

S. L. BROWN.
PIPE COUPLING.
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1,058,542.

Patented Apr. 8, 1913.

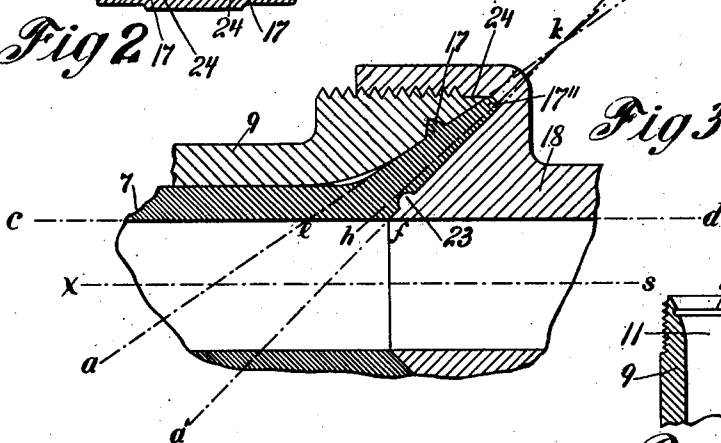
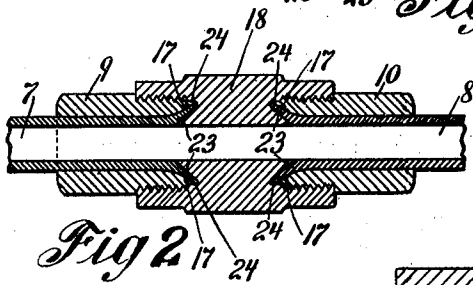
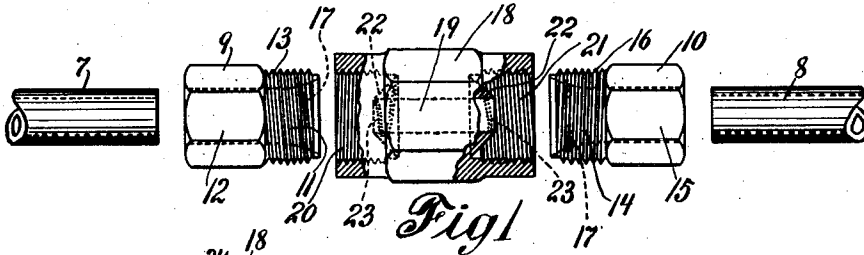


Fig 3

Fig 5

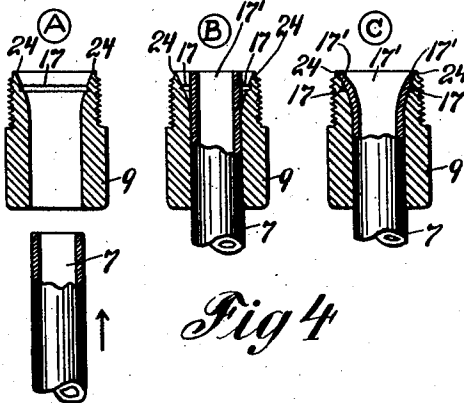


Fig 4

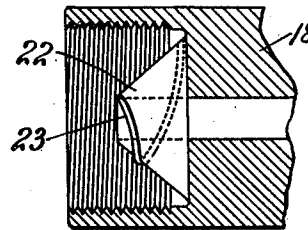


Fig 6

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PIPE-COUPLING.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, SYDNEY L. BROWN, a resident of Mamaroneck, in the county of Westchester and State of New York, (whose post-office address is 1 Tenney avenue, Harbor Heights, Mamaroneck, New York,) have invented certain new and useful Improvements in Pipe-Couplers, of which the following is a specification.

My invention relates to couplers adapted to connect a plurality of pipes or hollow fluid conductors; and aims particularly to provide a coupler of this type capable of advantageous utilization in connection with pipes formed of lead or other relatively plastic material; such coupler being especially capacitated to flare or expand, or aid in the flaring or expanding of, the adjacent end-portions of the coupled pipes.

The cardinal object contemplated is to provide a coupler adapted to grip the expanded portion of a pipe in a more positive manner than has been possible heretofore, and whereby a substantially air-tight closure will be secured, preferably without necessity for other manipulation than that which may be effected manually; thereby to render possible the passage through said coupler of any fluid without the leakage of any part thereof.

Another object is to provide an efficient coupler which will enable a smooth bore-connection to be formed thereby.

Another object is to provide a coupler of the above type including a relatively small number of different parts.

Another object is to provide a coupler of the above type which can be easily and quickly coupled and uncoupled when desired.

Another object is to provide a simple coupler, wherein the parts thereof are capable of inexpensive manufacture.

Another object is to provide a coupler characterized by the above advantages, and which may be used in connection with pipes of comparatively small diameter.

