J. CLARK.
REPAIR DEVICE FOR PIPE LINES.
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INVENTOR

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Attorneys
To all whom it may concern:

Be it known that I, JAMES CLARK, a citizen of the United States, residing at Bradford, in the county of McKean and State of Pennsylvania, have invented certain new and useful Improvements in Repair Devices for Pipe-Lines; and I do hereby 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.

My invention consists in the novel features hereinafter described reference being had to the accompanying drawings which represents an embodiment of the invention which I have selected for purposes of illustration and said invention is fully disclosed in the following description and claims.

Referring to the said drawings, Figure 1 represents a sectional view of a wrought metal repair sleeve embodying my invention which I have selected for purposes of illustration, showing it applied to a pipe joint. Fig. 2 is a horizontal sectional view on line 2—2 of Fig. 1. Fig. 3 is an end view of the device drawn to a reduced scale. Fig. 4 is a vertical sectional view on line 4—4 of Fig. 1 drawn to a reduced scale. Fig. 5 is a vertical sectional view on line 5—5 of Fig. 1 drawn to a reduced scale. Fig. 6 is a similar sectional view on line 6—6 of Fig. 1 drawn to a reduced scale. Fig. 7 is a detail sectional view showing lateral sleeve flanges, and the interposed packing strip in compressed condition. Fig. 8 is a detail sectional view showing part of one end of the split sleeve and one of the clamping rings with the end packing ring in compressed condition. Fig. 9 is a detail perspective view of one of the lateral packing strips.

My invention relates to what is known in the art as a repair sleeve or split sleeve, which is employed principally to stop a leak in a line of pipe without necessitating cutting off the flow of material through the pipe line or disturbing the pipe sections adjacent to the leak. These leaks usually occur at a joint in the pipe line, as where adjacent pipe sections are connected by a screw collar, and a leak has developed between the collar and one of the pipe sections or by the splitting of the collar or otherwise. The repair sleeve, therefore, comprises usually a sleeve having a sufficient size and internal 55 diameter to inclose the entire joint, that is the collar or other coupling and the portions of the pipe sections adjacent thereto, said sleeve being made in sections divided longitudinally and secured together by bolts to facilitate the placing of the sleeve over the defective joint, and having packing between the longitudinal edges of the sleeve, two clamping rings also made in sections and bolted together for the same reason, packing rings fitting around the pipe sections at each end of the sleeve, and bolts for connecting the clamping rings to the sleeve and forcing them into engagement with the said packing rings. Heretofore the metal parts of these repair sleeves or split sleeves have been made of cast metal (cast iron or cast steel) and as they are of necessity much larger and heavier than the couplings over which they are used, they are when so constructed, very heavy and hard to handle especially in the larger sizes. They are also objectionable in that there are frequently spongy spots, blow holes or sand holes, in the castings, which render them useless and necessitate their relegate to the scrap heap, with consequent loss to the manufacturer, and as these defects are not always visible to the eye, and there is no very convenient means of testing these devices hydraulically or pneumatically before they are used, the defects frequently are not discovered until the devices are put into actual use, at which time the presence of such defects necessitates replacing the device with another, and causes loss of time, labor and material and serious delay in repairing the leak.

