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METHOD OF MAKING SUCKER RODS

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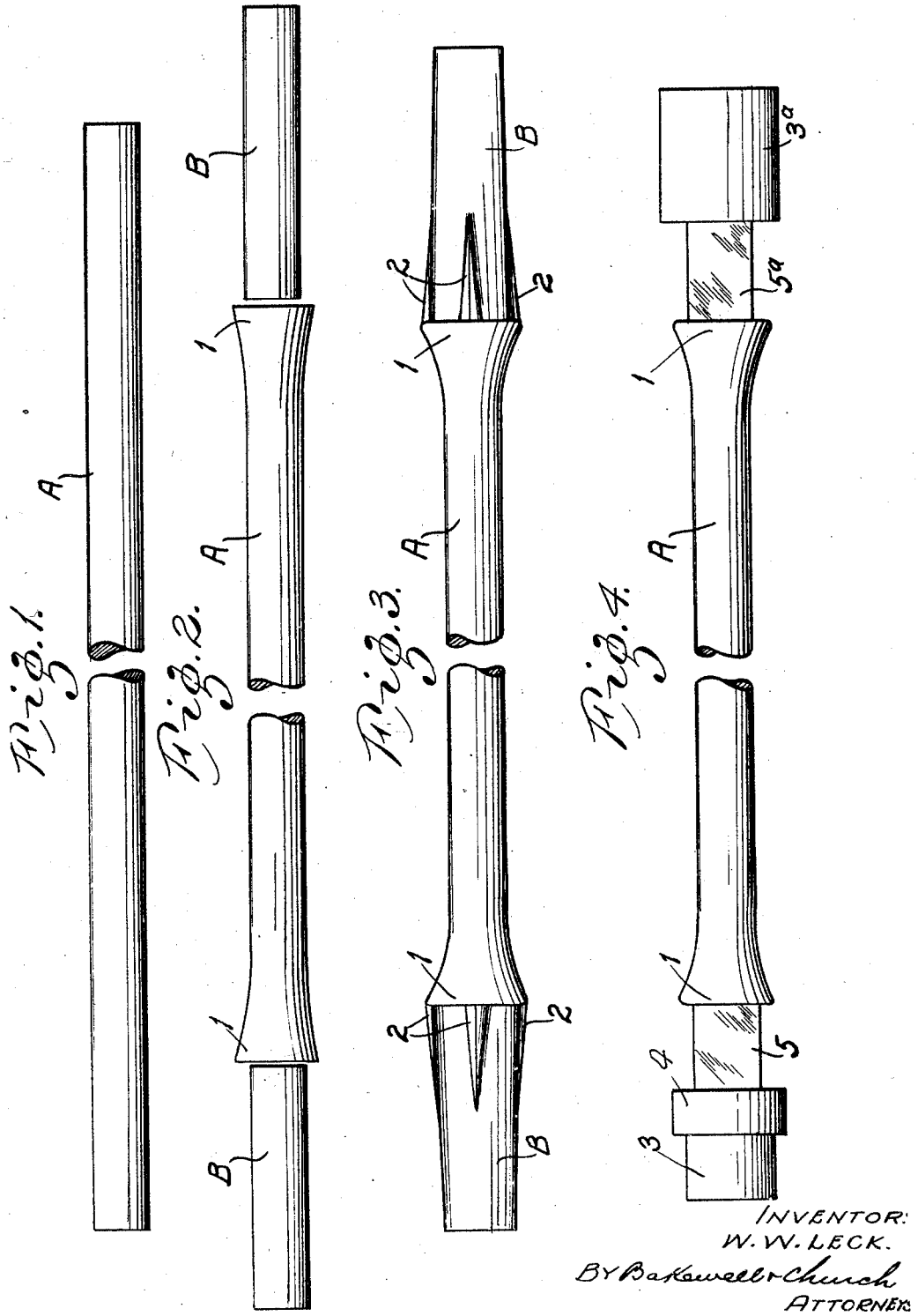


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## METHOD OF MAKING SUCKER RODS.