Other objects will be in part obvious and in part pointed out hereinafter.

To these ends, my invention generally consists in the novel arrangement, construction and combination of parts as hereinafter more specifically set forth and described and particularly pointed out in the claims.

I am aware that many types of coupler

have been devised, each comprised essentially of a pipe-encircling member adjacent an end thereof, in combination with an auxiliary member carrying a substantially cone-shaped portion adapted to bear against the interior wall of said pipe (hereinafter referred to as a "forcing-cone"), said members being capable of relative movement one with reference to the other, to grip the end portion of the pipe.

Referring now to the accompanying drawing, wherein is shown one of the various possible embodiments of this invention: Figure 1 is a view in side elevation showing in unconnected relation two adjacent pipes and the several elements comprising the coupler, one of said elements being partly in section; Fig. 2 is a longitudinal sectional view of said pipes and said elements, showing the relation of the parts upon the completion of the coupling; Fig. 3 is a similar view, on an enlarged scale and partly broken away, showing diagrammatically the angular values considered in arriving at the "efficiency angle" hereinafter mentioned; Fig. 4 includes a plurality of diagrams, lettered respectively, (A), (B), and (C), and showing successive stages in a preferable treatment of each adjacent end of the pipe to be joined, preliminarily to applying the part 18 shown in Figs. 1, 2, 3 and 6; Fig. 5 is a longitudinal sectional view, partly broken away, showing more clearly the general characteristics of one of said elements; Fig. 6 is a similar view, on an enlarged scale and partly in elevation, showing the general characteristics of another of said elements.

Similar reference characters refer to similar parts throughout the several views of the drawing.

I desire to state at the outset that in coupling-up pipes of plastic material, my experiments and trials have clearly demonstrated to me that there exists a vital necessity to be met, a necessity which requires that the pipe-encircling member should receive the pipe-end before the auxiliary member is applied thereto; rather than that the pipe-end be first jammed around the "forcing-cone" within the auxiliary member, which latter method has been generally and mistakenly contemplated by persons active in this art. In practice I have found that if the latter method be followed, or constructions contemplating its sequence be utilized,

many disadvantages arise. Notably among these disadvantages is the fact that the sometimes fruitless endeavors to force the pipe-end around the forcing-cone usually
 5 cause crinkling, twisting and probably irreparable injury to the pipe. Moreover, there is an important disadvantage existent in the concomitant necessity for relative movement between said pipe-encircling member and
 10 the pipe itself. I have found that there is a practical and positive gain in clamping efficiency when, on the other hand, such relative movement is properly between the interior wall of said pipe and the straight-sloped forcing-cone carried by the auxiliary
 15 member aforesaid. Furthermore in this connection, I have also found it preferable to have the pipe-encircling member snugly sleeve said pipe. Accordingly it would be
 20 very difficult, even if this were not in itself detrimental to the coupling efficiency and dangerous to the integrity of the pipe itself, due to the exceedingly high co-efficient of friction present by virtue of the relative
 25 plasticity of the latter, to cause relative movement between said pipe-end and said pipe-encircling member. These considerations, among others, led to the conception and development of the present invention.
 30 Referring now particularly to Figs. 1 and 2, numerals 7 and 8 represent respectively a plurality of pipes to be connected. 9 represents one of the pipe-encircling members aforesaid, and 10 another of said pipe-encircling
 35 members. I shall for convenience utilize the designation "thimble" in referring hereinafter to either of said members. Thimble 9 is as shown provided interiorly with a cupped portion 11, and exteriorly
 40 with a nut-portion 12 and a plurality of threads 13. Thimble 10 is provided with a similar cupped portion 14 and a similar nut-portion 15. The threads 16 carried by said thimble 10, however, are opposed in direction
 45 in Figs. 1 and 2, to the threads 13 carried by said thimble 9, said threads 13 and 16 being respectively "right-handed" and "left-handed"; the purpose of which will
 50 appear hereinafter. Thimbles 9 and 10 are each preferably, but not necessarily, provided as shown with an interior annular groove 17 (*vide* particularly Fig. 5), the function of which, as will be hereinafter
 55 more clearly apparent, is to allow the plastic pipe-wall to be forced to bite thereinto, thereby to aid in the coupling-security. 18 represents the hereinbefore-mentioned "auxiliary member," which for convenience I
 60 shall hereinafter designate the "connector." Connector 18 is here provided as shown with a central bore 19, a plurality of chambers 20 and 21, and a forcing-cone 22 within each of said chambers. Each of said chambers
 65 carries interiorly a plurality of threads as

shown; the threads carried within one of said chambers being, however, dissimilar in direction to the threads carried within said other chamber, whereby, upon properly adjusting said connector relatively to said
 70 thimble, so that the threads within chamber 20 will be reciprocally positioned with reference to threads 13 on thimble 9 simultaneously with the reciprocal positioning of the threads within chamber 21 with reference
 75 to threads 16 on thimble 10, and upon turning said connector in a single direction relatively to both said thimbles, the former will draw the latter together to complete the coupling. Forcing cones 22 are each preferably, but not necessarily, provided as
 80 shown with a helical thread or land 23 (*vide* particularly Fig. 6), the function and lie of each of which threads are to engage with the inner surface of the plastic pipe-wall in furtherance of the efficient expansion of said pipe and the final clenching
 85 thereof.