The object of my invention is to provide a repair sleeve or split sleeve in which the metal parts are composed entirely of wrought metal, which is much lighter than cast metal of the same strength and is impervious, thus obviating the objectionable features of the cast metal devices, and the construction of the parts of the wrought metal device is such as to provide tight
joints at the ends and along the meeting edges of the sleeve sections. This is somewhat more difficult in the case of the wrought metal sleeve, as the meeting longitudinal edges of its sections cannot conveniently be provided with packing receiving grooves, as is customary in the cast metal devices. In the embodiment of my invention which I have selected for purposes of illustration herein, 1 represents the sleeve proper, which is composed of two (or more) sections, each section being formed from steel plate by the action of dies, by hand manipulation or by both, or in any other preferred manner. The body of the sleeve comprises a shell which is provided at each end with portions preferably cylindrical on their inner faces, as indicated at 2, 2 to fit rather closely upon the pipe sections, of the size for which the sleeve is adapted, the central portions of the shell being bowed outward to completely inclose the coupling over which it is to be used, and which may be a screw collar A, as shown in the drawings, uniting the sleeve sections B, or any other style or form of pipe coupling. The shell is expanded at each end beyond the cylindrical pipe embracing portions 2, to form a packing recess 3, beyond which the marginal portions of the shell are bent outward to form an annular flange 4 disposed substantially perpendicular to the longitudinal axis of the sleeve, which flange is provided with a plurality of bolt holes. As before stated the shell or body of the sleeve is formed of two or more sections, preferably two, divided from each other longitudinally. The longitudinal edges of each section are provided with outwardly bent longitudinal flanges 5, 5 each of which is provided with a plurality of bolt holes to register with those in the similar flanges of the other section or sections. Between the opposing flanges 5, 5 of the sections, I place a longitudinal packing strip 6 preferably of rubber, which is preferably made in the form shown in the drawings, that is to say the main body of the packing strip 6 is so formed as to follow the form of the flanges 5, 5 and is somewhat thicker at its inner edge than at its outer edge throughout its length, as indicated at 6a, and adjacent to each end, and substantially in line with the pipe embracing portions 2 of the shell or body, the strips 6 are each provided with thickened portions indicated at 6b shaped exteriorly to follow the curved or bent portions where the flanges 5, 5 join the body of the shell, and extending inward far enough to contact with the exterior of the adjacent pipe sections, and having the clamping portions 6c adapted to be pressed into close engagement with the end packing rings hereinafter described to insure a tight joint. The packing strips are provided with bolt holes registering with those of the flanges 5, 5 and the sections of the shell or body are securely held together by bolts 7 and nuts 8 which pass through the flanges 5, 5 and the intervening packing strip 6, and clamp the flanges firmly upon the packing strip. It is not essential that the packing strip should extend out past the bolts and be provided with bolt holes, as obviously it might be cut away so as to permit the bolts to pass its outer edge, but I prefer the construction herein shown and described as it insures the packing strips being correctly placed and held in position prior to and while tightening the bolts. 9, 9 represent end packing rings, also preferably of rubber, and of the form shown, that is substantially rectangular in cross section with the outer face beveled, which packing rings are placed around the pipe sections, and within the packing recesses 3, 3 of the sleeve 1. It will be seen from an examination of Fig. 3, that the packing rings 9, 9 make contact with the widened portions 9a of the lateral packing strips 6. To facilitate placing the packing rings 9 as the pipe sections they are usually cut diagonally at one point, so that when placed in position the diagonal edges will overlap. The packing rings are forced into position by means of clamping rings 10, 10. The material for these clamping rings is obtained preferably, by cutting the proper length from rolled steel angle bars having the required cross section. They are formed by bending the pieces so cut in such a manner that one leg of the angle bar forms a cylinder having approximately the same curvature as the pipe, the ends of the pieces being formed in such a manner as to allow these to be fastened together mechanically. The rings have each an annular plate member 10a which is provided with bolt holes registering with those in the flanges 4, 4 of the split sleeve 1 and from the inner edge of the plate member an annular flange 10e projects on one side of the plate member, the outer edge 10d of which formed the packing engaging portion of the ring. Each of said rings 10 is made in two or more sections, and each section of the ring is provided at each end with an outwardly bent lip 10b perforated to receive a bolt, the flange portion 10c being cut away to form a recess 10e extending from the plate portion 10d to a point near the outer face 10f of the flange, leaving a short face 10g perpendicular to the face 10e, which is in the same plane as the outer face of the adjacent lip 10d. When the parts of the ring are placed together, the lips 10b of adjacent sections are connected by bolts 11 and nuts 12, and the flat faces 10a, 10a are drawn together accurately so that the packing engaging face 10b of the flange portion is practically con-
The provision of the recesses $10^\circ$ facilitates the bringing of the flat faces $10^\circ$ together neatly, and if any fitting should be necessary only the short flat faces $10^\circ$ need be ground or filed to insure a fit. The clamping rings $9$, $9$ will be compressed between the packing recesses of the sleeve and the exterior of the pipe section, and against the wide end portions $6^\circ$ of the packing strips $6$, thus making tight joints at each end of the sleeve and effectively inclosing the leaking joint, thus preventing any further leakage therefrom.

In Figs. $1$ to $6$ of the drawings the parts are shown assembled but before the nuts have been screwed down, so as to illustrate the shape and form of the packings more perfectly. The metal parts are drawn together until the packings are in a high state of compression and in close contact with the adjacent metal parts. In the case of the lateral packing strips $6$, it will be noted that as these strips are uniformly thicker adjacent to their inner edges they will be under a higher degree of compression near the inner edge than at the outer edge and the extreme inner edges will engage the curved portions where the flanges $5$, $5$ join the wall of the shell thus giving them a wedge shape as shown in Fig. $7$, which assists in preventing said packing strips from blowing out where the pipe line is subjected to a high internal pressure.

