"The Mechanical Sharpening of Rock Drill Steel"

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The article begins:

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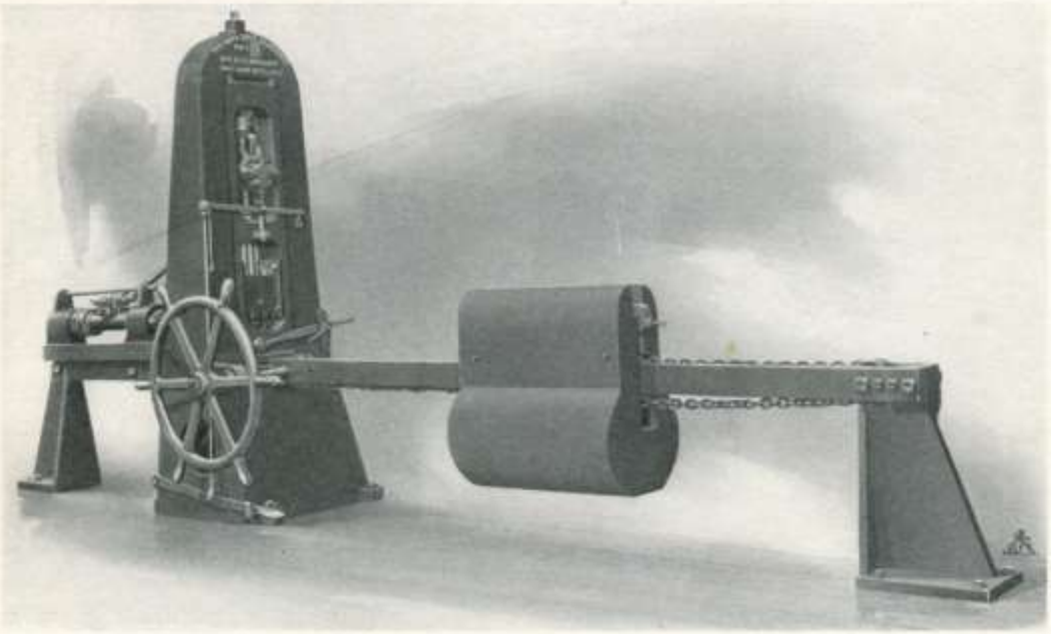
THE MECHANICAL SHARPENING OF ROCK DRILL STEEL.

By Matt. Brodie, M. E.*



The "Numa" Rock Drill Maker and Sharpener.

It is a well demonstrated fact that the accuracy with which drill bits are formed and sharpened greatly influences the capacity of a rock drill. The maintenance of drill steels is an important item in the cost of rock drilling, and during the past few years the making and re-sharpening of drill bits by machinery has undergone a rapid extension and reached a thoroughly practical stage. Almost every mine using a considerable number of drills, today includes one or more drill-sharpening machines in its equipment.

The different machines on the market are similar in general design, and usually consist of a horizontal hammer for upsetting the steel, a vertical hammer for drawing out the bit edges and an adjustable anvil block. The superiority of any one machine over others consists in its strength, speed, simplicity of operation and the perfection of the finished bit. In virtue of these qualities the "Numa" Drill Steel Sharpener, invented and manufactured by J. J. Brossoit, Salt Lake City, Utah, has found extensive use by the larger mining companies and contractors throughout the west, and is being shipped to the Michigan districts and to British Columbia.

A glance at the accompanying general view will give some idea of the strength of construction. The main vertical frame is cast in one piece and has a very liberal base, insuring a minimum vibration under the most severe service. This frame is cored out for the vertical engine frame. The anvil block is provided with roller bearings and is supported on a single rectangular rail, extending the entire length of the machine. The adjustment of the anvil block, for different lengths of steels and for upsetting, is effected by means of a chain running from the main frame to the front end, and a large hand wheel on the operator's side of the main frame. This block is of

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ample weight to resist the impacts from the horizontal hammer while upsetting the steel.

The vertical engine frame is a solid casting fitted and keyed into the main frame, and cored out to receive the cylinder and cross head guides. The cylinder and piston are a modified 2¼-inch or 2¾-inch Sullivan rock drill, the cylinder size depending on the class of work to be done and the air pressure available. The valve chest is of the standard Sullivan rock drill type provided with a stem extending through the lower end. This stem is connected, by levers and rods, to the foot treadle at the base of the main frame, and is held up by a compression spring directly under the valve chest. The stem holds the spool valve, inside the chest, in a position which keeps the vertical hammer at its highest point, thus allowing the steel being sharpened, to be passed back against the horizontal or upsetting die. By pressing the foot lever the valve on the vertical engine is released and the vertical hammer operates as long as the treadle is held down.

The frame for the horizontal engine comprises a continuous base, the front and back cylinder head blocks and the horizontal die guide block, all in one casting. It is securely bolted to the main frame, the through rail and the back pedestal. The cylinder, piston and valve chest are identical with the vertical engine, except that the valve is held or released automatically by the horizontal die. As soon as the operator forces the steel against the die, by drawing up the anvil block, the horizontal hammer begins to strike, and continues to do so until the steel is withdrawn from the die, when the valve is automatically stopped. This device effects a great saving in time and simplifies the operation of the machine.

The most distinctive feature of this machine, however, is the fact that both the vertical and the horizontal hammers work in the same vertical plane, thus eliminating the necessity of lifting the steel from the upsetting dies to the drawing out dies, and vice versa, which is necessary in other machines. As it is always necessary in making or sharpening bits to alternate several times between the dies for upsetting and drawing out, this arrangement results in a considerable economy both in time and in actual labor.

The dies are made of the best tool steel, and are easily and quickly removed and replaced by others for the different sizes of bits or shanks to be made.

The following operations are necessary in making new bits from round or octagonal stock. Heat about 5½ inches of the end of the steel and hammer it between the vertical dies until the ribs are laid out and thin enough to drop fully into the grooves in the dies. Then release the foot treadle, stopping the vertical hammer; rest the shank end of the steel in the recess in the anvil block, and force the steel against the upsetting die by means of the hand wheel, thus automatically starting the horizontal hammer. Continue to alternate flattening out the ribs and upsetting until the bit is well formed, taking care to turn the steel over frequently to insure evenness of the gauge on all sides. Then hold the steel so that the bit end is on the front part of the vertical dies, which are beveled, and draw out the bit edges with the vertical hammer. With a little persistent practice a mine blacksmith or helper soon becomes able to rapidly make or sharpen perfect bits. By sharpening all the steels which are of one length and then changing the dies for the next length, etc., the gauge will be very accurately maintained. These machines are furnished in sizes to handle steel of any desired length and bit gauge, the only change necessary being in the length of the bar on which the anvil block runs.

A brief comparison between sharpening by hand and by the "Numa" machine may be of interest. According to the writer's experience, an average mine blacksmith with helper will resharpen by hand about 35 drills per hour for, say, a nine hour shift, while with this machine one man will sharpen about 60, and with a helper about 90 drills per hour. These figures are not what would result from a short test run, but are what should be expected as an average per hour for the entire shift.

One of these machines was installed at one of the large copper mines in Bingham, Utah, about two years ago and below are tabulated the labor costs per shift for sharpening drill steels before and after installing the machine:

BY HAND.

3 Blacksmiths at $3.50	$10.50
3 Helpers at $2.75	8.25
Total	$18.75

BY MACHINERY.

1 Blacksmith	$3.50
1 Helper	2.75
Total	$6.25

A saving in labor cost of 66 per cent, or $12.50 per shift.