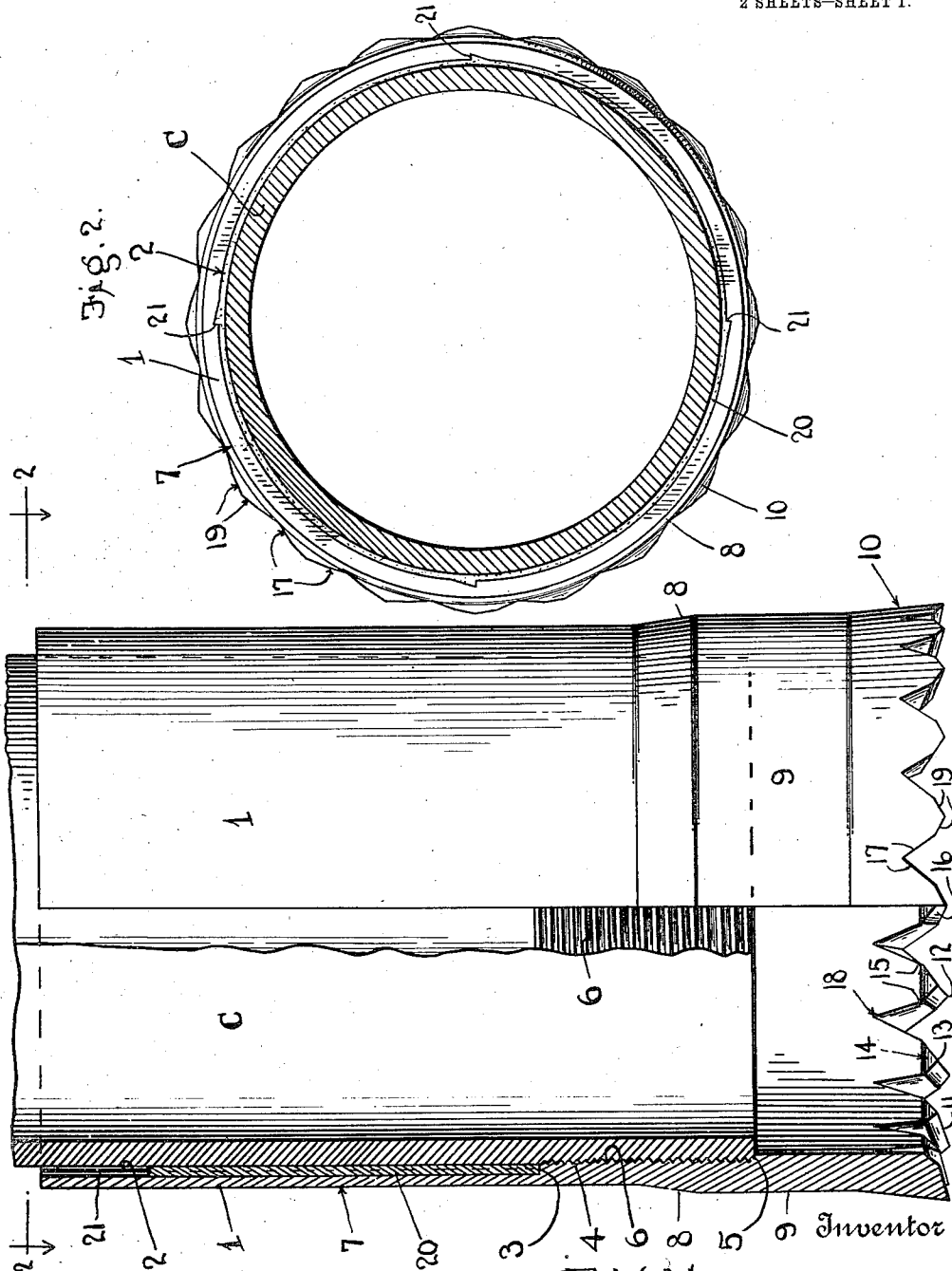


F. M. NEVINS.
SHOE FOR WELL CASINGS.
APPLICATION FILED APR. 11, 1912.

1,043,343.

Patented Nov. 5, 1912.

