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PROCESS OF MAKING CORED TUBULAR BODIES.

APPLICATION FILED JAN. 17, 1919.

1,390,746. Patented Sept. 13, 1921.

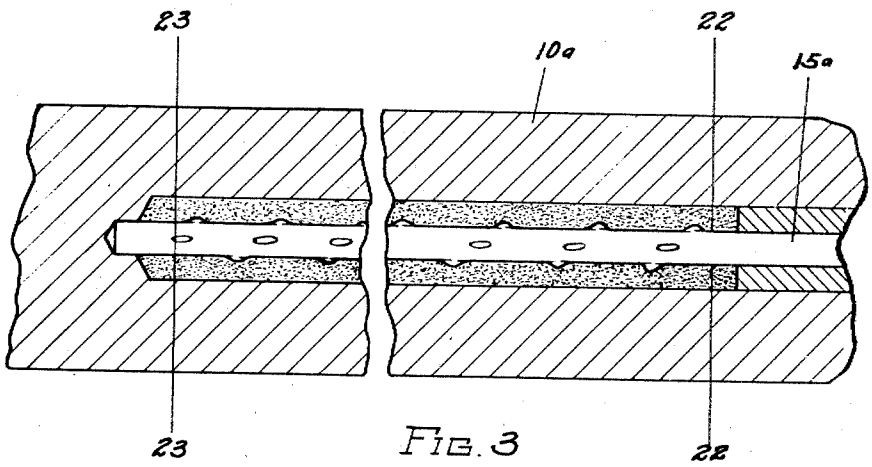


FIG. 3

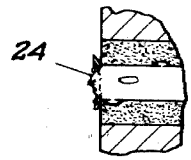


FIG. 4

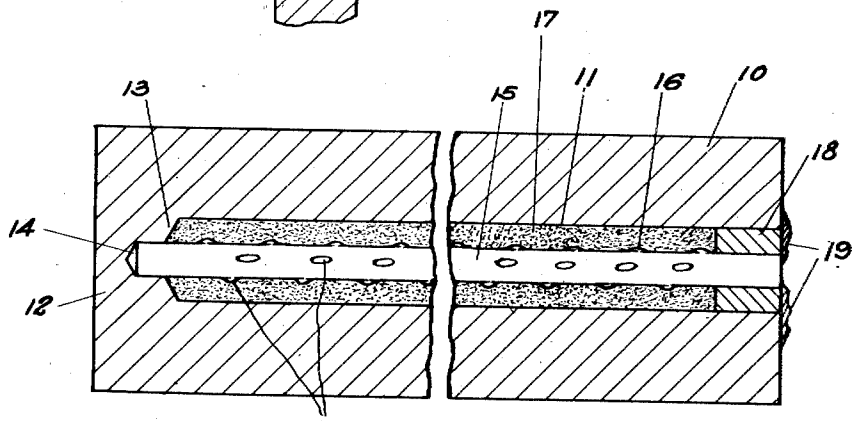


FIG. 1

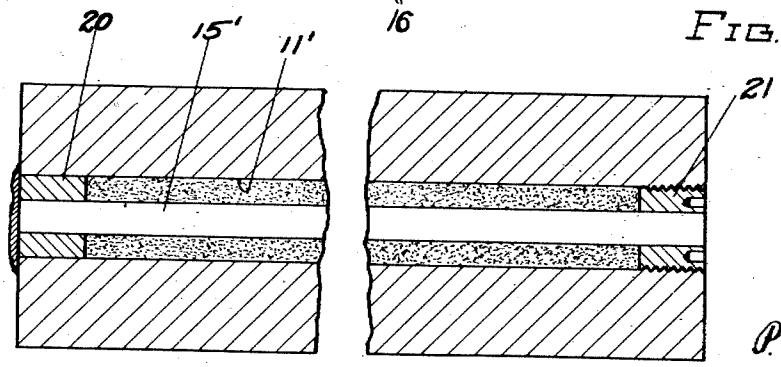


FIG. 2

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PROCESS OF MAKING CORED TUBULAR BODIES.

1,390,746. Specification of Letters Patent. Patented Sept. 13, 1921.

Application filed January 17, 1919. Serial No. 271,612.

To all whom it may concern:

Be it known that I, PERCY A. E. ARMSTRONG, a subject of the King of Great Britain, and a resident of Loudonville, county of Albany, and State of New York, have invented certain new and useful Improvements in Processes of Making Cored Tubular Bodies, of which the following is a specification.

The present invention relates to a process for making cored tubular bodies such as steel drill rod and the like.

In making tubular bodies in accordance with the present invention a billet is provided having a preferably axial opening or bore extending wholly or partially therethrough.

This bore receives a metallic member or rod which is substantially smaller in cross section or diameter than the bore in the billet, leaving a space of substantial width between the rod and the walls of the billet bore. This member will hereafter be referred to as a rod. Metal is used therefor which will not melt at rolling temperatures. In making hollow steel drill rod, for example, the rod may also be of steel which is preferably somewhat milder and more ductile than the drill rod steel of the billet.