When the bolts which force the clamping rings against the end packing are tightened there is a tendency for the end packings to be forced through any opening which may exist between the pipe and the sleeve. At the junction of two sections of the sleeve, such opening is naturally greater than at intermediate points between the lateral joints of the sleeve. The enlarged portions $6^\circ$ of the packing strips are of such shape that when compressed by the lateral flanges they will come into firm contact with the pipe, thus causing the strong friction between these portions of the packing strip and the pipe to assist in resisting the pressure of the end packings, thus helping to confine the same and preserving the shape of the packing recesses in which they are located. These are the most difficult parts of a split sleeve to make perfectly tight and the combined action of the end packing rings and the side packing strips above described effectively prevents any leakage occurring at these points.

Fig. $8$ shows the section of the end packing rings $9$ when subjected to the normal compression of the bolts and nuts.

I do not desire to be limited to the exact constructions herein shown and described, as obviously variations therein may be made without departing from my invention. It will be observed that my improved repair sleeve can be made comparatively light in weight as compared with a cast metal fitting thus greatly facilitating the transportation of these devices and the handling of the same in assembling them for use. This is an important item, as they usually have to be transported to remote points from the factory and they are frequently assembled in an excavation or trench. It will also be seen that the metal parts of the device are wholly impervious and that there is practically no danger of breaking the metal parts in assembling and tightening up the bolts. The provision of the recesses $10^\circ$ also enable the lips $10^\circ$, which are formed by bending portions of the flange forming the plate member $10^\circ$ at right angles thereto, to be so bent as to bring their outer faces in the plane of the short end faces $10^\circ$, of the curved flange member $10^\circ$, which could not be accomplished if the recesses $10^\circ$ were not provided, on account of the thickness of the plate member. The longitudinal packing strips $6$ are also made thicker at the inside to allow the side flanges of the sleeve to spring together at the outside edge which they will do when subjected to the bolt tension, thus closing the side joints and in this way preventing the packing strips from being forced out.

The embodiment of my invention herein illustrated and described is so constructed that it may be placed around a rubber packed coupling such, for example, as the Dresser coupling which is well-known in the art, as well as around a screw coupling as herein shown. It is also to be understood that I may make the repair sleeve herein shown and described, in a special size suitable only for inclosing screw couplings if this is found desirable, in which case, the diameter of the shell may be made smaller than would be necessitated in a sleeve designed to inclose a coupling of the Dresser type but the construction of the sleeve will be the same in any case aside from such slight variations in proportions. Such variations of form and proportions do not in any way affect the subject matter of the invention.

What I claim and desire to secure by Letters Patent is:

1. In a repair device for stopping leaks in pipe lines, a split sleeve formed of wrought metal and provided with an annular packing recess at each end, said sleeve comprising a plurality of sections separated longitudinally, each section having lateral flanges, flat longitudinal packing strips having portions lying between the opposed flanges of adjacent sections, said portions being thicker

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adjacent to the inner edges of said flanges and tapering toward their outer edges, and clamping bolts connecting the opposite flanges of adjacent sections, whereby when the bolts are drawn up the flanges may be drawn closer together at their outer edges than at their inner edges, and thus prevent the said packing strips from being forced outwardly.

2. A repair device for stopping leaks in pipe lines, a split sleeve formed of wrought metal and provided with an annular packing recess at each end, said sleeve comprising a plurality of sections separated longitudinally, each section having lateral flanges connected to the body portions of the section by curved portions, longitudinal packing strips composed entirely of compressible material located between opposed flanges of adjacent sections, and being of greater thickness adjacent to the inner edges of the said flanges and tapering therefrom outwardly, said strips being provided at their inner edges beyond the inner edges of the flanges with thickened portions to engage said curved portions of the sections, and clamping bolts connecting the opposed flanges of adjacent sections, whereby when the bolts are drawn up the flanges may be drawn closer together at their outer edges than at their inner edges.

3. A repair device for stopping leaks in pipe lines, comprising among its members, a split sleeve formed of wrought metal, said sleeve being provided adjacent to each end with pipe embracing portions approximately fitting the pipe, the central portion of the sleeve being enlarged in diameter to inclose a pipe coupling device, said sleeve being provided at each end with an annular packing recess, and being formed of a plurality of sections separated longitudinally, each section having its edges provided with longitudinal flanges, packing rings in said annular packing recesses, a clamping ring at each end of said sleeve for engaging said recesses, bolts for connecting said clamping rings to the retaining flanges of said sleeve, lateral packing strips located between the opposing longitudinal flanges of adjacent sections of said sleeve, and having portions at each end to engage the annular packing rings, and bolts for connecting said opposing flanges.

