

Nov. 10, 1925.

1,560,735

E. A. RUSSELL

FLEXIBLE METALLIC PIPE CONNECTION

Filed May 25, 1921

2 Sheets-Sheet 1

Fig. 1.

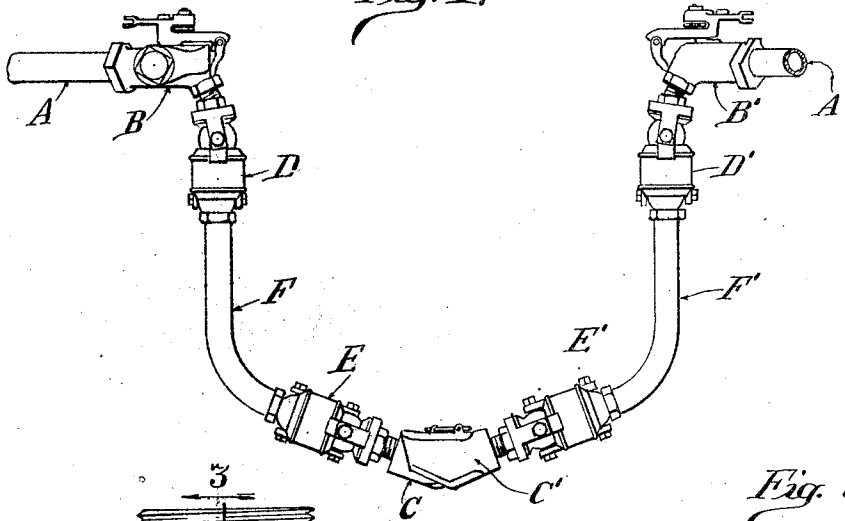


Fig. 2.

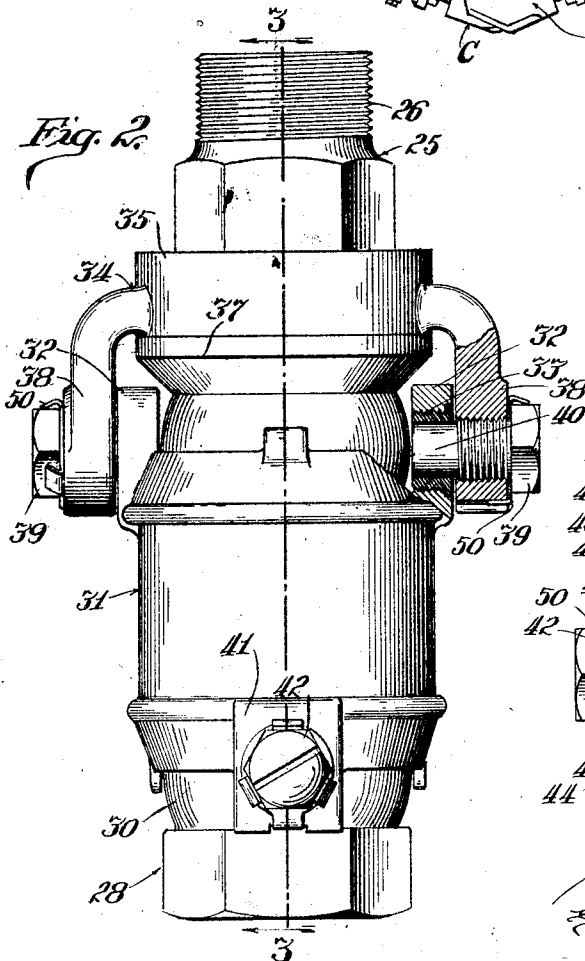
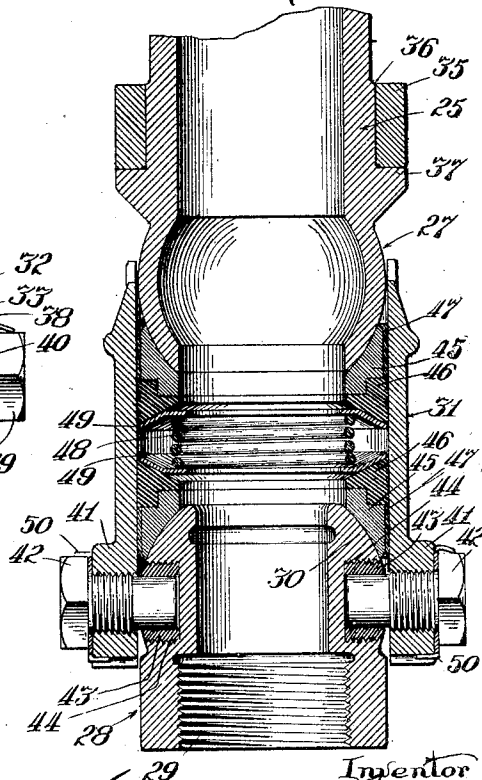