The space between the rod and the bore walls is filled with refractory material which will not fuse at rolling temperatures. Refractory materials such as dead burned magnesite or talc powder, lime, zirconia and other oxids and the like may be used, which are infusible at welding temperatures and will not cake up to an undue extent, but other materials may, of course, be used. The best results are obtained with refractory materials which will not cake up, frit or fuse. Such refractory material is preferably in finely divided condition. It will be hereafter referred to, for convenience, as sand.

The billet bore and the core rod are preferably substantially free from oxid when the sand is introduced, so as to avoid any lowering of the fusing point of the sand or other refractory material, which may result from the presence of a substantial amount of iron oxid. If desired, the core rod or the billet bore, or both, may be coated with non-welding material such as nickel, for example, to prevent welding if they should come into contact during rolling. While such coating is ordinarily unnecessary, it may be resorted to, for example, when especially high quality drill rod is to be made or the sand layer is only of moderate thickness.

The compound core so made up may be introduced into the billet bore in any desired way, as, for example, the rod may be put in first and the sand afterward introduced around the rod, or the core may be made up or put in place in other ways. If desired, the core may be centralized as by the use of collars or the like.

The ends of the billet are preferably closed, as by welding at one or both ends, and the billet is then subjected to treatment for elongation and reduction of cross section, as by heating and rolling, or by working in other ways.

With such treatment the core comprising the rod and its sand envelop is likewise elongated and reduced in cross section along with the billet.

When the billet has been worked to reduce it to the desired cross section the tubular body produced is preferably cut or broken off at the ends in such manner as to leave the rod projecting at one end for being gripped by a pulling device, and the rod is then pulled out. The effect of this upon the sand depends upon the formation of the rod. If the latter is twisted, for example, like reinforcing rods such as used in concrete construction, or otherwise deformed or roughened, pulling it out will serve to mechanically disturb the sand, thereby loosening it up and facilitating its ready removal. The following end, that is to say, that end of the rod which is pulled through and comes out last, may be battered up or deformed more or less, as with a hammer or other tool before pulling, in which case this battered or deformed end will dig into and loosen the sand. In this way a smooth round rod may be used, if desired, and yet the sand be well loosened up by the battered end of the rod during withdrawal.

It will be observed that in serving as a means for transmitting force from the billet to the rod during rolling or other working, the sand, being more readily deformable than the rod, will tend to be moved or worked with respect to the rod and bore, particularly if the rod be twisted or otherwise of irregular surface formation. Such movement or working taking place among

the particles of sand serves to prevent caking and to keep the sand more or less broken up, thereby facilitating its ultimate removal.

After the rod is withdrawn the sand remaining in the hole is removed in any desired way, as by water jet, air blast, etc., preferably accompanied by violent jarring or vibration of the drill rod or other tubular body. I prefer to remove it by suction through a smooth walled pipe while introducing air under pressure about the pipe adjacent to the bore walls.

The accompanying drawing illustrates modes of carrying out the invention.

In said drawing, Figures 1 and 2 are longitudinal sectional views of billets with a sand-rod core in place therein. Fig. 3 is a similar view, on an enlarged scale, of the tubular body produced by rolling the billet of Fig. 1 or otherwise working same for elongation and reduction of cross section and prior to removal of the core. Fig. 4 is a fragmentary sectional view showing the following end of the core rod deformed as by hammering before being pulled out.

The billet 10 of Fig. 1 has a bore 11 extending nearly, but not quite, the entire length thereof, leaving an integral portion 12 serving to close one end of the bore. When the bore is formed or completed by drilling it may have a tapered end 13 and may be continued a short distance axially, as with a smaller drill, providing a centrally located recess 14 which may serve to centralize the core rod, or, if desired, the rod may be centrally located at this end in other ways, as by the use of a collar or the like.

The core rod 15 may be of various forms, as square, twisted, etc., etc. It may be made up of a plurality of parts or strands, such as wire or the like. As shown in Fig. 1 it has surface knobs or projections 16 arranged spirally thereon.

The space between the rod and billet bore is filled with the sand 17. A collar 18 serves to close the space about the rod 15 at the remaining end thereof and to keep the rod and sand in proper relative positions. The collar and rod may be securely fastened in place in any desired way, as by being driven or wedged tightly in place, welding or the like. A weld is indicated at 19. The sand may be compacted by driving in the collar 18, if desired.

The showing of Fig. 2 differs from that just described, in that the bore 11′ goes completely through, being closed at one end by a welded collar 20, and at the other end the collar 21 is screwed in, which is of advantage in getting the sand well compacted. This end may be welded over, if desired. The core rod 15′, shown in Fig. 2, is a smooth round rod.

