

Sept. 15, 1942.

F. STONE ET AL

2,295,874

ADAPTER FOR WELL PIPES

Filed Sept. 25, 1939

2 Sheets-Sheet 1

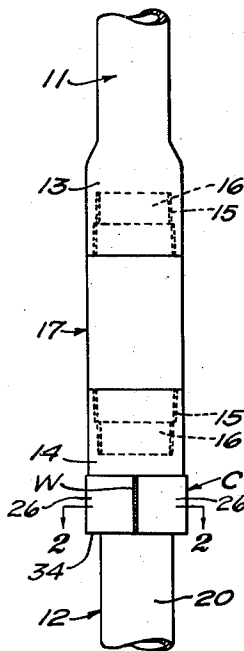


Fig. 1.

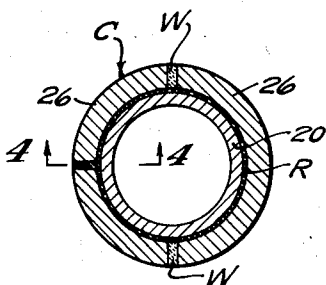


Fig. 2.

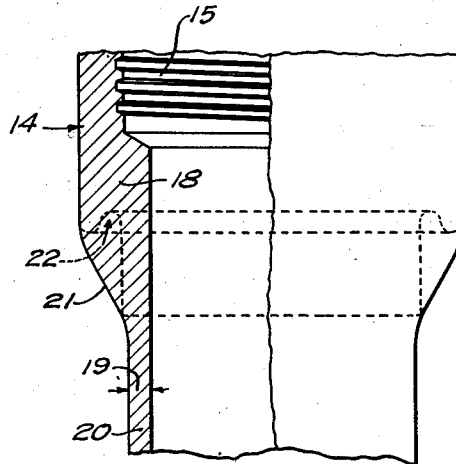


Fig. 3.

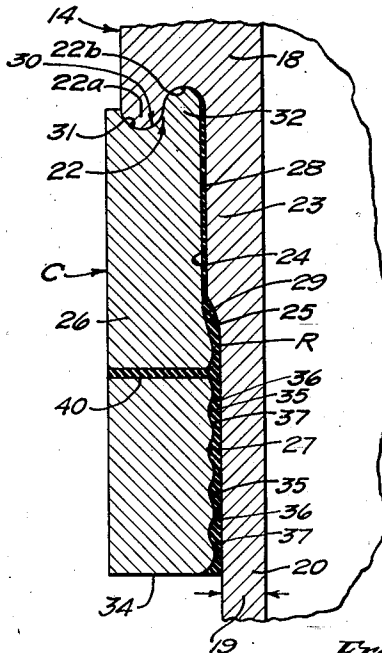


Fig. 4.

Inventors
Frederick Stone,
Albert L. Stone.

Barkeley & Scantlebury

Attorneys.

Sept. 15, 1942.

F. STONE ET AL

2,295,874

ADAPTER FOR WELL PIPES

Filed Sept. 25, 1939

2 Sheets-Sheet 2

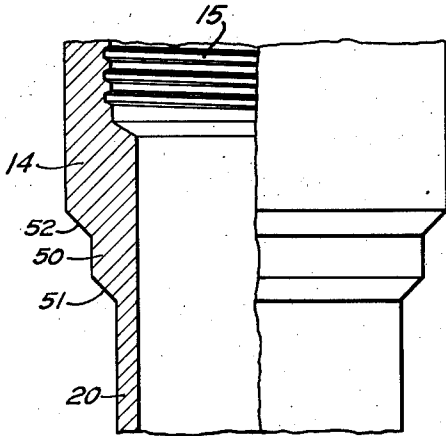


Fig. 5.

