

Oct. 10, 1950

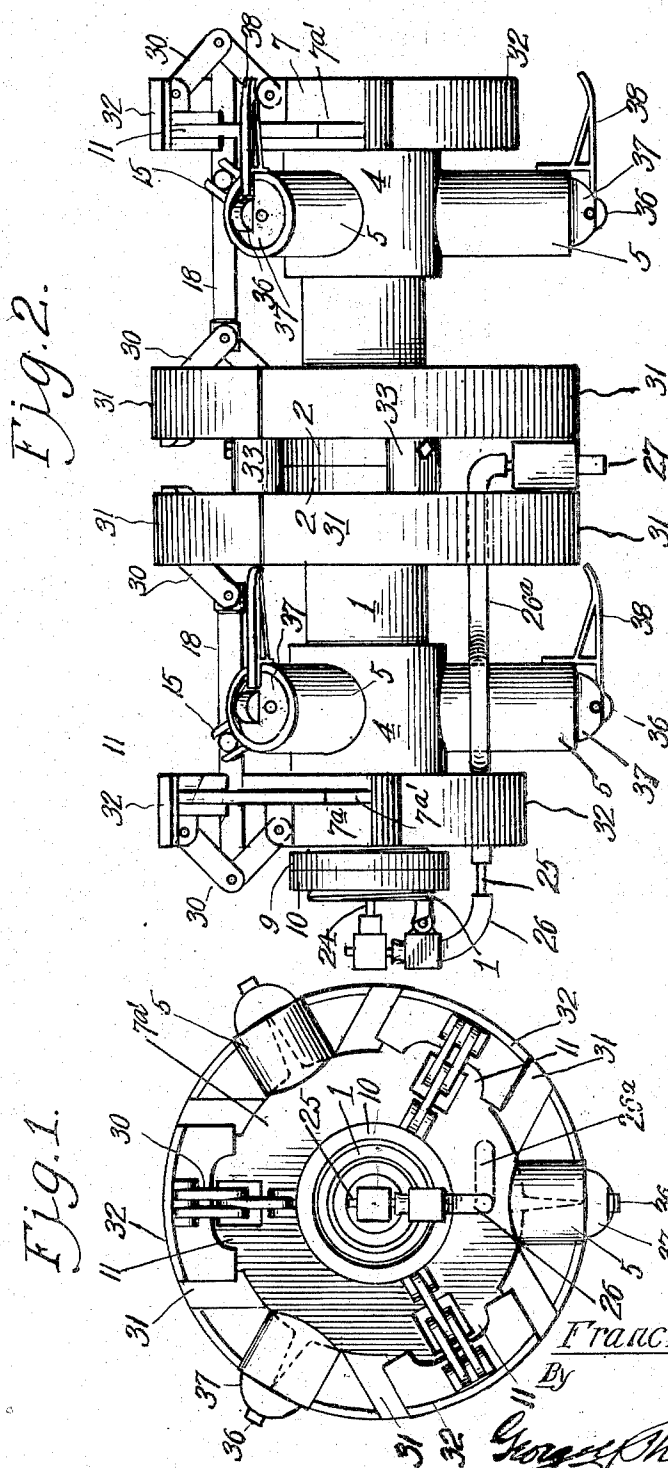
F. INGEMARSON

2,525,680

PIPE ALIGNING AND SPACING APPARATUS

Filed April 15, 1946

3 Sheets-Sheet 1



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Oct. 10, 1950

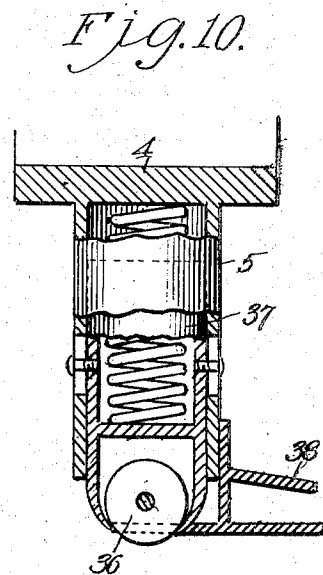
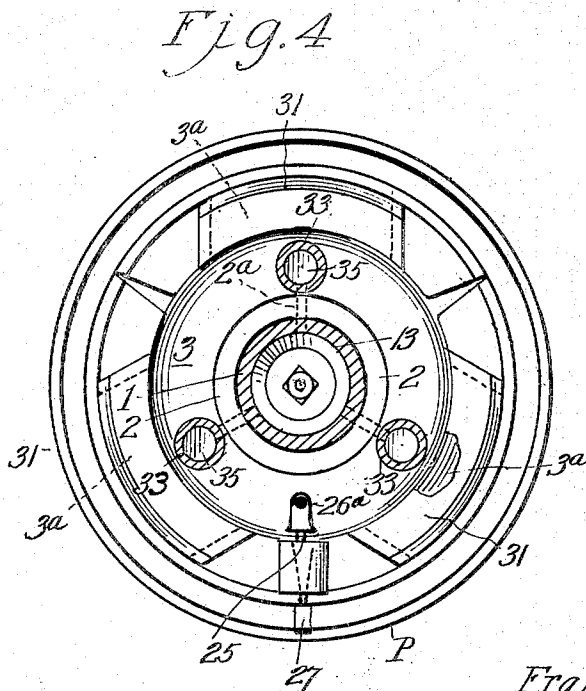
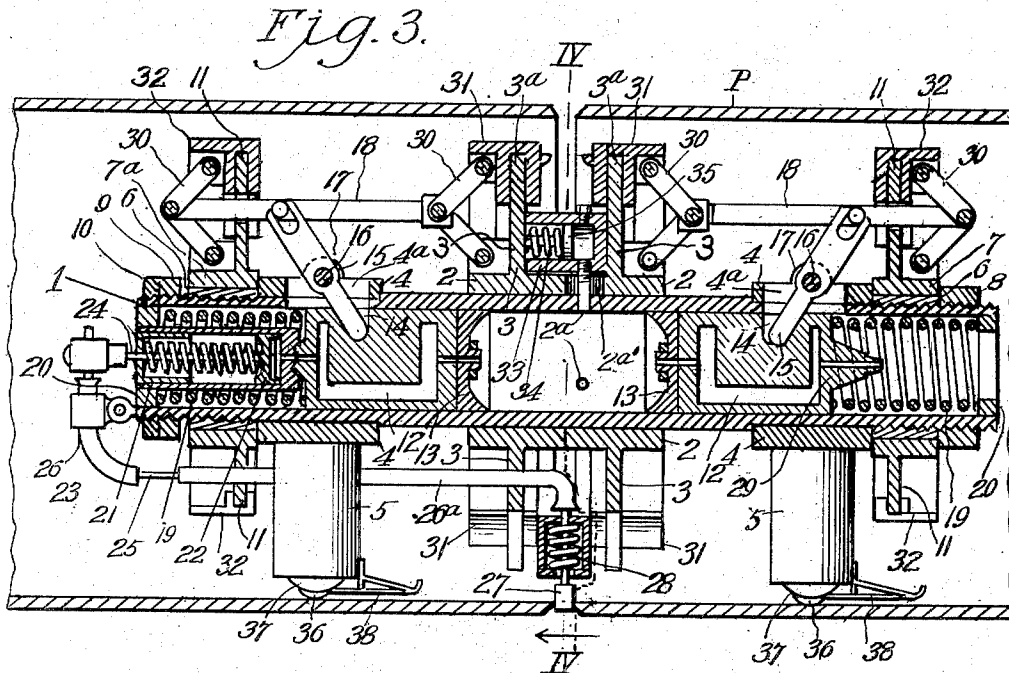
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PIPE ALIGNING AND SPACING APPARATUS

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Fig. 6.

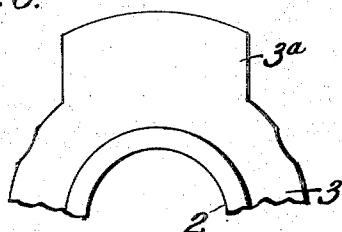


Fig. 7.

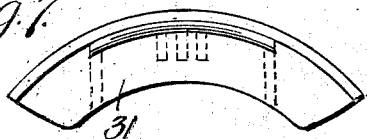


Fig. 8.

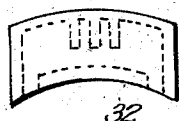
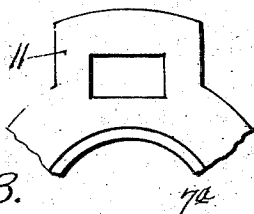


Fig. 9.

Fig. 11.