Fig. 3.



Inventor
Edward A. Russell
By *Barrett & Pomeroy*
Attorneys

Nov. 10, 1925.

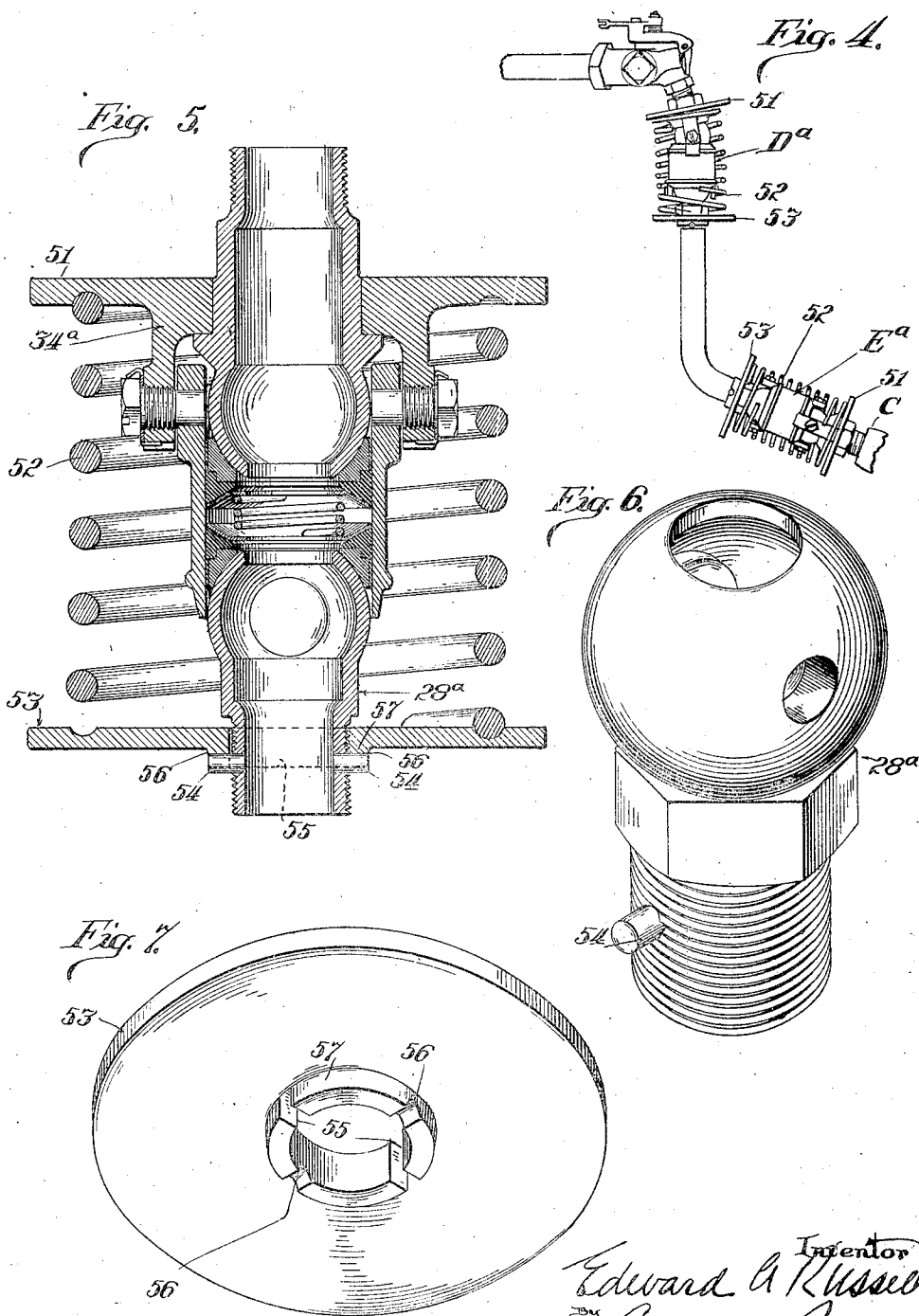
1,560,735

E. A. RUSSELL

FLEXIBLE METALLIC PIPE CONNECTION

Filed May 25, 1921

2 Sheets-Sheet 2



Inventor
Edward A. Russell
By Barnum T. Mumma
Attorneys

UNITED STATES PATENT OFFICE.

EDWARD A. RUSSELL, OF CHICAGO, ILLINOIS, ASSIGNOR TO VAPOR CAR HEATING COMPANY, INC., OF CHICAGO, ILLINOIS, A CORPORATION OF NEW YORK.

FLEXIBLE METALLIC PIPE CONNECTION.

Application filed May 25, 1921, Serial No. 472,470.

To all whom it may concern:

Be it known that I, EDWARD A. RUSSELL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Flexible Metallic Pipe Connections, of which the following is a specification.

My invention relates to a flexible metallic conduit or pipe connection, and the primary object of the invention is to provide a structure of this type suitable for use in connecting the train pipes on adjacent cars of a railway train. The invention will be described as applied to the coupling or connection between the steam train pipes of a railway train, the invention having special utility in this relation. It should be understood, however, that the novel and improved constructions constituting my invention may be employed for making the coupling between the air train pipes on railway trains or for affording a connection between any two pipes where the flexibility of such connection, capacity for withstanding high internal fluid pressure and ease and convenience in making the coupling between the pipes are requisites.

The pipe connection herein described and claimed is somewhat similar to that disclosed in the copending application of Laurence H. Gillick filed July 26, 1920, Serial No. 398,882. It is one of the objects of the invention to provide certain improvements upon said Gillick's pipe connection, the nature of which will be hereinafter set forth.