2 SHEETS—SHEET 1.



Witnesses

L. B. James

H. Colman

Fig. 1

F. M. Nevins

by *H. H. Wilson & Co.*

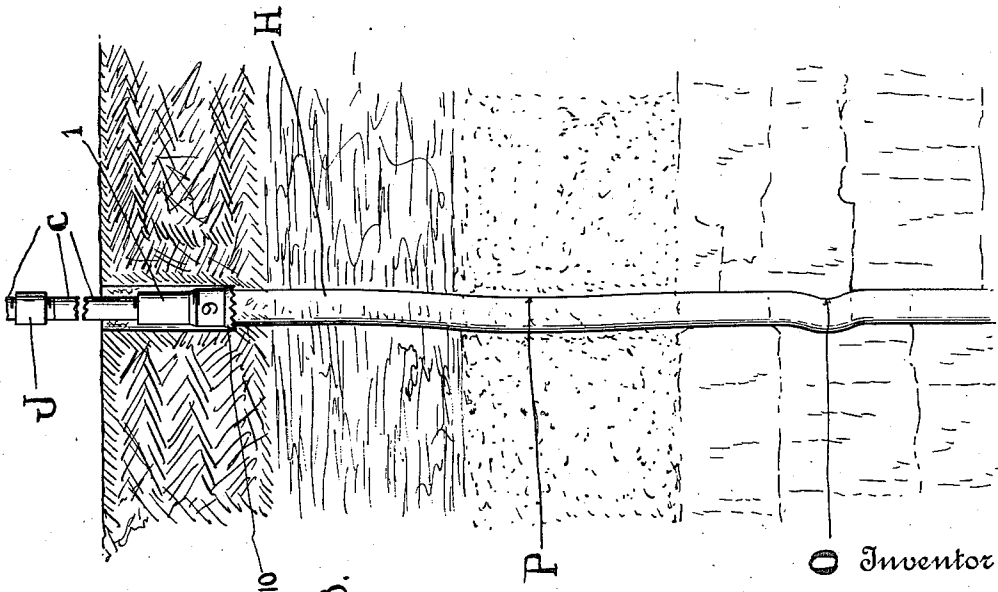
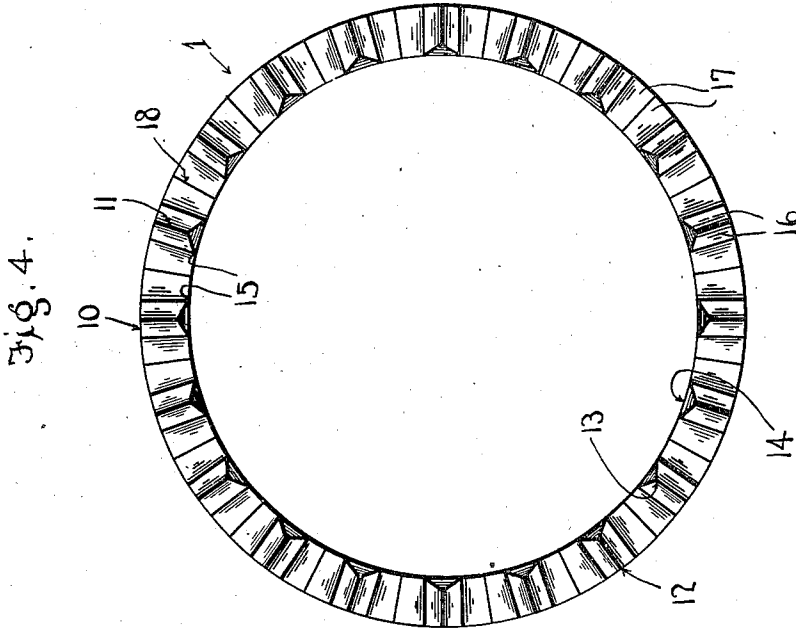
Attorneys

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L. B. James
H. Collamer

Fig. 3.

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UNITED STATES PATENT OFFICE

FRANK M. NEVINS, OF COALINGA, CALIFORNIA.

SHOE FOR WELL-CASINGS.

1,043,343.

Specification of Letters Patent.

Patented Nov. 5, 1912.

Application filed April 11, 1912. Serial No. 689,991.