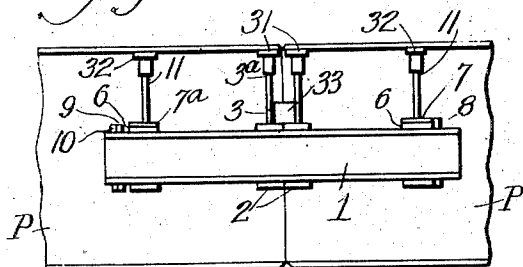


Fig. 5.

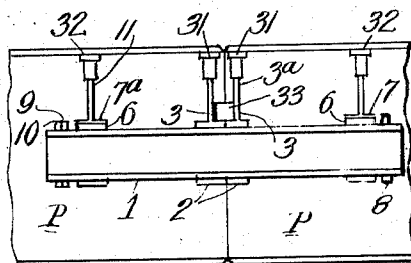
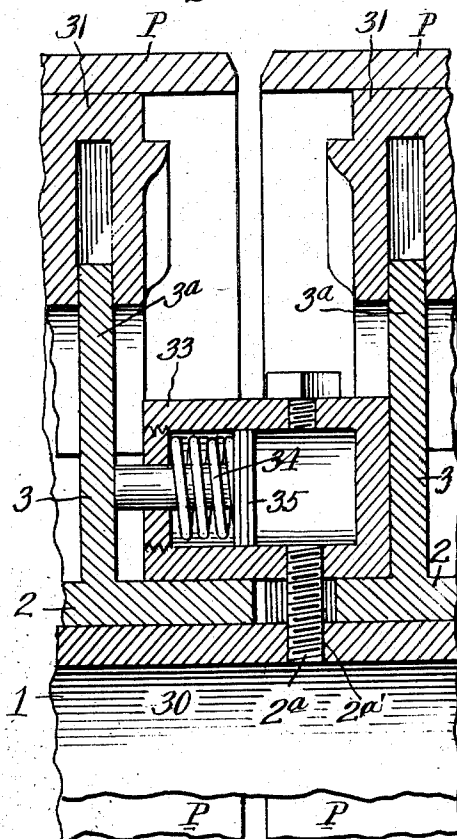


Fig. 12.

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PIPE ALIGNING AND SPACING APPARATUS

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Application April 15, 1946, Serial No. 662,374

5 Claims. (Cl. 113—103)

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This invention relates to appliances for use in accurately aligning and equally spacing pipe sections or lengths in the laying of a pipe line, especially in oil and gas fields.

The object of the invention is to produce an appliance for operation within the adjacent ends of endwise abutting pipe sections for the accurate aligning of the sections whether of exactly the same diameter or not, and for rounding-up to true circular form, one or both pipe sections if not initially exactly round, and after they have been rounded-up if necessary, effecting endwise separation of the pipe ends the proper distance for a good weld.

With the general objects named in view, and others as will hereinafter appear, the invention consists in certain novel and useful features of construction and organization of parts as hereinafter described and claimed; and in order that it may be fully understood, reference is to be had to the accompanying drawings, in which:

Figure 1 is an end elevation of an appliance embodying the invention.

Figure 2 is a side elevation of the appliance in full with the exception of the omission of the set of toggle mechanism at the near side.

Figure 3 is a central longitudinal section of the appliance.

Figure 4 is a sectional view taken on the line IV—IV of Figure 3.

Figure 5 is an enlarged sectional view showing the position of the central sets of shoes after they have been clamped against the pipe sections and the unwelded pipe section has been spaced from the welded section of the pipe line.

Figure 6 is a detail fragmentary face view of one of the central collars and part of its web and one of a set of three radial equispaced guides of the web for one set of the shoes.

Figure 7 is an inner face view of one of the central shoes.

Figure 8 is a fragmentary face view of an end collar showing one of a set of three radial guides of the web of said collar for a set of end shoes.

Figure 9 is a similar view of one of the end shoes.

Figure 10 is a view showing part of a collar of the apparatus partly in elevation and partly in longitudinal section, one of a set of telescopic supports for centralizing the apparatus within

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a pair of alined pipe sections to be butt-welded together.

Figure 11 is a schematic diagrammatic view of a modification of part of the appliance.

Figure 12 is a schematic diagrammatic view of a second modification of part of the appliance.