The invention consists in the novel arrangements, constructions and devices to be hereinafter described and claimed for carrying out the above stated objects and such other incidental objects as will be mentioned in connection with the following description of the preferred embodiments of the invention illustrated in the accompanying drawings.

In the drawings

Fig. 1 is a side elevation of a train pipe coupling or connection embodying the principles of my invention.

Fig. 2 is a view in elevation, with certain parts in section, of one of the universal joints used in said pipe connection.

Fig. 3 is a sectional view, on a somewhat smaller scale, taken on line 3-3 of Fig. 2.

Fig. 4 is a fragmentary side elevation of

a train pipe connection embodying my invention in a modified form.

Fig. 5 is a longitudinal sectional view through one of the universal joints of the pipe connection shown in Fig. 4.

Fig. 6 is a view, in perspective, of one of the ball members of the joint shown in the preceding two figures, and

Fig. 7 is a view, in perspective, of the spring abutment forming part of said joint.

Like characters of reference designate like parts in the several figures of the drawings.

Referring first to Figs. 1, 2 and 3, the letters A, A' designate the steam train pipes on adjacent cars of a railway train, and B, B' the angle cocks on the ends of the train pipes. The coupling between said train pipes is composed of two flexible metallic pipe connections which are coupled together by the mating coupler members C, C'. These couplers may be of any ordinary type, such as are used for coupling the hoses ordinarily employed for making a connection between railway car train pipes. The pipe connections between angle cock B and coupler C and angle cock B' and coupler C' are composed of universal joints D, E and D', E' connected preferably by curved metal pipes F, F'. The universal joints D, D' hang substantially vertically from the angle cocks. The universal joints E, E' associated with couplers C, C' are inclined slightly from the horizontal. The universal joints D, E; D', E' may be of like construction. This construction is illustrated in detail in Figs. 2 and 3.