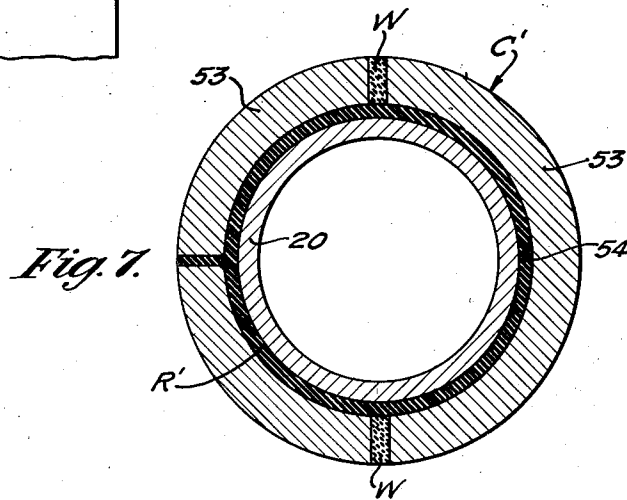


Fig. 7.

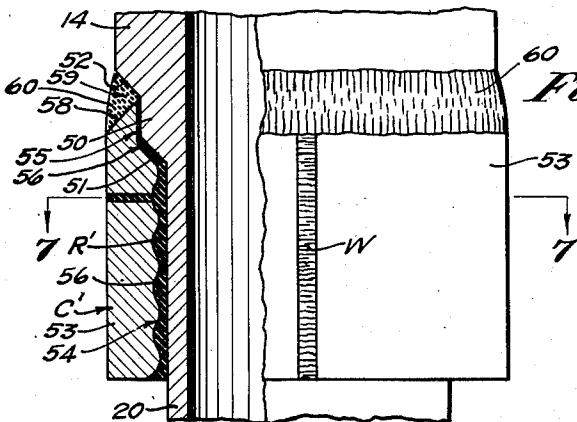


Fig. 6.

Inventors
Frederick Stone,
Albert L. Stone.

Barkeley & Scantlebury
Attorneys.

UNITED STATES PATENT OFFICE

2,295,874

ADAPTER FOR WELL PIPES

Frederick Stone, Redondo Beach, and Albert L. Stone, Palos Verdes Estates, Calif., assignors to Hydril Company of California, Los Angeles, Calif., a corporation of California

Application September 25, 1939, Serial No. 296,450

6 Claims. (Cl. 255—28)

This invention relates generally to adapter collars for well pipes, and is more particularly concerned with collars adapted to be applied to pipe having elevator shoulders of one type where-
by elevator shoulders of another type are sup-
plied.

The invention is shown in connection with drill pipe having external terminal upsets, the upsets presenting downwardly and inwardly tapering shoulders to which complementary shoulders on specially formed pipe elevators are applied when the pipe is to be raised, lowered or suspended from the overhead crown block of an oil well derrick.

Occasion sometimes arises where only one or a few lengths of such upset pipe are included in a drill stem which is otherwise equipped with A. P. I. tool joints having square-cut—rather than tapered—shoulders. For handling the A. P. I. tool joint shoulders, an elevator with square-cut shoulders is utilized. In order that a special elevator need not be kept on hand and substituted for the square-shoulder elevator when one of the upset lengths is reached, it is desirable that said upset lengths be equipped to take square-shoulder elevators.

Therefore it is the general object of our invention to provide an adapter collar for tapered-shouldered or upset pipe which will permit such pipe to be handled by square-shoulder elevators.

The application of such a collar involves a number of difficulties. It cannot be merely welded on the larger diameter of the upset, for that would make the diameter of the shoulder too large to fit square-shoulder elevators, or would prohibitively increase the overall diameter of the collared upset with relation to the casing or hole through which the drill stem is shifted vertically.

On the other hand, if such a collar were applied in a normal manner to the body portion of the pipe, the tendency for the ends of the collar to form "fulcrums" about which pipe-bending strains are concentrated creates incipient fracture planes which are very likely to yield under heavy "twist-off" or tensile strains.

Again, if the collar is shouldered against the downwardly facing upset shoulder, special precaution must be taken to prevent the wedge effect of the tapered upset shoulder from unduly swelling or splitting the collar.

Therefore it is among the objects of the invention to provide an adapter collar which overcomes all these difficulties and yet may be ap-
plied with relative ease and dispatch so as to be economically feasible.

plied with relative ease and dispatch so as to be economically feasible.