A brief synopsis of the method of operation of the appliance is, as follows: Following the deposit of pipe sections P—P adjacent a trench to receive the pipe line, and the placing of a second pipe section in rough alinement with the welded string, as conventional—it being assumed that at such time the appliance is in the welded pipe line—said appliance is drawn by a cable (not shown), or otherwise, until it protrudes for about half of its length from the free end of the pipe line and into the alined or loose pipe section next to be welded. The appliance has means to centralize it within the sections, and means for stopping the loose section in its approach toward the welded line, from accidentally pushing the appliance back into the welded line. With the two pipe sections related as explained and the appliance positioned for automatic functioning, fluid pressure is applied, and this pressure first withdraws the stop means so that the loose pipe section may be drawn up into contact with the end of the welded line. Continued application of fluid pressure to the device, effects outward radial movement of pressure shoes to round-up the pipe ends and to bring the two pipe sections into accurate axial alinement, and while holding such alinement, the final action of the fluid pressure is to move the loose section away from the welded pipe line the proper distance for the customary welding of the pipe sections. These operations are repeated for each additional length of pipe welded in the line.

To centralize and support the tube within a pair of pipe sections, and to facilitate longitudinal movement of the tube therein, means hereinafter described, is provided.

Referring now to the drawings in detail, where like reference characters identify corresponding parts in all of the figures, 1 is a tube or cylinder of any suitable length providing a hydraulic chamber. Positioned on the tube and normally abutting at its midpoint, is a pair of webbed collars 2, the left-hand collar 2 being free for sliding movement in relation to the tube 1, while

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the right-hand collar may be in fixed or slidable relation to said tube. The collars 2 are integrally formed with webs 3, which are each cut away at three equi-spaced points to provide three radial guides 3a positioned around the circumference of the tube 1.

The opposite ends of the tube or cylinder 1 are diametrically reduced, and fitted immovably on said reduced ends is a pair of similar collars 4, said collars being integrally formed with three radially projecting spring-receiving tubes 5 positioned 120° apart in planes bisecting the angles between the center lines of the web guides 3a. In the same longitudinal planes as the web guides 3a, the collars 4 on the tube 1 are slotted at 4a for a purpose which will hereinafter appear. To retain the collars 4 in proper position on the tube 1 and up against the shoulders where said tube is reduced in that type of construction where the right-hand collar 2 is in fixed relation to the tube 1, the ends of said tube or cylinder 1 are threaded to receive threaded sleeves 6, which abut against the adjacent ends (Figure 3) of said collars 4 and in conjunction with shoulders of the tube, retain said collars against independent movement in relation to the tube 1.

Slidably fitted on the sleeves 6 is a pair of collars 7 and 7a, the former being held against movement on its sleeve by the adjacent collar 4, and a clamping or locking ring 8 threaded on the end of the tube 1, while the collar 7a on the other sleeve 6, may have limited movement relative to the tube 1, as controlled by the position of a stop ring 9 and a lock nut 10, threaded on the end of said tube 1. The collars 7 and 7a are formed with outwardly projecting webs, which are cut away to provide three radially-projecting guides 11, in longitudinal alignment with the guides 3a of the collars 2.

Slidably mounted within and adjacent the opposite ends of the tube or cylinder 1, is a pair of hollow plungers 12, the adjacent ends of said plungers being spaced apart and provided with suitable packing cups 13. In alignment with slots 4a in collars 4 and in the wall of the tube 1, the plungers 12 are provided with three external sockets 14 to rockingly receive the inner ends of rock levers 15 pivoted on pins 16 carried by ears 17 on the collars 4, the opposite ends of said levers 15 being operatively connected to links 18 of toggle mechanisms hereinafter described. Each of the plungers 12 is forced inwardly by an expansion spring 19 mounted between the ends of the plungers and stop nuts 20 threaded in the internally threaded ends of the tube or cylinder 1. The inward travel of the plungers 12 is limited by the limit or extent of oscillation permitted the levers 15.

The outer end of the left-hand plunger 12 is threaded into the inner end of a small hydraulic cylinder 21, within which is a piston 22 advanced by the pressure of a spring 23. The stem 24 of piston 22 is externally connected to a single flexible cable 25, which passes through a pivoted guide tube 26 and a fixed guide tube 26a, and has its end connected to a stop pin 27 which is normally projected by a spring 28 beyond the internal diameter of the pipe section. This pin acts as a guide or stop by overlapping the end of the fixed pipe and making it impossible to accidentally thrust or shove the machine assembly into the end of a completed section of the line while attempting to line up the next pipe section to be welded, as will hereinafter appear.