The joint is composed of the following parts: 25 is a conduit member preferably formed with a threaded nipple 26 for engaging the adjacent element of the coupling and at the other end with a ball 27. 28 is a conduit member internally threaded as indicated at 29 and formed at the other end with a ball 30. 31 is an intermediate conduit member, preferably cylindrical, adapted to receive the balls 27 and 30. The intermediate member 31 is formed at one end with a pair of projecting lugs 32 having threaded perforations to receive brass or bronze bushings 33. 34 is a yoke having an annular portion 35 swiveled upon a cylindrical portion 36 of member 25 and bearing against a circumferential shoulder 37 formed on member 25. The yoke 34 is formed with a pair of diametrically arranged arms 38 pro-

vided with threaded perforations through which extend pivot studs 39, the smooth ends 40 of which project into and make a fairly close fit with the bushings 33.

5 The intervening member 31 of the joint is formed on its other end with a pair of perforated lugs 41 at right angles to the lugs 38 and adapted to receive pivot studs 42, the ends of which project into bushings 43
10 arranged in recesses 44 in the ball portion 30 of member 28.

The joints between member 31 and balls 27 and 30 are sealed by two gaskets each of which may consist of a single piece of
15 suitable packing material such as rubber or rubber composition, the gasket, in each case, being preferably, however, composed of two sections, one section 45 being composed of a relatively hard rubber composition, such as
20 Jenkins material, and the other, 46, being of softer, more resilient material, soft rubber for example. The gasket section 45 may be provided with a metallic armoring 47. This section of the gasket is formed with a
25 curved inner surface conforming to the outer face of the ball 27 or 30, as the case may be. Section 46 of the gasket is arranged back of and bearing against the gasket section 45, the gasket being held against balls
30 27, 30 by means of a coiled spring 48 interposed between preferably conical metal washers 49 bearing upon the beveled inner ends of the inner gasket sections 46. The pivot studs 39, 42 may be held in place by
35 nut locking devices indicated at 50.

Operation.—The problem of providing a metal flexible pipe connection between the train pipes on railroad cars to take the place
40 of the rubber hoses commonly used has received considerable attention for some time, a metallic connection for such purpose being highly desirable in view of the relatively high cost of rubber hoses and their lack of durability especially when used for making
45 the connection between steam train pipes due to the deteriorating action of the steam on the rubber. The difficulty has been, however, to obtain a metal pipe connection which should be flexible when subject to
50 high steam pressure, sufficiently durable to warrant their higher cost in comparison with rubber hoses, and composed of parts so articulated that the couplers will be capable of such manipulation as to enable them
55 to be readily coupled and uncoupled. So far as durability is concerned, it will be realized that the articulated parts of the pipe connection used for this purpose are subject to continual movement one upon the
60 other through the vibrations of the railway cars and the constantly changing position of one car with respect to the other due to inequalities of the track. As the universal joints used in making a pipe connection of
65 this character are likely to be subjected to

steam pressures up to one hundred pounds per square inch, or even more, the need for flexibility of the connection when in service requires a system of articulation which will admit of ease of movement of one part on
70 the other even when the internal pressure is high while maintaining a steam tight relation between the connected elements of the structure.

