Oct. 19, 1926. 1,603,403

H. S. POTTER

HOLLOW TAPERED DRILL

Filed July 19, 1923

FIG. 1.

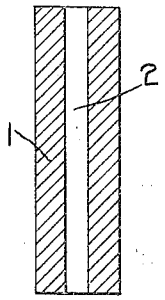


FIG. 2.

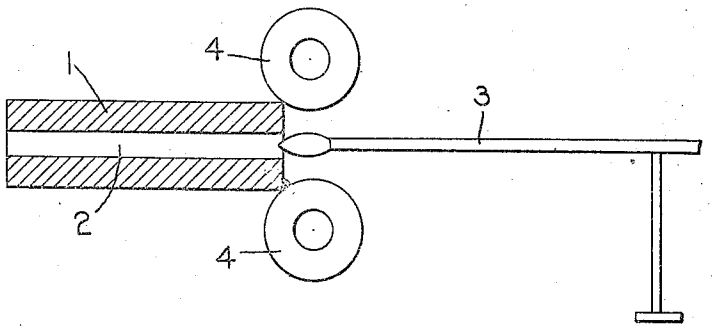


FIG. 3.

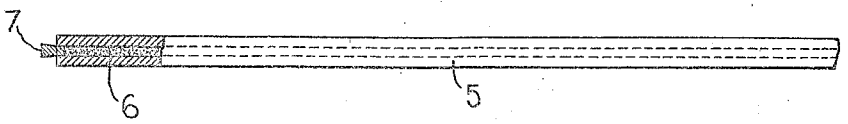


FIG. 4.

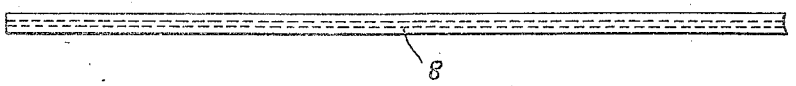
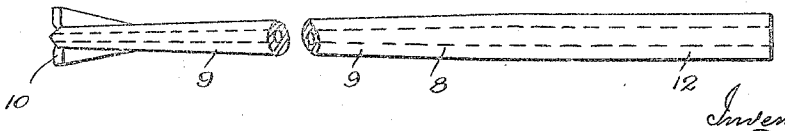


FIG. 5.



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Patented Oct. 19, 1926. 1,603,403

UNITED STATES PATENT OFFICE.

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HOLLOW TAPERED DRILL.

Application filed July 19, 1923, Serial No. 652,650, and in Great Britain September 26, 1922.

This invention has reference to the production of hollow tapered mining drills from billets or ingots of steel.

In the heretofore usual production of hollow rods and bars either of two methods are generally employed, namely the mandrel method or the sand core method. Both these methods have disadvantages hereinafter referred to and which disadvantages it is the object of the present invention to avoid.

In the drawings, Figure 1 is a longitudinal section of a pierced billet. Fig. 2 is a side view of the rolls and mandrel for reducing the billet. Fig. 3 is a side view partially in section of a portion of a tube filled with sand. Fig. 4 is a side view of a portion of a finished tubular rod formed according to this process. Fig. 5 is a side view of a hollow tapered drill formed according to this invention.

According to the mandrel method the steel billet is thoroughly heated and an axial hole of adequate size is formed therethrough by a piercing operation, that is to say by forcing a bar through the billet. The billet is then again heated to the necessary temperature and rolled down between rolls having grooves of different sizes, the axial hole being supported by the spear-head of a mandrel during the rolling operation. This generally necessitates heating the material three or four times and as will be understood the bar is gradually lengthened by the rolling operation and the bore of the hole is simultaneously gradually reduced until it is no longer practicable to use a spear-head mandrel and the rolling operation is continued without the same, the interior of the hole being sometimes cooled as with a jet of water or compressed air. With this method of treatment the piercing operation to form the hole in the billet tends to drive the piping or cavities in the centre of the billet into the wall of the hole; moreover when the rolling down is continued without the support of the mandrel there is a tendency of longitudinal ridges being formed lengthwise of the hole, especially with holes of small bore, although prior to the rolling without the spear-head mandrel a perfectly polished and smooth hole is produced by reason of the spear-head. A further disadvantage of this process is the tendency of the interior of the bar becoming more or less decarbonized by the repeated heatings to which the bar is subjected.

