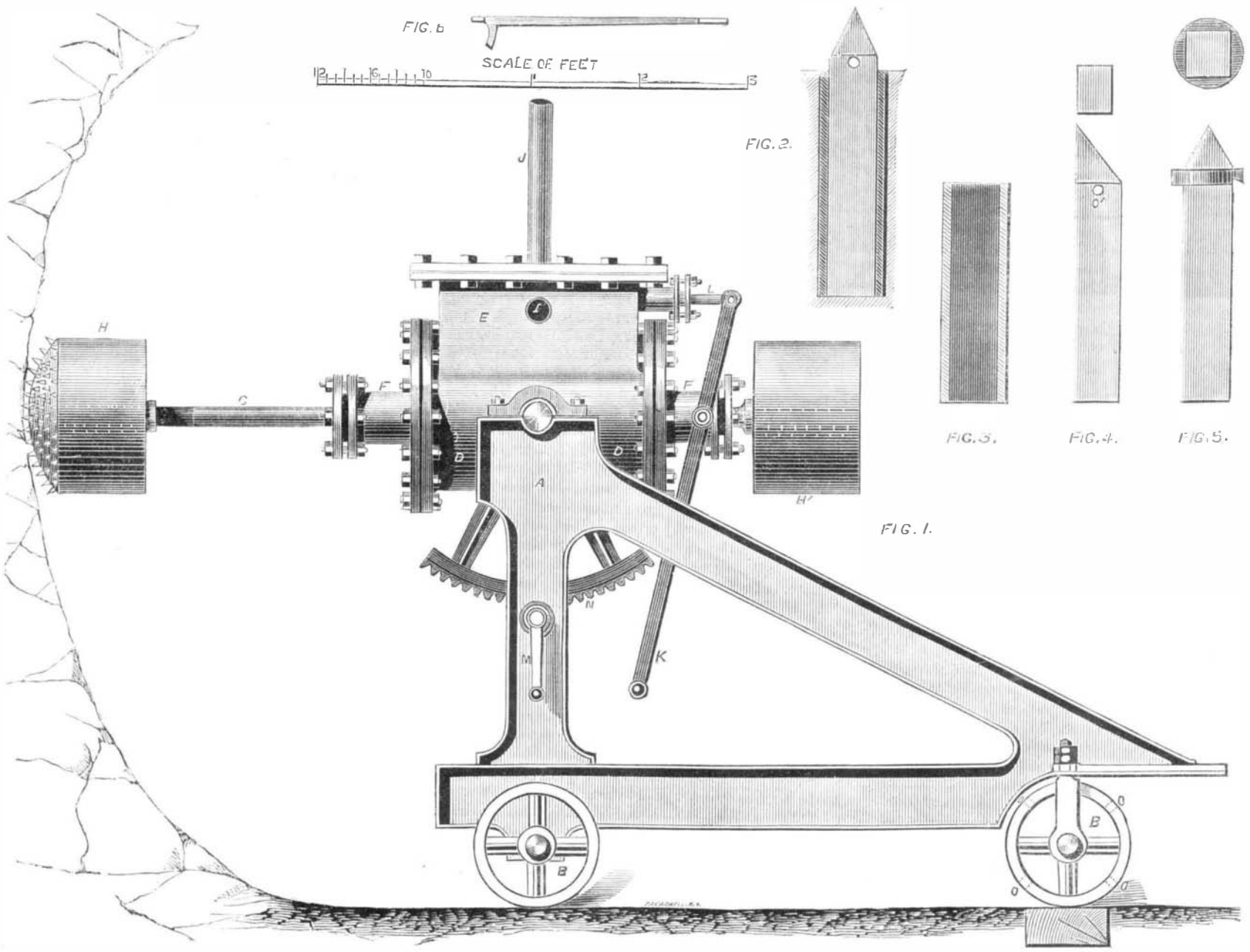
The gun carriage may be placed upon a turntable; and jets of water, projected against the place where the hammer is striking, will serve to carry off the rubbish. The operation would suppress the transport of the latter by wagons; and the work,it is stated,would be continuous,which is not the case when blasting the rock by gunpowder or dynamite.

In connection with the St. Gothard tunnel, we note that, up to November 30, 1873, the drift had reached an extent of 3,353 feet. The total length of the bore is to be 47,680 feet.

PURE glycerin should not produce, when locally applied, a burning sensation, which it always does when the fatty acids are not all extracted. But even absolutely pure glycerin, when undiluted, is a water-extracting body. It should therefore, when used as a cosmetic, or for medical application, be always diluted with water.

Uniform Mean Time.

The extent of the territory of the United States forbids the adoption of one mean time for railroad use, found so convenient in the countries of Europe. It is therefore the practice, on our railroads, to run by Portland time, New York time, Altoona time, or by the mean time of some other center of railroad traffic. The Pennsylvania Railroad and some of its dependencies, extending from New York to St. Louis, use Pittsburgh time, which is transmitted by electricity from the Allegheny observatory, an astronomical clock of the best construction being used. This clock is regulated by a telescope, aided by other mechanism, such as the chronograph, which records, by the aid of electricity, the time that the clock keeps, to the hundredth part of a second. The telescope shows its return, every twenty-four hours, to the point of observation of a fixed star, so that the earth itself becomes the regulating clock of the observatory. Four lines of telegraph, says the *American Exchange and Review*, enter the observatory, one of which connects with the railroad wires. The circuit is led through the standard clock, in which a wheel with sixty teeth revolves once a minute. One of the gold terminals of the wires is in contact with a jewel, which is moved slightly every second by a passing tooth. At this instant the circuit is broken, and, by filing away some of the teeth, certain beats may be omitted, to designate the end of the minute, while another piece of mechanism holds the circuit open for the last minute in each hour. The action is purely automatic and continuous, and the clock beats are repeated, through the twenty-four hours, in the principal offices at Pittsburgh, with which they are united by a line specially devoted to their use. At a certain hour the current is switched into the main circuit, and then the clock may virtually be heard ticking in New York and Chicago, and at every intermediate station, at the same instant. The system has been in use, as the official standard of the Pennsylvania Central Railroad and its eastern connections, for some years; more recently it has been extended to the western roads. The aggregate length of main and branch lines thus supplied is several thousand miles.



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