These requisites are combined in the flexible pipe connection herein shown and described. The ball members 25 and 28 are pivotally connected with the intermediate member 31 on axes at right angles to each
75 other so that a very considerable internal pressure has very little stiffening effect on the joint. The gaskets are arranged so that they are self sealing under the pressure of the fluid passing through the joint. Spring
80 48 is designed merely to hold the gaskets in their normal position at such times as the pipe connection is not under steam pressure. The conical form of the followers or washers 49 and the beveling of the ends of the
85 gasket sections 46 insure the expanding or spreading of these sections against the socket member 31 of the joint. When steam is admitted to the joint the outer ends of each gasket (the hard composition gasket section
90 45) is forced with a wedging action into the space between the inner wall of member 31 and the outer face of ball 27 or 30, as the case may be. When the inner section 46 of the gasket is made separately and of softer material, which is the preferred arrange-
95 ment, the steam pressure against this section of the gasket tends to spread it against the inner wall of member 31 so as to prevent the steam from working out along the outer surface of the gasket. The swivel movement
100 afforded by the rotary connection between yoke 34 and member 25 allows one part of the joint to be turned, axially, with respect to the other, with a minimum of wear on the parts engaged. This swiveling movement is important in order that the interlocking faces of the couplers C, C' may be brought into proper relation with each
105 other. The conduit members 25, 28, 30 are ordinarily made of cast iron. By providing bushings 33, 43 for the pivot pins 39, 42 any looseness between the pins and the parts they engage may be remedied by removing the bushings or pins or both of them and putting in new ones.
120

In Figs. 4, 5, 6 and 7 I have shown an expedient for holding the coupling up from the track when the car is at the end of the train, for example, so that the hose coupler
125 is not in its usual engagement with the mating coupler of an adjacent car. In this construction the yoke member 34^a is formed with a disk 51 against which is seated the end of a coiled spring 52 which surrounds the joint and bears at its other end against
130

a disk 53 shown as held in place on the ball member 28^a by means of studs 54 fixed in the latter. The disk 53 is formed with slots 55 through which studs 54 may be passed in assembling, the disk being then given a quarter turn until studs 54 seat in grooves 56 formed in a flange 57 on the under side of the disk.

As shown in Fig. 4 both the upper universal joint D^a and the lower joint E^a are provided with the supporting springs 52, as above described. It may be sufficient, in some cases, to use the spring in connection with only one of these joints. The spring, it will be noted, tends because of the pressure exerted against discs 51, 53 to hold the parts of the joint from swiveling as well as from flexing on the pivotal connections.

I claim:

1. A flexible pipe connection comprising a pair of conduit members, one of which is formed with a ball adapted to project into the other member, a gasket arranged to bear against the inner end of the ball and freely slidable on said other member to maintain sealing contact with said members when the surface of the gasket against the ball wears and a connecting element having a direct pivotal non-swiveling connection with one of said members and rotatable on the other.

2. A flexible pipe connection comprising a pair of conduit members, one of which is formed with a ball adapted to project into the other member, a gasket arranged to bear against the inner end of the ball and freely slidable on said other member to maintain sealing contact with said members when the surface of the gasket against the ball wears, one of said members being formed with a circumferential shoulder, and a yoke swiveled on said last mentioned member and having a direct non-swiveling connection with the other member.

3. A flexible pipe connection comprising a pair of conduit members, one of which is formed with a ball adapted to project into the other member, a gasket arranged within the conduit formed by said members to seal the joint between said members, and a connecting yoke swiveled on one of said members for movement about the longitudinal center line of the pipe connection and provided with pivot studs engaging the other member.

4. A flexible pipe connection comprising a pair of conduit members, one of which is formed with a ball adapted to project into the other member, a gasket arranged within the conduit formed by said members to seal the joint between said members, and a connecting yoke swiveled on one of said members and provided with pivot studs engaging the other member, said last named member being provided with bushings to receive said studs.

5. A flexible pipe connection comprising a pair of conduit members, one of which is formed with a ball adapted to project into the other member, a gasket arranged within the conduit formed by said members to seal the joint between said members, one of said members being formed with a circumferential shoulder and the other with diametrically arranged bushings, and a yoke swiveled against said shoulder and provided with pivoted studs projecting into said bushings.

6. A flexible pipe connection comprising a pair of conduit members, one of which is formed with a ball adapted to project into the other member, a gasket arranged to bear against the inner end of the ball and freely slidable on said other member to maintain sealing contact with said members when the surface of the gasket against the ball wears, a connecting member having a direct pivotal non-swiveling connection with one of said members and rotatable on the other and a spring which tends to force the gasket into the space between said members.