The invention combines with other features certain of the features individually set forth and claimed in the copending application of Albert L. Stone and entitled Well pipe collars and method of attaching same to pipe, filed September 25, 1939, Serial No. 296,451.

How the above objects are attained, as well as further objects and features of novelty, will be set forth in the following detailed description, reference being had to the accompanying drawings, in which:

Fig. 1 is an elevation of a fragment of a drill pipe equipped with a collar of our invention;

Fig. 2 is an enlarged section on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary elevation, partly in section, showing an external upset box on a drill pipe, and indicating in dotted lines how the box may be prepared for the application of one type of collar embodying our invention;

Fig. 4 is an enlarged, fragmentary section on line 4—4 of Fig. 2;

Fig. 5 is a view showing how an upset box is prepared for the application of a variational type of collar embodying our invention;

Fig. 6 is a view partly in elevation and partly in longitudinal medial section, showing such a variational type of collar applied to the box as prepared according to Fig. 5; and

Fig. 7 is a section on line 7—7 of Fig. 6.

In Fig. 1, numerals 11 and 12 indicate general lengths of drill pipe having externally upset ends 13 and 14, respectively, wherein are provided threaded boxes 15 for the reception of pins 16 on the double-ended tool joint 17.

Fig. 3 shows, in full lines, a fragmentary enlargement of upset 14 as it would normally appear, it being noted that the wall of the upset at 18 is appreciably thicker than the wall 19 of the body portion 20 of the pipe. Downwardly facing, conical shoulder 21 of the upset is the normal elevator-taking shoulder, elevators used for handling this type of pipe having a load-taking shoulder substantially complementary to shoulder 21.

It will be seen that shoulder 21 is not of a formation properly to receive application of an elevator having a square-cut load-taking shoulder, such as used in handling drill pipe equipped with standard, square shoulder, A. P. I. tool joints. We have explained above certain occasions which call for the handling of the upset type of pipe with the square-shoulder type of elevator, and

we have indicated in dotted lines in Fig. 3 how upset 14 may be prepared for the reception of an adapter collar which will accomplish the desired end. Of course, this particular preparatory step is not limitative on the invention, considered in its broader aspects, and, in fact, we will later discuss a somewhat different preparatory step, but the one illustrated in Figs. 3 and 4 is particularly well adapted to the purpose.

The upset is turned down to provide a transverse, downwardly facing annular shoulder 22 and, while this is not limitative, the extent of shoulder-cut is such that it leaves a cylindric step 23 of the original upset (thus preserving the benefit of a certain amount of upset stock below the newly cut shoulder) having a cylindric face 24 and terminating in a conical shoulder 25 which is part of original shoulder 21. Shoulder 22 is preferably formed so it presents, in cross-section, a reverse curve, the shoulder merging smoothly into step 23 and into the outer periphery of the normal upset. This curve forms, in effect, an outer, downwardly extending annular lip 22a on the upset, which lip defines an annular, smoothly curved groove 22b at the base end of upset step 23.

Adapter collar C, preferably made of a superior wear-resistant metal such as high manganese steel, may be made up of a plurality of arcuate sections 26 whereby the collar may be assembled about the pipe beneath the upset, the sections then being welded together as at W. However, this sectional characteristic of the collar and method of assembly is merely illustrative and not limitative on the invention, for it will be apparent that under certain circumstances, such as where there is an upset at only one end of the pipe, the collar may be a solid ring and slipped onto the pipe over the plain end thereof and then slid along the pipe to the upset.

Collar C has a major bore 27, a counterbore 28 and a conical shoulder 29, each of which is of sufficient diameter to provide annular clearance between the collar and the horizontally opposite body portion 20, step 23 and shoulder 25, respectively. The upper end of collar C forms a shoulder 30 complementary to and adapted relatively snugly to interfit shoulder 22, the collar end having a groove 31 adapted to take lip 22a, and a lip 32 adapted to extend and fit groove 22b.