The end of the right-hand plunger 12 is pro-

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vided with a coupling 29 to which a tube (not shown) for compressed air, oil or the like, is attached. The hollow plungers communicate with the space in the center of the tube 1 and consequently with nipples 2a tapped through the tube wall. Assuming the appliance is projecting from the end of a pipe line, the pin 27 being projected to prevent accidental movement of the appliance into the completed line, the pipe section to be welded is drawn into approximate abutting relation with the projected stop pin and aligned as accurately as needed. Fluid pressure is now applied through the right-hand plunger to the interior of the tube 1, and the first action is to operate piston 22 to cause the tube 26 to rock and exert a pull on the cable to withdraw the stop pin 27. No further pressure is applied to the tube 1 until the pipe section to be welded has been brought up into endwise abutment with the welded line. This operation is performed in any suitable manner.

Further pressure is now fed to the tube or cylinder 1 and the next action is to move plungers 12 outwardly in opposite directions against the resistance of their springs 19. This movement swings the levers 15 which move the links 18, and through the toggle connections 30 at the ends of the links 18, move the clamping shoes 31 and 32 outwardly, said shoes being mounted for sliding movement on the radially projecting guide flanges 3a and 11, respectively. In this action the pipes are rounded-up and brought into axial alignment with the tube 1.

Pressure continues to build up in the device, until all of the shoes have moved outward against the respective pipe sections, forcing out of round pipes into circular form, and finally, since the pipe section to be added to the line offers less resistance to movement than the completed pipe line, it will be evident that the action of the shoes is to firmly clamp the unwelded pipe in position in axial alignment with the welded or completed pipe line.

With the pipe sections held firmly as explained, pressure continues to build up in the apparatus and passes through nipples 2a fixed to tube 1 and projecting out through notches 2a' in the right-hand collar 2, into cylinders 33 located between the webs of said collars 2, the pressure finally overcoming the springs 34 of pistons 35 in the cylinders 33, and said pistons are caused to press against the immovable web 3 of the left-hand collar. As the welded line is relatively immovable, the unwelded pipe section, including the tube 1 and the parts in fixed relation thereto, will be longitudinally moved to the right, this movement being stopped by abutment of the collar 9 against the collar 7a to provide the proper welding space or gap so that all welds will be relatively uniform, it being apparent that the collars 7a cannot move because the shoes therefor are clamped immovably in the pipe line.

The pipe section having been welded into the line, the pressure in cylinder 1 is released, and the movable parts are returned to their various positions by the springs heretofore mentioned, it being understood that the pin 27 cannot move outwardly as it will be restrained by contact with the inner wall of the pipe. The entire assembly is now pulled through the pipe section last welded, and it rolls to the right on the wheels 36 journaled in the ends of spring-actuated pistons 37 reciprocatory in the tubes 5 heretofore identified. To minimize chance of binding or locking of the wheels in kinks, wrinkles or irregularities in the

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internal diameters of the pipes, the elongated runners or extensions 38 attached to pistons 37 are provided. These runners will act to bridge irregularities and prevent the wheels from jamming. As soon as the appliance projects out of the end of the last pipe section for about one-half of its length, the pin 27 is reprojected by its spring 28. All further operations are repetitions of those described.

Where two pipes to be welded differ slightly in diameter, the shoes all move outwardly, the ones within the smaller pipe first functioning to round, if necessary, and clamp upon such pipe before the shoes within the other pipe complete their functioning on such pipe; the pipes being axially aligned and concentric with respect to the tube. With the pipes as arranged regardless of difference in diameter, a solid and substantial weld of uniform width is secured, differing from welded on pipes of equal diameter only in the fact such weld is inclined laterally.

In the preferred construction as shown by Figures 1 through 10, the tube is moved forward for the provision of the welding space between the fixed pipe and that to be welded thereto. It will be apparent, see Figure 11, if the collars equipped with the shoes clamped to the pipe to be moved, are relatively movable with respect to the tube 1, movement of said collars by the expansion of the element 33, will apply force on the ring or collar 8 and consequently move the tube 1 forward. It will be seen that the preferred construction shown in Figures 1 through 10 and the modification of Figure 11, are identical in function by shifting the position of ring or collar 8 to the right, the spacing of the pipes for welding occurs but the tube remains stationary as indicated in Figure 11 and the ring or collar 8 determines the width of the weld, instead of utilizing the ring or collar 9 and the left-hand shoe-carrying ring or collar 7a, for that purpose.

