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IMPROVED DIAMOND STONE SAWING MACHINE.

The working of stone, although one of the greatest of human industries, has, up to this time, probably received less assistance from steam machinery than any of the principal arts. It is therefore with special gratification that we chronicle and portray the new mechanism here presented, which, by its remarkable performances, entitles it to rank among the important mechanical achievements of the age. As a labor-saving device, this Emerson machine executes in stone almost what the common circular saw does in wood.

Our engraving is from a photograph of the original machine as arranged for practical operation. It is very strongly built, weighing about 24,000 lbs The metal portion alone comprises about 20,000 lbs. of this weight, The apparatus is mounted with a circular saw, 73 inches in diameter, carrying 48 diamonds and steel points.

Without changing the velocity of the main shaft, the speed of this saw may be varied from 5 revolutions to 500 per minute, an advantage of importance, as in the use of hard metal points a slow speed and heavy feed are required, while in the use of diamonds for the cutting points the reverse is necessary. The feeding of the stone to the saw may be varied from one sixteenth of an inch to four inches at each revolution, the feed motion being taken from the mandrel of the saw. The carriage or beds upon which the stone is mounted are moved by a separate feed motion, back and forth, much faster than when the saw is cutting. A single hand lever suffices for this operation

By the aid of simple mechanism in connection with another hand lever, the saw, with all of its appliances, may be raised or lowered without stopping its motion or changing the tension of a belt; so that when it is desirable to saw stone more than thirty inches in thickness or in width, the saw can be elevated and an upper cut made through the stone as deep as the saw will cut. The stone is then run back, and the saw lowered. The carriage next passes over the top or upper part of the mandrel, and an under cut is made. The time taken in raising and lowering the saw does not occupy more than five minutes, notwithstanding that the weight raised and lowered may exceed 4,000 lbs. In ordinary work, the stone is not moved after it is placed upon the bed until it is sawn into slabs or pieces of the required thickness. The saw is made movable upon its own mandrel by the turning of a small hand wheel. At each revolution the saw is moved sidewise one fourth of an inch, being four turns of the crank to one inch. The carriage or bed, upon which the stone rests, runs, it is claimed, as perfectly as the bed of an iron planer. It travels upon heavy iron rollers, the journal boxes of which are made perfectly grit proof and self oiling.

Stone may be sawn to any length up to 14 feet, and of any angle or depth to five feet, so that a corner piece may be sawn out of a stone block. All stone to the hardness of ordinary grindstone, may be sawn with hardened steel or metal points; diamonds are substituted in working upon the harder grades.

It is claimed that one circular saw in this machine will do the work of more than one hundred hand saws, and this accurately true and out of wind. The machine has already sawn one hundred and twenty-five superficial feet of actual cutting in one hour, of the hardest kind of Berea sandstone, a material harder than ordinary grindstone grit. This was done with the diamonds as cutting points.

In our second figure (see page 163) is shown a section of two teeth of the saw with the holders in position; A is the diamond holder, and B the steel point holder. The steel holders are made adjustable and interchangeable in the saw, so that either the steel tooth holders or diamond holders may be used in the same blade.