7. A flexible pipe connection comprising a pair of conduit members one of which is formed with a ball and the other with a cylindrical opening into which the ball extends, a gasket within the latter member adapted to be thrust against the inner end of the ball by fluid pressure in said pipe connection to seal the joint between said members, said gasket being freely slidable in said cylindrical opening as the surface of the gasket against the ball wears and a connecting member having a direct pivotal non-swiveling connection with one of said members and rotatable on the other.

8. A flexible pipe connection comprising two conduit members and a third intervening conduit member with opposite ends of which the first members have ball and socket connections, one of the first mentioned conduit members being pivoted to the intervening member, and an element connecting the other of the first mentioned conduit members with the intervening member which element has a swiveled engagement with one of said members and a pivoted connection with the other on an axis at right angles to the first named pivotal connection.

9. A flexible pipe connection comprising two conduit members formed with balls, an intervening conduit member into opposite ends of which the balls project, gaskets in the intervening member adapted to be thrust against said balls, pivot studs for pivoting one of the ball members to the intervening member, a yoke swiveled on the other ball member, and pivot studs on the yoke at right angles to the first named studs for engaging the intervening member.

10. A flexible pipe connection comprising two conduit members formed with balls, an

intervening conduit member provided at opposite ends with pairs of perforated lugs, one pair of lugs being at right angles to the other, pivot studs extending through one pair of lugs and into the ball of one of the first named members, a yoke swiveled on the other of said first named members, pivot studs on said yoke extending into the other pair of lugs on the intervening member, and gaskets in the intervening member adapted to be thrust against said balls.

11. A flexible pipe connection comprising two conduit members formed with balls, an intervening conduit member provided at opposite ends with pairs of perforated lugs, one pair of lugs being at right angles to the other, pivot studs extending through one pair of lugs and into the ball of one of the first named members, said ball having removable bushings to provide bearings for said studs, a yoke swiveled to the other of said first named members, pivot studs on said yoke extending into the other pair of lugs on the intervening member, said lugs having removable bushings to provide bearings for said studs, and gaskets in the intervening member adapted to be thrust against said balls.

12. A flexible pipe connection comprising a pair of conduit members one formed with a ball adapted to project into the other, and a gasket in the other made in two sections, one of which sections is of relatively hard material and is adapted to be wedged between the ball and the wall of the other member, the other section being of more resilient material and arranged inwardly of the first section and adapted to be thrust against the same and against the wall of said other member.

13. In combination with the train pipe of a railway car and the train pipe coupler, a flexible pipe connection between said train pipe and coupler comprising a universal joint which hangs substantially vertically from the train pipe, a universal joint approximately horizontal and associated with the coupler, and a curved pipe connecting said joints, each of said joints being composed of two conduit members, and an intervening conduit member with the opposite ends of which the first named members are connected by ball and socket connections and by pivotal connections, the axes of which latter are at right angles to each other.

14. In combination with the train pipe of a railway car and the train pipe coupler, a flexible pipe connection between said train pipe and coupler comprising a universal joint which hangs substantially vertically from the train pipe, a universal joint approximately horizontal and associated with the coupler, and a curved pipe connecting said joints, each of said joints being composed of two conduit members, and an in-

tervening conduit member with the opposite ends of which the first named members are connected by ball and socket connections and by pivotal connections, the axes of which latter are at right angles to each other, one of said first named conduit members having also a swiveled relation with the intervening member.

15. In combination with the train pipe of a railway car and the train pipe coupler, a flexible pipe connection between said train pipe and coupler comprising a universal joint composed of members having a pivotal relation with each other, and a spring which surrounds said joint so as to tend to hold said members in substantially their normal relationship when said coupler is not engaged with a mating coupler.