As a further modification, the shoe-equipped collars related to the pipe to be moved, may bear a movable relation to the tube 1 as well as those related to the fixed pipe. In this construction, as indicated in Figure 12, the expansion element will operate as explained heretofore, but the collar or ring 8 will be adjusted or spaced further to the right on tube 1 from the adjacent collar 7, and constitutes the stop member for the pipe to be welded and no movement of tube 1 occurs.

From the above description it will be apparent that I have produced a construction embodying all of the features of advantage set forth as desirable, and while I have described and illustrated the preferred embodiment, it is to be understood that I reserve the right to all changes within the spirit and scope of the appended claims.

I claim:

1. In an appliance for alining and spacing a pair of pipes, a tube for extending into both pipes, a set of collars around the tube and within one of said pipes, a second set of collars around the tube for location within the other pipe, the first-mentioned collars bearing a slidable relation to the tube and the other collars a rigid relation to the tube, a member rigid on the tube and spaced to the left from one of the first-named collars, a set of shoes on each collar around the tube and slidable radially thereof, means actuated by fluid under pressure supplied within the tube for moving the shoes outward, an expansion means for bearing longitudinally against a collar in slidable relation to the tube and a collar in

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rigid relation with the tube, the expansion means under the pressure of fluid from the tube imparting longitudinal movement to the right to the tube and the parts rigid therewith and to the shoes in longitudinal rigid relation to the tube, to space the two sets of shoes apart a distance corresponding to that originally provided between the said member to the left of one of the first-named collars and such collar.

2. In an appliance for alining and spacing a pair of pipes of which one may be a fixed part of a pipe line in course of construction, a tube for extending into both pipes, a pair of adjacent collars on the tube for respective location within adjacent ends of said pipes, the one within the fixed pipe bearing a slidable relation to the tube and the other one a fixed relation to the tube, a third collar bearing a slidable relation to the tube for location within the fixed pipe and a fourth collar in fixed relation to the tube for location within the other pipe, shoes carried by said collars and telescopically related thereto for radial movement relative to the tube, means rigid with the tube and spaced to the left from the said third collar on the tube, means for imparting outward movement to the shoes for clamping them rigidly to the respective surrounding pipes, means connecting the shoes of the collars slidably related to the tube, means connecting the shoes of the collars in fixed relation to the tube, and means for moving the tube, the fixed collars thereon, the shoes of said collars and the pipe engaged by said shoes, forward a distance determined by the width of the space between the said slidable collar and said means on the tube to the left of said collar.

3. In an appliance of the character described, a hollow cylindrical tube for receiving fluid under pressure, a pair of plungers in the tube subject to separating movement under force of such pressure, means tending to resist and reverse such movement of said plungers, two sets of shoes disposed concentrically around said tube, means actuated by separating movement of the plungers to force the two sets of shoes radially outward equal distances, and an expansion element fed by pressure from the tube and reacting between the shoes to cause separation of the shoes by pressure built up in the tube after the shoes have completed their radial outward movement.

4. In an appliance of the character described, a rigid tube for receiving fluid under pressure, yieldingly projected pins for radial movement relative to and supported from and around said tube, means actuated by fluid pressure within said tube for withdrawing the pins from projected position, a pair of reciprocatory plungers within said tube subject to the fluid pressure in said tube for yieldingly resisting movement under said pressure until after the said pins have been withdrawn, two sets of arcuate shoes of equal radius disposed around and supported from and concentrically of the tube, means actuated by said plungers under pressure within said tube after withdrawal of the pins, for imparting equal outward but independent movement to said shoes, means actuated by pressure in the tube after the outward movement of the shoes terminates, for imparting relative longitudinal separating movement of the two sets of shoes, and means to limit such separating movement of the shoes.

5. In an appliance for alining and endwise spacing a pair of pipes of which the left one is stationary and the other movable longitudinally, a tube for projecting into the adjacent ends of

said pipes, two sets of collars on said tube, one collar being movable and the other stationary, means in fixed relation to the tube for limiting movement to the right of the movable collar, a plurality of sets of radially movable shoes on and around each collar, and expansive means for anchorage against the stationary collar and adapted as expanded, to shift the movable shoes and the collar for such shoes to the right until arrested by the collar in fixed relation to the tube.

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