The method of application of this invention to initiate and complete a coupling operation should be sufficiently clear from the foregoing description; and I desire now to call attention to an advantageous feature of my invention which resides in the important
 90 fact that, (in view of the novel arrangement of parts which I provide and whereby as aforesaid the male expanding instrumentality, or forcing-cone, is applied finally and dynamically rather than, as heretofore, initially and quiescently), each pipe-end is adapted to be quickly and conveniently
 95 given a preliminary treatment which I have found to be highly desirable.

I refer now to Fig. 4, Diagrams (A), (B) and (C). In Diagram (A) the pipe 7 is disposed preparatory to being inserted into
 100 thimble 9, as indicated by the arrow. In Diagram (B), said pipe 7 is shown fully inserted within said thimble. And in Diagram (C) the pipe-end 17' is shown disposed within said thimble after receiving
 105 said preliminary treatment; which treatment preferably consists in manually grasping the outside of thimble 9 in one hand and utilizing in the other an ordinary wire nail, prick-punch or the like simple instrumentality, to the extent of inserting the latter
 110 obliquely within the portion 17' of said pipe shown in Diagram (B), and thereupon giving the same a plurality of turns until the said portion 17' assumes approximately the position illustrated in Diagram (C) or at
 115 least is provided with a slight flare the wall of this flared portion of course decreasing in thickness toward the outer end. This slight preliminary flare serves to maintain the pipe-end nested practically rearwardly-irremovable within its thimble, and lies in the path of, and tends to encompass, the summit
 120 of the approaching forcing-cone. These
 125
 130

new and desirable results are made possible because of the fact that, after the pipe-end is so flared, and after the manipulation of the part which controls the final juxtaposition of the substantially flat bearing surfaces of the forcing-cone, no further relative movement whatever takes place between the pipe-end and its encircling thimble. Accordingly, at no time during the coupling operation is the pipe itself twisted or given undesirable stress of any kind. I have also found it desirable to provide a jamb 24 upon the thimble, forward of the teeth, as shown most clearly in Fig. 3, which aids in finally compressing and kneading the expanded, relatively thin-in-cross-section edge 17" (said Fig. 3) of the clenched pipe.

I have shown in the drawings an embodiment of this invention, for purposes of illustration, having its relatively movable parts equipped with exterior nut-portions in aid of their manual or other manipulations; and it is of course obvious that other exterior characteristics, such as nurlings, kerfs or the like could be advantageously substituted.

I am aware of the fact that unitary connectors, each provided at its respective end-portions with opposed threads, have been heretofore utilized for the purpose of drawing up and connecting at one operation two separate elements to be connected; but by employing such a plurality of dissimilar instrumentalities in connection with a unitary structure carrying in combination therewith the plurality of similar forcing-cones hereinbefore described, I have made it possible to secure in an expander-coupler a positive and certain expansion and substantially airtight gripping of the contiguous ends of the coupled pipes in a manner not heretofore attainable. I have moreover attained this result with an exceedingly small number of relatively movable parts, all told three in number; two of which, the thimbles, are substantially similar.

I have made what I believe is an important discovery in this art, and I have embodied the lesson of the same as one of the features of the device illustrated in the drawings. I call attention particularly to Fig. 3. In practice I have found that if the parts are so designed (with the line $c-d$ assumed parallel to the longitudinal axis $x-s$ of the smooth bore through the coupled elements) that the angle $p'-f-d$ is made properly greater than the angle $p-c-d$, a tremendous gain in efficiency is attained. This angle $p'-f-d$ is an arbitrary angle which I determine by experiment. In connection with the manner of said angle's determination, attention is directed to the angle $g-h-d$; the prolongation of the leg $h-g$ thereof diagrammatically representing the normal slope of the inner wall of the expanded pipe-end. And it should be here

noted that in devices which have heretofore carried a forcing-cone similar to the forcing-cone herein disclosed, the direction of slope of any one of said forcing-cones has been either parallel to the direction of slope of the line $c-p$ or else parallel to the direction of slope of the line $g-h$. The angle $g-h-d$ (which I may call "the measure of the angular approach of the interior wall of the expanded pipe-end toward the longitudinal axis of the pipe") is seen to be greater than the angle $p-c-d$ (which I may call "the measure of the angular approach of the exterior wall of the expanded pipe-end toward the longitudinal axis of the pipe"); it being seen that the lines $c-p$ and $h-g$ will at some point k intersect. Now, in order to secure the important advantage of having the forcing-cone, upon manipulation of the relatively movable parts, approach the portion of the pipe already nested as aforesaid within the encircling thimble, thereby to commence the pinching action upon the pipe-end at the portion 17" thereof and near the base of said forcing cone, I preferably design the slope of the latter in such a way that its angular approach to the line $c-d$ is, as diagrammatically shown, equal to a still greater angle than the angle $g-h-d$, to wit, the angle $p'-f-d$, experimentally determined. For purposes of reference, I call the angle $h-k-f$ the "efficiency angle of the forcing-cone".