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This invention relates to sucker rods of the kind that are used to transmit movement to the plunger of a well pump from a walking beam or other pump operating mechanism located above the surface of the ground.

The conventional sucker rod consists of a relatively long, round rod of small cross section, usually about 5/8 to 7/8 of an inch in diameter, provided at its opposite ends with heads that carry devices which are used to join the rod to other sucker rods. In some instances both of the heads at the opposite ends of the rod are provided with externally screw-threaded pins which are adapted to cooperate with sleeves that are used to couple the rods together, and in other instances, the head at one end of the rod is provided with an externally screw-threaded pin and the head at the other end of the rod is provided with an internally screw-threaded socket which is adapted to receive the pin on an adjacent rod.

One method that is now used to manufacture sucker rods contemplates starting with a round rod of the same diameter but of considerably greater length than the finished sucker rod, and forming heads on both ends of the rod by an upsetting operation, i. e., by subjecting the end portions of the rod to endwise pressure while heated to a forging temperature, so as to reduce the length of said end portions and increase the diameter of same sufficiently to produce parts that can be used to form either externally screw-threaded pins or internally screw-threaded sockets. Although the shape and dimensions of the heads of sucker rods vary, it is not unusual to provide a sucker rod with a head about 3½ inches in length, that has a pin portion or socket portion thereon of about 1½ inches in diameter, which latter dimension is about twice the diameter of the body portion of the rod. Accordingly, in order to obtain such a pin portion or socket portion by an upsetting operation, it is necessary to upset a portion or section of the rod of relatively great length, and in this upsetting operation the fibre of the metal is often distorted, causing a wavy structure and when the rod is subjected to stresses when in use, said distorted fibre or wavy structure causes the pin portion, socket portion or some other part of the head to rupture.

Another method that is sometimes used to produce sucker rods, consists in connecting a straight rod to two head pieces produced by a drop forging operation, the head pieces being completely formed and thereafter welded to the ends of the rod. Such a method of producing sucker rods is expensive and it is open to the objection that the finished rod shows plainly that it is a built up structure composed of three separate and distinct pieces joined together by uneven welds, and which accordingly, is not as desirable as a one-piece sucker rod provided with integral heads.

I have devised a method of manufacturing sucker rods which makes it possible to produce a sucker rod that has the same appearance as a sucker rod made from a single piece of stock, but which is stronger than the conventional one-piece sucker rod, in that the fibre of the metal in the heads is not subjected to destructive stresses or abnormal distortion in such a way as to cause a rearrangement of the molecules that is apt to result in some portion of the head breaking in the event the rod is subjected to an abnormal strain when it is in use. My improved method, briefly described, contemplates starting with a rod of the cross-sectional area desired for the finished sucker rod, then enlarging the end sections of said rod slightly by an upsetting operation so as to form tapered end portions thereon, which, in the finished sucker rod, are located between the body portion and the heads, then connecting to these enlarged end portions, preferably by an electric welding operation, pieces of stock that are of greater diameter than the original diameter of the rod, and finally deforming these added pieces of stock by an upsetting operation, so as to produce sucker rod heads of conventional shape and dimensions. Usually, the pieces of stock that are welded onto the enlarged end portions of the rod will be of

substantially the same diameter as the terminal ends of said enlarged portions and of approximately the same diameter as the pin of a sucker rod head.

A sucker rod produced by such a method is, to all intents and purposes, the same as a one-piece sucker rod, due to the fact that the stock used to form the heads becomes merged with the enlarged end portions of the rod by the electric welding operation, followed by the upsetting operation in deforming the added pieces of stock. Such a sucker rod, however, is not so liable to fracture as the conventional one-piece sucker rod, because the heads of the rod are formed from pieces of stock of approximately the same diameter as the pin or pin and socket of the finished rod, and therefore, do not have to be upset to an extent or degree which is liable to cause a rearrangement of the molecules of the metal or cause the fibre of the metal to be subjected to destructive stresses or abnormal distortion. If desired, the added sections can be constructed of steel of a higher quality than the body portion of the rod, thus insuring greater strength at the joints.