To all whom it may concern:

Be it known that I, FRANK M. NEVINS, a citizen of the United States, residing at Coalinga, in the county of Fresno and State of California, have invented certain new and useful Improvements in Shoes for Well-Casings; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to Artesian and oil wells, and more especially to the tubing or casing thereof; and the object of the same is to produce and attach to the lower end of the casing a shoe or head which will straighten the drill hole as it descends and therefore facilitate insertion of the casing or lining therein. It is well known that in sinking wells of this character, whether by drilling or boring, the bit or auger is frequently deflected laterally by striking some hard substance, with the result that the well hole is not perfectly straight; and later, after the drill and its rod are withdrawn and the hole is to be lined, difficulty is experienced in the insertion of a straight piece of pipe or tubing to form the casing or lining. Various efforts have been made to provide the lower end of the casing with some form of shoe which would cut its way through or dislodge obstructions as they were encountered (the obstruction or pieces thereof being subsequently removed from the casing), and I have devised a shoe of this character which experience has proved especially efficacious for reasons which will appear below.

The invention is hereinafter more fully described and claimed, and illustrated in the accompanying drawings wherein—

Figure 1 is an elevation of the lower end of the well casing and the shoe attached thereto, one half of the view being in section and parts broken away. Fig. 2 is a section on the line 2—2 of Fig. 1. Fig. 3 is a sectional view of a well and a side elevation of the casing in the act of descending therein. Fig. 4 is a bottom plan view of the shoe alone.

In Fig. 3 of the drawings the letter H designates a hole which has been sunk in the ground by an earth auger or bit for the purpose of producing an oil- or gas-well, and the letter C designates the casing or lining which in the illustration is being forced

down into such hole in a manner well known in the art, the same being made up of pipe sections connected by joints or couplings J where their extremities meet. In the act of forming the hole the bit or auger will probably have been deflected out of a true straight line by its contact with hard substances such as minerals or rocks, and the result will be that the hole H left by the withdrawal of the bit or auger and its rod is wavy or irregular at one or more points which are greatly exaggerated in the drawings and indicated at P. It follows that when the lining is to be subsequently inserted, being a rather stiff piece of tubing instead of a more flexible rod, it does not lend itself to the irregularities in the hole and at the points P where the projections occur therein the lower end of the casing is quite likely to strike and stick upon the obstructions O which the bit or auger avoided by the deflection of the rod. Therefore a so-called "shoe" or head is attached to the lower end of the casing, and the lower extremity of this shoe is provided with a cutting edge so that when the obstructions are encountered the casing may be rotated and the shoe will cut its way through them. But the difficulty has hitherto presented itself that, if the obstructions were many or serious or composed of substances which were extremely hard, even the casing would be deflected a little or more likely the connection of the shoe therewith would become loosened or the shoe itself cracked or broken. The result was that the casing, with or without the shoe, became stuck in the hole so that it could be moved neither up nor down, and sometimes the shoe with or without a piece of the casing became detached from the remainder of the latter and remained in the hole so that the insertion of a second casing was impossible. To overcome these serious difficulties is the object of the present invention.

The shoe shown in the accompanying drawings comprises a comparatively long sleeve 1 whose internal diameter or bore 2 is larger than the external diameter of the casing C down to the point 3 which designates an internal shoulder, beneath which the sleeve is internally threaded at 4 down to the point 5 where occurs a second internal shoulder upon which rests the lower end of the casing, the latter being provided at its lower end with external threads 6 engaging those within the sleeve. Externally the lat-

ter is cylindrical for most of its length as at 7; and while its size throughout this portion will probably be sufficient to permit the couplings J between the sections of the casing to pass down the hole H, I prefer to form an external shoulder 8 on the sleeve somewhere between the extremities of its internal threads 4. All said shoulders face upwardly, with the result that the sleeve is successively increased in thickness three times and correspondingly strengthened toward that portion of the shoe where the greatest strain occurs, while the casing is connected with the sleeve by the rather long engaging threads 4 and 6 and by the firm contact of its lower end upon the shoulder 5. Below the latter the sleeve 1 is continued downward integrally into what might be called a collar 9 whose internal diameter is less than the threads 6 of the casing C and whose size externally corresponds with that of the sleeve below its external shoulder 8, and this collar forms the shell of what might be called an annular bit or drill and is flared slightly at its lower end as shown at 10.