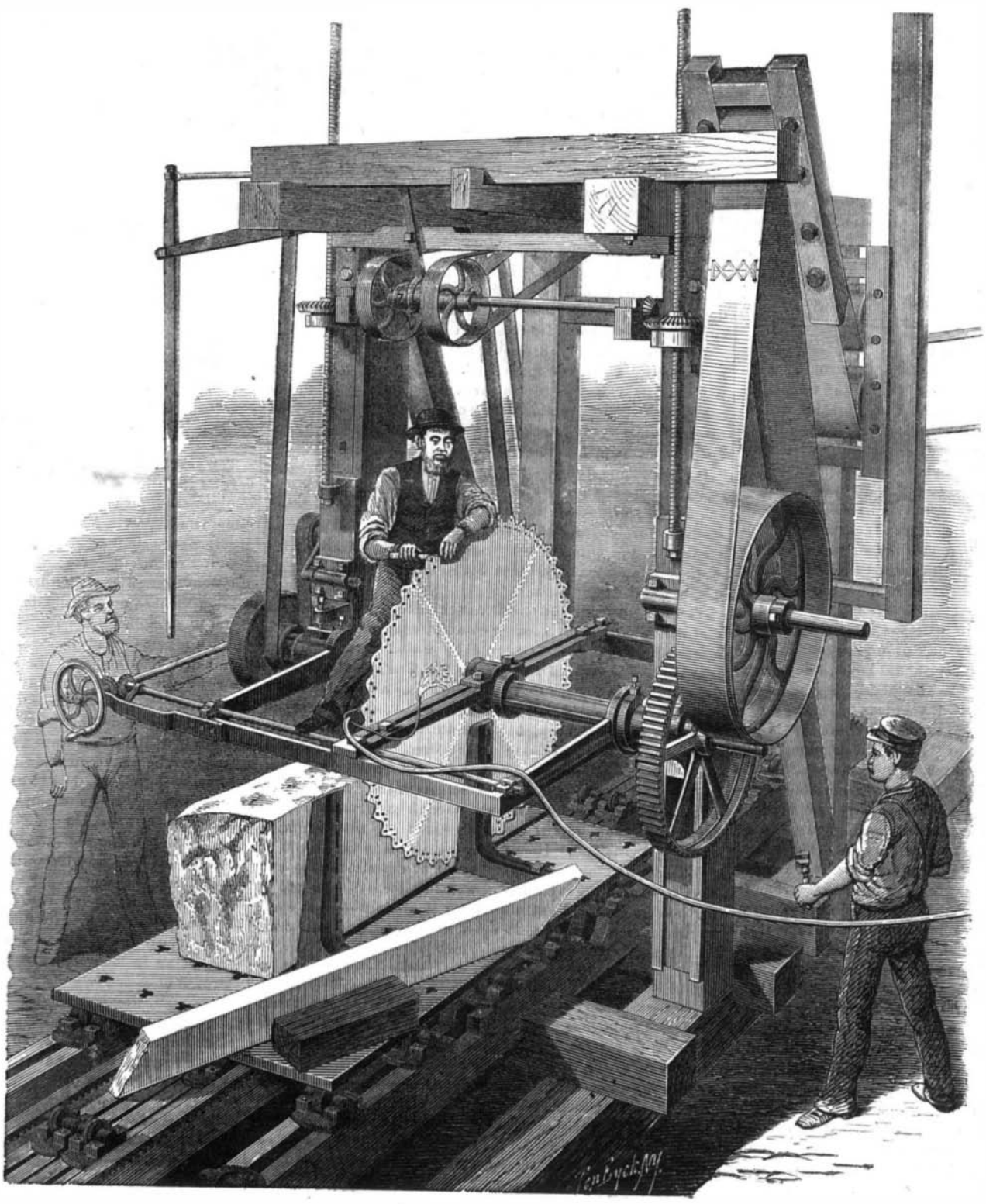
Fig. 3 (page 163) shows the diamond holder and diamond detached from the saw, C C being a full sized holder with diamond inserted; D a half section, showing the cavity cut to receive the diamond, and E the diamond, inclosed or partially embedded in a soft metallic casing (copper by preference). The method of setting and holding the diamond, as now adopted, is here clearly represented. The diamond is first wrapped in a casing of copper, and placed so as to present the most desirable cutting part in suitable direction and position. The casing is then closed around it so as to maintain it in position. The diamond is then, with the casing, placed between two metal or other suitable substances of sufficient hardness to press the casing into every jagged shape and irregularity of the diamond, but not of sufficient hardness to crush or break the same. The surplus part of the casing is then cutaway. A cavity is then formed in the steel holder, approximating the outer shape of the diamond casing. The latter is then placed between the jaws of the holder, and under pressure is forced, to a perfect fit of profile, into the steel and on the diamond. The lower portion of the casing is gripped between the jaws of the holder, as in a vise, forming a perfect fit and substantial connection. This exceedingly simple method enables any mechanic of ordinary skill to set the diamond.

Fig. 4 (page 163) is a holder with three or more diamonds set in one piece, designed more particularly for straight saws, to be used with reciprocating motion.

Machinery for the use of this saw may be varied and constructed to suit all kinds of stone sawing and dressing.

We understand that the machine here illustrated is to be set up and operated at the Cincinnati Industrial Exposition, which opens September 2, 1874. The stone saw and machine is the invention of Mr. J. E. Emerson, and is covered by numerous patents.

Further information may be obtained by addressing Messrs. Emerson, Ford & Co., Beaver Falls, Pa., or Richard S. Robertson, Esq., No. 12 Smithfield street, Pittsburgh, Pa.



EMERSON'S PATENT DIAMOND STONE SAWING MACHINE.

Structure of Coal.

By close investigation E. W. Binney, F.R.S believes he has established the following facts: Soft caking, or cherry, coal is chiefly composed of the bark, cellular tissue, and vascular cylinders of coal plants with some macrospores and microspores. Caking coal has much the same composition, except that it contains a greater proportion of bark. Splint, or hard coal, has a nearly similar composition, but with a great excess of macrospores. Cannel coal, especially that yielding a brown streak, is formed of the remains of different portions of plants which had been long macerated in water; it contains a great excess of microspores. Macrospores are from $\frac{1}{20}$ to $\frac{1}{15}$ of an inch in diameter, and can be easily seen by the naked eye. Their exterior is composed of a brown coriaceous substance, containing within it carbonate of lime or bisulphide of iron, according to the nature of the matrix. The microspores are about 320 times less in size, and contain some form of hydrocarbon, which, by the action of heat, becomes paraffin. These conclusions were arrived at merely as to the composition of the different kinds of coal. Each seam is materially affected by the nature of the roof, since, if it is an open sandstone, gaseous matter can freely escape, which is of course not the case when the seam is roofed in with airtight black shale or blue bind.

THE Pilot Knob Iron Company have recently sunk a shaft on Shepherd Mountain, Iron county, Mo., and have now passed through 70 feet of almost solid ore.