Figure 1 of the drawings illustrates the round rod that is used to form the body portion of the finished sucker rod.

Figure 2 illustrates said rod after the end portions of same have been slightly enlarged by an upsetting operation, said figure also illustrating the pieces of stock which subsequently are welded to said end portions.

Figure 3 illustrates the next step of the method, i. e. upsetting the metal at the inner ends of the added sections and also the metal in the enlarged portions of the rod to which said sections are joined; and

Figure 4 illustrates the finished sucker rod.

In producing a sucker rod according to my method, I start with a rod or piece of stock A of the diameter desired for the body portion of the finished sucker rod. I then slightly enlarge the end portions of said rod by an upsetting operation so as to produce tapered end sections 1 on same. The next step consists in joining pieces of stock B to the enlarged end portions 1 of the rod A, preferably by an electric welding operation, the diameter of the added sections B being approximately the same as the terminal ends of the enlarged portions 1 of the rod A, and usually of approximately the same diameter as the threaded pin on the head of a conventional sucker rod. The next step consists in deforming the enlarged end portions 1 of the rod A and the adjacent inner ends of the added sections B by an upsetting operation so as to reduce the length of said end sections 1 and increase the diameter of same and also form four longitudinally disposed, tapered ribs 2 of substantially triangular shape in cross section at the inner ends of the added sections B. The final step in the method consists in reducing the length and changing the cross-sectional shape of the added sections B by an upsetting operation, so as to convert said added sections into finished heads of the kind shown in Figure 4, the head at one end of the rod comprising a pin portion 3 that is integrally connected to an enlarged collar 4 which is connected by a wrench engaging portion 5 to one of the enlarged end sections of the rod A, and the head at the opposite end of the rod comprising a wrench engaging portion $5^a$ that joins the adjacent enlarged end section of the rod A to a socket portion $3^a$. Subsequently, the pin portion 3 on one head is provided with external screw threads and the socket portion $3^a$ on the other head is provided with internal screw threads. It is not absolutely essential that the inner end portions of the added sections B be deformed in such a way as to produce longitudinally-disposed, tapered ribs 2 thereon, but this is preferable if the heads of the rod are to be provided with square or rectangular shaped wrench engaging portions, as said ribs facilitate the shaping of the corners of the wrench engaging portions in the final upsetting step of the method.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A method of manufacturing sucker rods, characterized by upsetting the metal in one end of a rod so as to produce an enlarged portion on the rod, then connecting to said enlarged portion by an electric welding operation, a piece of stock of approximately the same diameter as the terminal end of the enlarged portion of the rod, and thereafter upsetting the metal in said added section and in the enlarged portion of the rod so as to increase the diameter of said enlarged end portion and convert the added section into a head provided with a wrench engaging portion and a part that is used to join the finished sucker rod to an adjacent sucker rod.

2. A method of manufacturing sucker rods, which consists in upsetting the metal in the end sections of a round rod so as to produce enlarged portions thereon, joining to said enlarged end portions by a welding operation pieces of stock of greater diameter than the original cross section of said rod, and thereafter upsetting the metal in said added sections and in the enlarged end portions of the rod so as to form a head on one end of the rod that is equipped with a pin portion and a head on the other end of the rod that is equipped with a socket portion.

3. A method of manufacturing sucker rods, which consists in upsetting the metal in one end of a round rod so as to produce

an enlarged portion on same, joining to said enlarged portion by a welding operation a piece of stock of greater diameter than the original cross section of the rod, upsetting the metal in the zone of said weld so as to reduce the length and increase the diameter of the enlarged portion of the rod and form ribs on the inner end of said added section, and thereafter subjecting said added section to an upsetting operation so as to convert it into a sucker rod head provided with a rectangular shaped wrench engaging portion and a cylindrical part which is adapted to be threaded.

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