16. In combination with the train pipe of a railway car and the train pipe coupler, a flexible pipe connection between said train pipe and coupler comprising a universal joint composed of a pair of conduit members and an intervening conduit member with which said first named members have ball and socket connections and also pivotal connections on axes at right angles to each other, discs associated with said first named members respectively, and a spring surrounding said intervening member and bearing against said discs.

17. In combination with the train pipe of a railway car and the train pipe coupler, a flexible pipe connection between said train pipe and coupler comprising a universal joint composed of a pair of conduit members formed with balls, an intervening conduit member into the ends of which said balls extend, a yoke swiveled on one of said first named members pivoted to the intervening member and provided with a spring abutment, means for pivoting the other of said first named members to the intervening member, a spring abutment on said other member, and a spring surrounding the intervening member and interposed between said spring abutments.

18. In a flexible pipe joint, the combination of a ball member, an interiorly cylindrical socket member and a gasket comprising two annular sections, one of which is arranged between the socket and inner end of the ball and is formed with a curved surface to fit the ball, and the other is a sealing member of relatively soft material which is held against the inner end of the first named section and against the socket by the fluid pressure within the pipe joint, both sections being freely slidable in the socket to maintain sealing contact with said members when the surface of the inner section against the ball wears.

19. In a flexible pipe joint, the combination of a ball member, an interiorly cylindrical socket member, a gasket comprising two

annular sections, one of which is arranged between the socket and inner end of the ball and is formed with a curved surface to fit the ball, and the other is a sealing member of relatively soft material of which is held against the inner end of the first named section and against the socket by the fluid pressure within the pipe joint, both sections being freely slidable in the socket to maintain sealing contact with said members when the surface of the inner section against the ball wears, and a spring tending to force said gasket toward said ball member.

20. In a flexible pipe joint, the combination of a ball member, an interiorly cylindrical socket member, a gasket comprising two annular sections, one of which is arranged between the socket and inner end of the ball and is formed with a curved surface to fit the ball, and the other of which bears against the inner end of the first named section and against the socket, both sections being freely slidable in the socket to maintain sealing contact with said members when the surface of the inner section against the ball wears, the inner section being formed with its inner end beveled, a conical follower to bear against said beveled surface, and a spring to bear against said follower.

21. In a flexible pipe joint, the combination of a ball member, an interiorly cylindrical socket member, a gasket comprising two annular sections, one of which is composed of relatively hard packing material arranged between the socket and the inner end of the ball and is formed with a curved surface to fit the ball, and the other of which is composed of relatively soft material and bears against the inner end of the first named section and against the socket, both sections being freely slidable in the socket to maintain sealing contact with said members when the surface of the inner section against the ball wears.

22. In a flexible pipe joint, the combination of a ball member, an interiorly cylindrical socket member, a gasket comprising

two annular sections, one of which is composed of relatively hard packing material arranged between the socket and the inner end of the ball and is exteriorly armored and formed with an inner curve surface to fit the ball, and the other of which is composed of relatively soft material and bears against the inner end of the first named section and against the socket, both sections being freely slidable in the socket to maintain sealing contact with said members when the surface of the inner section against the ball wears.

23. In a flexible pipe joint, the combination of a ball member, an interiorly cylindrical socket member, a gasket comprising two annular sections, one of which is composed of relatively hard packing material arranged between the socket and the inner end of the ball and is formed with a curved surface to fit the ball, and the other of which is composed of relatively soft material and bears against the inner end of the first named section and against the socket, both sections being freely slidable in the socket to maintain sealing contact with said members when the surface of the inner section against the ball wears, the inner section being formed with its inner end beveled, a conical follower to bear against said beveled surface, and a spring to bear against said follower.

24. In a flexible pipe joint, the combination of a ball member, an interiorly cylindrical socket member, and a gasket comprising two annular sections, one of which is composed of relatively hard packing material arranged between the socket and the inner end of the ball and is formed with a curved surface to fit the ball, and the other of which is composed of relatively soft material and bears against the inner end of the first named section and against the socket, both sections being freely slidable in the socket to maintain sealing contact with said members when the surface of the inner section against the ball wears.

EDWARD A. RUSSELL.