The teeth or bits around the lower extremity of the collar (which, with the sleeve is by preference made entirely of tool steel) are formed with their cutting edges 11 truly radial to the collar and straight but inclined from their points 12 which occur in the line of the flared outer wall 10 of the collar, upward and inward to their heels 13, and inside of the latter the teeth are beveled off as at 14 so as to produce a flat face of triangular form with the apex at the heel 13 and the other two angles 15 occurring within the line of the inner wall of the collar. I may say here that the purpose of these flat faces is to permit the ready closing of the jaws of an underreamer if one is subsequently employed, and avoid the direct contact of said jaws with the cutting edges which would of course dull the latter. At opposite sides of the cutting edge 11 each tooth is beveled off as at 16 in both directions away from said edge, at any pitch desired, but preferably not at a very steep pitch, and laterally more remote from each cutting edge the bevels are increased as at 17 so that the pitch is somewhat steeper all the way up to the valley 18 between each two teeth, where the inclination is the same as that of the cutting edge but steeper. If the outer wall of the sleeve is flared as shown at 10, the radially outer end of each tooth presents two shearing corners 19 which are disposed along the angle between the bevels 16 and the outer face of the collar, and one of these angles will cut into the material whichever way the collar is rotated.

One other feature of the present invention consists in the reinforced connection I employ between the sleeve and the casing. Above the point where these members are

screwed together the bore 2 of the sleeve is slightly larger than the outside of the casing, and into the annular space between them I pour molten babbitt 20 which is allowed to set while the shoe is held in strict axial alinement with the lower section of the casing. Also on the inner face of the sleeve I provide about four upright angular grooves 21 into which this molten babbitt flows as it is poured into said annular space and within which it sets so as to form ribs closely filling said grooves. The latter are preferably ratchet-shaped as shown, with their flat faces directed clock-wise. After the casing is screwed into the sleeve against the shoulder 5 it cannot be turned farther to the right, and when turned to the left to unscrew it from the shoe, if it should carry the filling with it, the latter would strike against the flat faces of said grooves and therefore not be dislodged from its position within the sleeve. This result would not be accomplished if the grooves were annular, besides which I find that the use of longitudinal grooves freely admits the molten metal as it is poured into place, and even if it should become chilled while being inserted at other points within the space between the casing and sleeve it would form ribs throughout the length of the longitudinal grooves. This not only overcomes any tendency of loose or imperfect threads to cause a slightly oblique disposition of the shoe upon the casing, but assists in holding these parts subsequently alined and preventing their accidental disconnection.

The uses and advantages of my invention will now be apparent. As the casing is passed down the hole H it is preceded by this improved shoe whose size is by preference as nearly that of the hole as possible so that it will admit a casing or lining having an ample bore. When obstructions O or projecting points P are encountered, the casing is rotated rapidly and the cutting teeth or bits dislodge or disintegrate the obstruction if its nature will permit or cut into it if necessary, before the shoe and hence the lower end of the casing can be deflected by the obstruction. In the act of cutting the latter, the points 12 enter it first, followed by the shearing edges 19 as the casing and shoe are borne downward, and the material cut or ground off of a rock for instance falls into the hole or is drawn up through the casing with the outflowing water. Assuming that the collar finally passes through a projecting obstruction, as soon as it has descended far enough for the external shoulder 8 to pass such obstruction, the reduced external size of the sleeve 1 takes it out of contact with the obstruction and nothing thereafter touches it as the casing proceeds down the hole. It follows, therefore, that once having cut through an obstruction,

there is no subsequent contact with it and no tendency to deflect or bend the well casing at any other point.

I have not illustrated and do not consider it necessary to describe the action of an underreamer or other tool when used in conjunction with this device, either before or after it has reached the bottom of a hole.

What is claimed as new is:

1. The combination with a well casing externally threaded at its lower end; of a shoe having two internal upwardly facing shoulders and internal right-hand threads between them engaging those on the casing, the lower end of the latter resting on the lowermost shoulder and the bore of the shoe above the threads being larger than the external circumference of the casing and provided with longitudinal angular grooves having flat faces facing to the right; and a filling of Babbitt metal in the annular space thus produced, forming ribs projecting into such grooves.

2. The herein described shoe for well casings, the same comprising a sleeve having means for attachment to the lower end of

the casing, a collar integral with and depending from the lower end of the sleeve, and a series of bits around the lower end of the collar, each having its cutting edge inclined inward and upward from its point which occurs in the line of the outer wall of the collar to its heel, then beveled to the inner wall thereof, and the valleys between the teeth inclined in the same direction but steeper.

3. A tooth for tubular drills having its cutting edge inclined inward and upward from a point in the line of the outer wall of the drill to its heel, then beveled upward to the inner wall thereof, and the tooth at both sides of said cutting edge being beveled away from it for a distance and then beveled more steeply to the valleys between the teeth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FRANK M. NEVINS.

Witnesses:

W. W. ENOCH,
M. F. CRONIN.