It will be observed that the main bore of the thimble 9 has a diameter greater than that of the member 18, and that the diameter of the bore in member 18 is equal to the internal diameter of the pipe, 7, 8. Furthermore, when the parts are assembled as in Fig. 3, the outer surface of the forcing cone or taper-extension 22, and the opposed inner surface of the taper-cup gradually converge, being farthest apart in a line joining the end of said truncation with the nearest point on the opposed inner surface of the taper-cup, which line is longer than the normal thickness of the pipe wall. From this it follows that there is room between the end of the truncation and the opposed wall of the thimble, for the increased thickness of pipe due to the fact that the outer end of the pipe is being compressed, thus driving the material inwardly. Except for the provision made as described above, this increased thickness would take the form of an annular protuberance on the inner surface of the pipe, interrupting the smoothness of the passage through the pipe and connector member 18.

It will thus be seen that I have provided an embodiment of this invention having inherently the advantages hereinabove mentioned and which is peculiarly adapted for utilization with pipes of relatively small

diameters and wall thicknesses, such as, for instance, pipes employed in water-filtering circulations and in the air-circulations of pneumatically operated piano-actions or the like. Various other modifications and changes in the design and construction of my improved coupler may be resorted to, however, without departing from the spirit of the invention or sacrificing any of its advantages.

Inasmuch as many changes could be made in the above construction, and many apparently widely different embodiments of my invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense. It is also to be understood that the language used in the following claims is intended to cover all the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I desire it to be understood that wherever I use the word "unitary" with reference to any particular element, I mean that such element is integral for all practical purposes; in other words, without relatively manipulative parts.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a device of the kind described, in combination, a threaded thimble having a main bore and an outwardly flaring taper-cup communicating with the main bore; a pipe of compressible material within the thimble and having a flared mouth within and conforming to the taper-cup, the thickness of the wall of said flared portion gradually decreasing toward the outer end thereof; a member provided with a bore having a vestibuled portion that is threaded to engage the threads on the thimble, and having also within the vestibuled portion a truncated taper-extension surrounding the bore of the member, which taper-extension, when said thimble and member are threaded together, is adapted to enter the flared mouth of the pipe, with the bore of the pipe substantially aligned with the bore of the member, the slope of said taper-extension being at a greater angle to the axis thereof than the angle at which the inner surface of the pipe-flare extends from the axis of the pipe.

2. In a device of the kind described, in combination, a threaded thimble having a main bore and an outwardly flaring taper-cup communicating with the main bore; a member having a bore of less diameter than that of the thimble and having a vestibuled portion that is threaded to engage the threads on the thimble; said member having also within the vestibuled portion a truncated taper-extension surrounding the bore of the member and so that when said thimble and said member are threaded together the taper-extension of the member will enter the taper-cup of the thimble with their opposed surfaces gradually converging and farthest apart in a line joining the end of said truncation with the nearest point on the opposed surface of the thimble, which line is longer than the difference between the radius of the thimble bore and the radius of the bore of said member.

3. In a device of the class described, in combination, a threaded thimble having a main bore and an outwardly flaring taper-cup communicating with the main bore; a pipe of compressible material within the thimble and having a flared mouth within and conforming to the taper-cup; a member having a bore of a diameter less than that of the thimble and equal to the internal diameter of the pipe, said member having a vestibuled portion that is threaded to engage with the threads on the thimble, and having also within the vestibuled portion a truncated taper-extension surrounding the bore of the member, which taper-extension, when said thimble and member are threaded together, is adapted to enter the flared mouth of the pipe, with the bore of the pipe substantially aligned with the bore of the member, the slope of said taper-extension being at a greater angle to the axis thereof than the angle at which the inner surface of the pipe flare extends from the axis of the pipe, the opposed surfaces of the taper-extension and taper-cup gradually converging and farthest apart in a line joining the end of said truncation with the nearest point on the opposed surface of the thimble, which line is longer than the normal thickness of the main pipe wall.

In testimony whereof, I have hereunto signed my name in the presence of two witnesses.

SYDNEY L. BROWN.

Witnesses:

A. C. McDONNELL,
S. S. NEWTON.