To all whom it may concern:  

Be it known that I, Henry E. Deavers, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Well-Casing Straightening Tools, of which the following is a specification.

My invention relates to a rotary tool for restoring to its normal condition well casing that has become accidentally deformed after the same has been lowered into position in a well.

A main object of my invention is to provide a well casing straightening tool provided with a plurality of tapered rolls that will effectually restore bent well casings to their normal shape without injury thereto.

Another object is to provide a well casing straightening tool in which worn tapered rolls may be readily removed therefrom and new ones readily substituted as occasion demands, and to provide means for supporting the rolls in operative position should their bearing pins become accidentally broken during the operation of the tool.

It will be understood that I do not limit myself to the precise construction herein described and illustrated, but I may resort to various changes in the mechanical construction within the scope of my appended claim, and without departing from the spirit of my invention.

I accomplish the above objects by means of the device herein described and illustrated in the accompanying drawings forming a part thereof, in which:

Figure 1 is a vertical section through a drilled well with the casing in position, the lower portion being shown as deformed, the tool being in side elevation above the deformed portion of the casing.

Fig. 2 is a side elevation of the straightening tool.

Fig. 3 is a transverse section taken on line 3-3 of Fig. 2.

Fig. 4 is a central vertical section through the tool taken on line 4-4 of Fig. 5.

Fig. 5 is a top plan view of the tool.

Fig. 6 is a side elevation of a modified form.

Fig. 7 is a central vertical section of the form illustrated in Fig. 6.

Fig. 8 is a transverse section taken on line 8-8 of Fig. 7.

In lowering into position oil well casing, the same is often bent out of shape by reason of unusual or rocky geological formations, and when such accidents occur the casing usually has to be withdrawn from the well in order that the drilling operations may be continued.

By means of my present invention, when such accidents as above recited occur to a section of casing, the casing need not be withdrawn from the well, as my tool can be readily lowered into the casing to the point of deformation and operated to restore the same to normal condition.

Referring now more specifically to the drawings wherein are exhibited an embodiment of my invention, 10 designates the frame portion of the tool, provided with a centrally disposed bore 11 for the passage of water through from the well, the cylindrical wall tapering upwardly as at 14, the purpose being described further on. The extreme upper end of the frame portion of the tool terminates in a threaded tapered pin 15, and at the base of this pin 15, is formed an annular bearing flange 16. Disposed around the cylindrical tapered portion 13 of the frame and spaced equally apart, are a series of roller bearings 17, rotatably mounted on bearing pins 18, provided with upper headed ends 19 and reduced lower ends 20, that engage circular cavities 21 formed in the upper surface of the base portion of the frusto-conical end. Bearing pins 18 pass through circular openings 22 formed in the flange 16, the headed ends 19 engaging circular seats 23 formed at the upper ends of the openings, the lower end of drill pipe 24 when connected to the tapered pin holding the pins from rotation.

In order to readily remove the tapered pins 18 when they become worn or broken, I have provided elongated apertures 25 extending from each cavity 21 through the conical end of the tool in order that a pin or other tool may be introduced therein to force the pins 18 out of engagement with their seats.

Should any undue or unusual strain be imposed on the roller pins 18, I have provided downwardly extending lugs 26, preferably formed integral with the flange 16 of the frame, the side faces of each lug being concaved longitudinally and of a depth to
permit the free rotation of the various rollers. From this construction it will be apparent that should a pin become broken or bent during the operation of the device, the lugs 26 will prevent a displacement of the rollers.

In Figs. 6, 7, and 8, I have illustrated a modified form of casing straightener, in which the frame portion is exactly the same as in the preferred form, the rollers 17 being of the same tapered form and disposed in exactly the same manner, the only change residing in the frusto-conical end of the tool, which is provided with a plurality of pairs of tapered rollers, designed to impart a rolling action to the extreme end of the tool when the casing is badly deformed.

The surface of the frusto-conical end is provided with recesses 30 extending downwardly from the base or flange portion 12 of the end of the tool and terminating adjacent the lower end thereof, and arranged in pairs and disposed between the rollers 17 mounted thereafter, as clearly shown in Figs. 6 and 8 of the drawings. By disposing the recesses formed in the surface of the frusto-conical end of the tool between the rollers 17, a sufficient surface is provided to form apertures 25 utilized for removing worn or broken rollers 17 as in the preferred form. The annular edge of the base or top portion of the frusto-conical tool end is provided directly above each recess 30 with vertically disposed concavities 31, the top wall of the recesses 30 having apertures 32 through which pass the headed bearing pins 33 of the tapered rollers 34, the lower ends of the pins seating in circular recesses 35 formed in the bottom wall 36 of each recess, the apertures 25 leading from the bottom wall of the recesses to the outer surface of the frusto-conical end.

In Fig. 1, I have illustrated an application of my improved casing straightener, the casing 37 being shown deformed as at 38 by the rocky formation of the wall of the well. From the above illustration it will be observed that the tool is secured to the lower end of a rotary drill pipe 39, the end 12 engaging the walls of the deformed casing. On a rotation of the tool by means of the usual rotary mechanism (not shown), end 12 of the tool will gradually press the deformed wall outwardly so that the tapered rolls 17 mounted thereabove will engage the interior wall and completely force or press the casing into its normal or original form, water or semi-fluid mud passing downwardly through the drill pipe and bore of the tool thoroughly lubricating the same during its operation.

By employing a plurality of tapered rolls in connection with my tool, the deformed wall of the casing is subjected to a rolling action, the metal being expanded equally without undue strains, and without injury or breakage thereto.

What I claim is:

In a device of the class described, a substantially cylindrical frame having a cone shaped lower end and a threaded upper end, a plurality of tapered anti-friction rollers mounted in said frame intermediate its upper and lower ends bearing lugs formed on said frame, a lug between each of said rollers and its adjacent roller, and a plurality of tapered anti-friction rollers mounted on the surface of the cone shaped end of said frame.

In witness that I claim the foregoing I have hereunto subscribed my name this 16th day of October, 1923.

H. E. DEAVERS.