The lower end of the collar presents a substantially square-cut, elevator-taking face 34, and the collar preferably is of greater diameter than upset 14 so it not only presents a shoulder 34 of considerable horizontal extent but also so it will take the wear incident to pipe movement through the casing or hole and thus relieve the upset, proper, from such wear, this being a feature of advantage entirely irrespective of the end-shoulder characteristics of the collar.

Preferably, though not necessarily, the inner peripheral face which defines collar bore 27 is indented, for instance by a vertical series of annular grooves 35, presenting alternate and oppositely inclining wedge faces 36 and 37.

At some time during the operation, a ring R of rubber or the like is positioned to be finally interposed between the collar and the opposed peripheral faces of body portion 20, step 23 and shoulder 25, the rubber of the ring extending into grooves 35 and preferably being bonded to both pipe and collar. The application of the rubber may be made to the pipe before the application of the collar sections, or in the form of liners on the collar sections, but preferably it is intro-

duced after the ring sections are welded together about the pipe, it being remembered that it has been specified that the relative diameters are such that annular clearance exists between pipe and collar.

For instance, an opening 40 may be extended through the collar to the clearance space between collar and pipe, and rubber, in a proper degree of fluidity or plasticity, forced under high pressure through this opening into the clearance space, the collar being held with shoulder 30 engaged with shoulder 22 during this operation. The rubber may be vulcanized or otherwise suitably bonded to both pipe and collar, thus resiliently connecting them against relative rotation and against other than very limited downward movement of the collar along the pipe. Any tendency of the collar to move downwardly along the pipe tends, through wedge faces 36 of groove 35, to wedge the rubber more tightly against the pipe and thus sets up increased resistance to the collar shifting along the pipe. The portions of the rubber projecting into grooves 35 and the rubber within opening 40 may be considered as "key" connections between the rubber ring and collar.

When a square-face elevator is applied to the pipe against shoulder 34, it will be seen that the lifting strains are directed vertically through the collar to shoulder 22 without wedge-spreading the collar, and lip 22a prevents the upper end of the collar from spreading under longitudinally compressive strains which, under certain conditions, may tend to bulge the collar. The smooth curving of shoulder 22 and its terminal merge into the upset stock prevents the formation of weak zones such as are caused by sharply angled meeting points.

Since the collar is out of metal-to-metal peripheral contact with body portion 20, there is formed no rigid "fulcrum" point along this relatively weak portion of the pipe, which would otherwise localize the strains due to pipe bending and tend to set up fracture planes in the pipe which are apt to yield to "twist-off" or excessive tensile strains. The resiliency of rubber ring R permits relative movement between pipe and collar of an extent which will relieve each element from the transmission of harmful strains from the other element.

In Figs. 5 to 7, inclusive, we have shown a variational embodiment of the invention, it being understood that corresponding parts perform the same general offices as those described in connection with Figs. 1 to 6, inclusive, except that the rubber shown in Figs. 5 to 7 is not depended upon for holding the collar against movement downwardly along the pipe.

The upset 14 is here turned down to provide a cylindric step 50 with a part 51 of the original upset shoulder forming the lower terminal shoulder thereof, while a conical shoulder 52, preferably but not necessarily parallel to shoulder 51, is formed at the upper end of the step.

Collar C', preferably of a material similar to collar C, is preferably made up of arcuate sections 53 welded together at W after they are assembled about the pipe, though the reservations as to the sectional characteristics made in connection with collar C, also apply to collar C'. As in the case of collar C, the collar C' preferably, though not necessarily, is of greater outside diameter than the upset to provide additional wear stock and to relieve the upset of peripheral wear, at least initially.

Collar C' has a bore 54, counterbore 55, and internal, conical shoulder 56, the diameters of each being larger than the parts 20, 51 and 50 of the pipe which they respectively oppose when the collar encircles the pipe in the position of Fig. 6. The upper end of the collar is tapered outwardly and downwardly at 58, thus defining, with shoulder 52, a substantially V-shaped weld-groove 59. Upset 14 and the upper end of collar C' are weld-integrated by weld material 60 which is applied when the collar is properly located on the pipe. Since the weld occurs at the relative heavy upset, the relatively thinner portions of the pipe are not disturbed or weakened by the welding operation.