According to the sand core method of production, the billets, suitably cut to length, are formed with an axial hole by drilling, the hole is charged with sand which is caused to tightly fill the same as by jarring in a suitable machine and the billet is then rolled down to the requisite diameter to produce the hollow rod or bar desired and finally, after cutting off the plugged ends, the sand is removed in any suitable manner, for example by means of compressed air. With this method of production the drilling operation entails a waste of material although it obviates the liability of any piping such as may take place when the hole is formed by piercing; in the drilling operation however there is a likelihood, unless great care is taken, of chippings getting wedged at the sides of the drill and these chippings then score the wall of the hole with a groove or grooves corresponding to the feed of the drill; in the subsequent sand filling operation these grooves get filled with sand and in the succeeding rolling operation the sand in the grooves tends to start transverse ridges or the beginning of cracks that are very detrimental to long life of the finished rod or bar when subjected to vibration as when used as is usual for pneumatic and the like drills in mining operations.

According to the present invention a billet of suitable steel is formed with an axial hole as by plunging or drilling and if necessary or desirable this hole is reamed and polished; by the mandrel process the billet is then rolled down until the hole is of such small bore that a mandrel cannot be used; one end of the hole is then plugged and the hole filled with sand which by jarring is very tightly packed therein, after which the other end of the hole is plugged and the hollow steel bar rolled down to the desired extent and finally the plugged ends of the rod or bar are cut off and the sand is removed, as by compressed air in any usual and convenient way, from the bore of the hollow steel so produced. The result of this method of production is a hollow steel rod or bar free from longitudinal cracks and free from transverse ridges or cracks as well as generally possessing greater strength than similar hollow steel prod-

ucts made in the heretofore usual way and therefore adapted to stand up more effectively against the vibration to which it is subjected when in use.

It is to be noted that in the improved method of producing hollow steel the sand is consolidated into the relatively long hollow bar, say six to eight feet long, after the rolling operation, whereas in the known sand core method the sand is packed in the axial hole formed in a relatively short billet, say eighteen inches long, and owing to the greater height of sand in the long bar it is possible to more firmly consolidate the sand therein than is possible in the case of the short billet. The result of this is that the small hole throughout the length of the finished article is more central than is the case with existing methods of production and the amount that has to be cropped or cut off the ends of the rod or bar is less. It is also to be noted that the bore of the hollow rod or bar produced by rolling the billet over the spear-head of a mandrel is smooth and is free from cracks or crevices into which the sand could enter.

The billet 1 having a hole 2 is rolled out by rolls 4 upon a mandrel 3, until a tube 5 is formed having a smooth bore of about five-eighths of an inch in diameter. This is about as small as can be made with a mandrel. The tube 5 is then packed with sand 6, or similar material, and its ends are closed with plugs 7. The tube 5 is then rolled out until it forms a small bore tubular rod 8, the bore of which still remains smooth.

Such rod or bar is mainly useful for the manufacture of cutting tools employed with pneumatic and the like rock drills. In some cases these drills are preferably tapered slightly, say from one and a quarter inch to one and one eighth inch and to facilitate the manufacture of such tapered drills, the hollow bar or rod after being rolled down as before described and before the ends of the bar or rod are cut off, may conveniently be swaged down to the desired extent for a suitable length at one end whilst still filled with the sand. The tubular rod 8 has one end portion 9 swaged into tapering form before removing the sand. The sand is then removed, and the smaller end of the part 9 has cutting edges 10 formed on it. The other cylindrical end portion 12 or shank of the drill is shaped to suit the chuck of the drilling machine in any approved way if same is necessary. As some of the smaller drills have square shanks the hollow steel may be rolled of square cross section and finally the end portion of the bar so produced may be swaged down whilst still filled with sand to the required diameter and to the desired taper.

The improved method of production results in a substantial saving in steel and enables material to be produced for drills capable of drilling a hole of smaller volume than usual. Assuming the steel billet or ingot is of good quality hollow steel bars or rods of uniform quality can be produced from which drills can be formed eminently suitable for the work for which they are designed.

What I claim is:—

A method of making hollow tapered drills, which consists in first drawing out a tubular billet by means of rolls and a headed mandrel into a tube of predetermined size, then packing the tube with sand, plugging the ends of the tube, rolling the tube to the desired small size, then swaging a portion of the tube into a drill of tapering form before removing the core of sand from it, and finally removing the sand and finishing up the smaller end of the drill to fit it for use as a drill.

In testimony whereof I affix my signature.

HENRY SAMUEL POTTER.