After rolling or other working, the drill rod or other tubular body 10^a is cut or broken off at its ends. The cut or break at one end may extend only through the hollow drill rod 10^a, as indicated at 22, Fig. 3, leaving the core rod 15^a projecting, while at the other end the cut or break may extend entirely through the drill rod, sand and core rod, as indicated by line 23, Fig. 3.

The elongated core rod is now pulled out after the following end, which goes through the sand and comes out last, has been hammered up or otherwise deformed, if desired, as shown at 24, Fig. 4. This may not be required with rods which are of rough surface, twisted or of the like formation, but is of special advantage with a round core rod such as shown in Fig. 2, because it permits the use of a smooth round or cylindrical rod adapted to produce a bore of good form, and at the same time the rod may be utilized, upon its withdrawal, to loosen or dig up the surrounding sand in an effective manner. If desired, the rod may be divided, substantially midway between its ends, into two parts which are withdrawn from each end of the tubular body produced.

The process of the present invention has numerous advantages over the use of either an all sand or all metal core. Compared with the former, its advantage is obvious as the sand may be substantially prevented from caking during rolling or other working and is mechanically dislodged and broken up by pulling out the core rod, making the cleaning out of the sand a simple task, much easier than the removal of a solidly caked, all sand, core.

Compared with the all metal core the advantages are equally obvious and great, the core rod being much more easily withdrawn than the all metal core. Further, while the all metal core must be of substantially smooth and even surface, the use of a core rod of irregular surface formation is not only permissible, but is of positive advantage with the present process. With the all metal core great care must be taken to prevent welding, which would take place readily, for example, if a slightly rusted core should come into contact with the drill rod steel. With the present invention it is possible, though not ordinarily desirable, to make use of core rod taken directly from the mills, since it can not become welded to the billet bore even if its surface should be somewhat oxidized, so long as a substantial body of sand is everwhere interposed between the core rod and the bore wall. The presence of iron oxid in amounts sufficient to cause a substantial lowering of the fusing point of the sand or other outer refractory core material is, of course, to be avoided.

While the invention has been described with particular reference to the making of hollow steel drill rod, it is not limited thereto and may be utilized in the production of

tubular bodies of various kinds and from a variety of materials.

I claim:

1. The process of making tubular bodies such as hollow drill rod and the like which consists in providing a longitudinally apertured billet with a core comprising a metal rod surrounded by a substantially thick layer of sand, elongating and reducing the cross section of the billet and core as by rolling, withdrawing the rod, and removing the sand.

2. The process of making tubular bodies such as hollow drill rod and the like which consists in supporting a metal rod substantially centrally of the billet bore, filling the space within the bore and around the rod with sand, elongating and reducing the cross section of the billet and the bore contents as by rolling, withdrawing the rod, and removing the sand.

3. The process of making tubular bodies such as hollow drill rod and the like which consists in providing a longitudinally bored billet with a core comprising a metal rod of irregular formation surrounded by a substantially thick layer of sand, elongating and reducing the cross section of the billet and core as by rolling, withdrawing the irregularly formed rod and thereby breaking up and loosening the sand, and removing the same.

4. The process of making tubular bodies such as hollow drill rod and the like which consists in introducing into a longitudinally bored billet a rod of irregular formation, supporting it substantially centrally of the bore, filling the space between the bore walls and rod with sand, elongating and reducing the cross section of the billet and contents of its bore as by rolling, withdrawing the rod and thereby loosening and breaking up the sand, and removing the loosened sand.

5. In the process of making sand cored tubular members such as drill rod and the like, the step which consists in providing a metal rod within the sand core.

6. In the process of making sand cored tubular members such as drill rod and the like, the steps which consist in providing a metal rod in substantially the center of the sand core, elongating and reducing the cross section of the billet and core as by rolling, and withdrawing the rod.

7. In the process of making sand cored tubular members such as drill rod and the like, the steps which consist in providing a metal rod in the sand core of a bored billet, elongating and reducing the cross section of the billet and core as by rolling, deforming the following end of the rod, and withdrawing same through the sand, whereby the sand is loosened.

8. The process of making tubular bodies such as drill rod and the like which consists in providing a bored billet with a core comprising a metal rod surrounded by a substantially thick layer of sand, elongated and reducing the cross section of billet and core as by rolling, removing the ends of the tubular body formed, deforming the rod at one end and pulling it out from the other end, whereby the sand is loosened.

9. A solid metal core surrounded with a substantially heavy layer of non-welding material adapted to be inserted and tightly packed in a hole in a piece of metal and serving for maintaining a hole therein after the metal and core have been subjected to mechanical work.

10. The process of making tubular bodies such as hollow drill rod and the like which consists in introducing into a longitudinally apertured billet a core comprising a metallic member surrounded by a substantially thick layer of weld-preventing material, elongating and reducing the cross section of the billet and core as by rolling, and withdrawing such member.

In testimony that I claim the foregoing, I have hereto set my hand, this 14th day of January, 1919.

PERCY A. E. ARMSTRONG.