A ring R' of rubber or the like is interposed between the opposed peripheral faces of the collar and pipe, this rubber being applied and functioning in the same manner as described in connection with Figs. 2 to 4, except that the bonding sometimes need be to only one of the faces. The inner peripheral face of the collar may be grooved as at 56, into which grooves the rubber extends in the same manner as described in connection with collar C, though here the grooves serve mainly to prevent bodily displacement of the rubber under squeezing forces when the pipe bends within the collar. Vulcanization of the rubber to the collar and pipe, or any other suitable type of bond between them, may be utilized to aid in preventing such bodily displacement of the rubber.

While weld 60 holds the collar against endwise movement along the pipe, it will be realized that the thinner sections of the pipe may flex somewhat with respect to the collar, but as stated above, rubber R' resiliently permits such flexure without subjecting the pipe to localized strain, as is true when a metal-to-metal contact exists between the collar and a relatively weak part of the pipe.

While we have shown and described preferred embodiments of our invention, various changes in design, arrangement and procedure may be made without departing from the spirit and scope of our invention.

We claim:

1. In combination, a well pipe having an external annular upset presenting a downwardly facing annular shoulder, a collar encircling the pipe below the upset and having its upper end engaging said upset shoulder, the collar extending downwardly about the pipe below the upset, and a ring of rubber or the like interposed between the opposed peripheral faces of the collar and pipe, and extending throughout the downward extent of the collar, said collar presenting a downwardly facing, elevator-taking shoulder, and interacting positioning means between the upper end of the collar and said upset adapted to hold the upper end of the collar against movement radially with respect to the pipe.

2. In combination, a well pipe having an ex-

ternal annular upset presenting a downwardly facing annular shoulder, a collar encircling the pipe below the upset and having its upper end engaging said upset shoulder, the collar extending downwardly about the pipe below the upset, and a ring of rubber or the like interposed between and vulcanized to the opposed peripheral faces of the collar and pipe, said collar presenting a downwardly facing, elevator-taking shoulder, one of said peripheral faces having annular grooves presenting, in effect, wedge faces inclining with respect to the pipe axis, the rubber of the ring extending into said grooves.

3. In combination, a well pipe having an external annular upset, a downwardly facing shoulder on the upset, said shoulder being reversely curved as viewed in section, a collar encircling the pipe below the upset and having its upper end substantially complementary to and in engagement with said upset shoulder, the collar extending downwardly about the pipe below the upset and out of metal-to-metal peripheral contact therewith, said collar presenting a downwardly facing, substantially square-cut, elevator-taking shoulder.

4. In combination, a well pipe having an external annular upset presenting a downwardly facing annular shoulder, a collar encircling the pipe below the upset and having its upper end engaging said upset shoulder, the collar extending downwardly about the pipe below the upset and out of metal-to-metal peripheral contact therewith, said collar presenting a downwardly facing, elevator-taking shoulder, an annular, depending lip on the upset at the upset shoulder and defining an annular groove in said upset, and an annular lip on the end of the collar fitted in said groove.

5. In combination, a well pipe having an external annular upset presenting a downwardly facing annular shoulder, a collar encircling the pipe below the upset and extending downwardly about the pipe from said upset shoulder, the collar, throughout its downward extent, being out of metal-to-metal peripheral contact with the pipe, and interacting positioning means between the upper end of the collar and said upset adapted to hold the upper end of the collar against movement radially with respect to the pipe.

6. In combination, a well pipe having an external annular upset presenting a downwardly facing annular shoulder, a collar encircling the pipe below the upset and extending downwardly about the pipe from said upset shoulder, and a ring of rubber or the like interposed between the opposed peripheral faces of the collar and pipe, and interacting positioning means between the upper end of the collar and said upset adapted to hold the upper end of the collar against movement radially with respect to the pipe.

FREDERICK STONE.
ALBERT L. STONE.