4. A repair device for stopping leaks in pipe lines comprising among its members a split sleeve formed of wrought metal, and formed in sections separated longitudinally, said sleeve being provided adjacent to each end with a pipe embracing portion approximately fitting the pipe, and an annular packing recess and having its end portions bent outwardly to form retaining flanges, said sleeve having its central portion enlarged in diameter to inclose a pipe coupling device, each of said sections being provided with longitudinally disposed flanges, packing rings located in said annular packing recesses, clamping rings for engaging said recesses, bolts for connecting said clamping rings to the retaining flanges of said sleeve, lateral packing strips located between the opposing longitudinal flanges of adjacent sections of said sleeve, and having portions at each end to engage the annular packing rings, and bolts for connecting said opposing flanges.

5. A repair device for stopping leaks in pipe lines, comprising among its members, a split sleeve formed of wrought metal, and formed in sections separated longitudinally, said sleeve being provided adjacent to each end with a pipe embracing portion, approximately fitting the pipe and an annular packing recess, and having its end portions bent outwardly to form a retaining flange, said sleeve having its central portion enlarged in diameter to inclose a pipe coupling device, the sections of said sleeve being each provided with flat longitudinally disposed flanges connected thereto by curved portions, packing rings located in said annular packing recesses, clamping rings engaging said packing rings, bolts connecting said clamping rings with the retaining flanges of the sleeve, lateral packing strips located between the opposing longitudinal flanges of adjacent sections of said sleeve, said strips being thicker adjacent to the inner edges of said flanges and tapering outwardly therefrom, and being provided at their inner edges with portions extending inward beyond said flanges to engage the said curved portions of adjacent sections, said strips being provided at each end with portions of still greater thickness adjacent to the pipe embracing portions of the sleeve, and with portions adjacent thereto extending into engagement with said annular packing rings and bolts for connecting the opposing flanges of said sleeve sections.

6. A repair device for stopping leaks in pipe lines, comprising among its members, a split sleeve, formed of wrought metal, said sleeve being provided adjacent to each end with pipe embracing portions approximately fitting the pipe, the central portion of the sleeve being enlarged in diameter to inclose a pipe coupling device, the said sleeve being provided at each end with a packing recess, and a securing flange provided with bolt holes, said sleeve being formed of a plurality of sections separated longitudinally, each section having its edges provided with longitudinal flanges connected to the main body of the section by curved portions, and
provided with bolt holes, longitudinal packing strips interposed between the opposed longitudinal flanges of said sections and provided with apertures registering with said bolt holes in said flanges, said packing strips being of greater thickness at their inner edges than at their outer edges, and having their inner edges extending inward adjacent to the curved portions of said sections, said packing strips having thickened portions adjacent to each end for engaging the pipe and inclined portions extending into the said packing recesses, bolts connecting said longitudinal flanges, packing rings located in said packing recesses, clamping rings of wrought metal formed of a plurality of sections, connected together and bolts for connecting said clamping rings to the flange portions of said split sleeve.

7. The combination with a sleeve provided with packing recesses adjacent to its ends, and packing rings engaging said recesses, of a clamping ring formed of a plurality of sections, provided at each end of the same with securing lips, said ring comprising a plate member, disposed substantially perpendicularly to the axis of the ring and an annular flange member projecting from one side of the plate member, and disposed substantially perpendicularly thereto, the meeting edges of said ring sections being recessed from a point adjacent to the outer face of the flange member to a point adjacent to the securing lips, to facilitate the meeting of the ends of the flange member sections, clamping devices engaging said lips and securing the sections together, and clamping devices engaging the plate members of said rings for forcing them in a direction toward said sleeve, to compress said packing rings.

8. A clamping ring comprising an annular plate member disposed substantially perpendicularly to the axis of the ring, and an annular flange member, extending on one side of the plate member, and forming a packing engaging portion, said ring being formed of a plurality of sections, each provided at each end with a securing lip, the meeting edges of said ring sections having the flange portion thereof recessed from a point adjacent to the outer face of the flange member toward the plate member, and clamping devices engaging said lips for securing the ring sections together.

9. A clamping ring formed of wrought metal comprising an annular plate member disposed substantially perpendicularly to the axis of the ring and provided with bolt holes and an annular flange member disposed substantially perpendicularly to the plate member, said ring being formed of a plurality of sections, each section being provided at each end with a perforated lip, disposed perpendicularly to the plane of the plate member, and having the ends of the flange portion of each section provided with a short meeting face adjacent to the outer face of the flange member and perpendicular thereto, and a recess from said short face extending toward the plate portion of the section, the said short meeting faces of each section being in the same plane as the exterior faces of the adjacent lips of the section, and clamping bolts for connecting said lips to hold the ring sections together.

In testimony whereof I affix my signature, in the presence of two witnesses.

JAMES CLARK.

Witnesses:

M. CLARK,
H. M. WICK.