W. J. HOLLICK.

COUPLING.

APPLICATION FILED MAY 19, 1919.

1,425,525.

Patented Aug. 15, 1922.

3 SHEETS—SHEET 1.

FIG. 1.

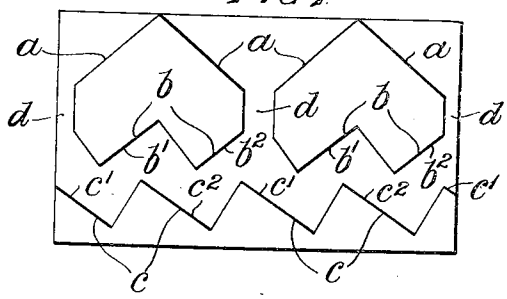


FIG. 2.

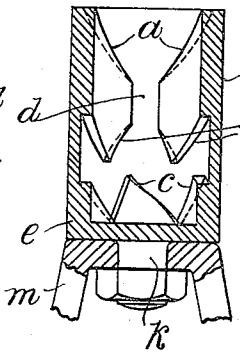


FIG. 3.

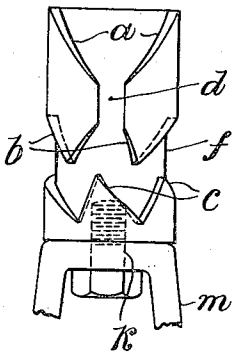


FIG. 4.

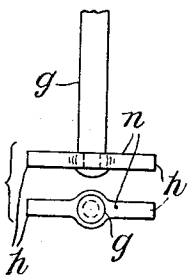


FIG. 5.

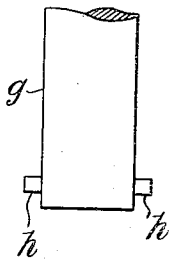


FIG. 6.

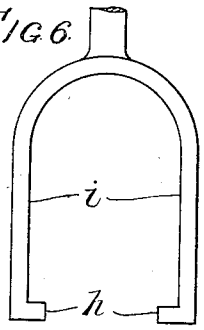


FIG. 7.

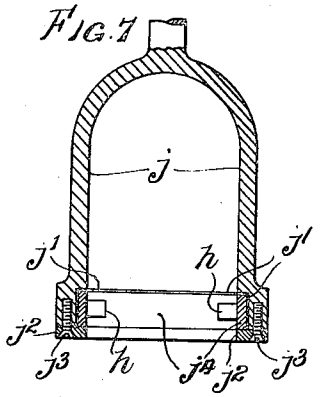


FIG. 8.

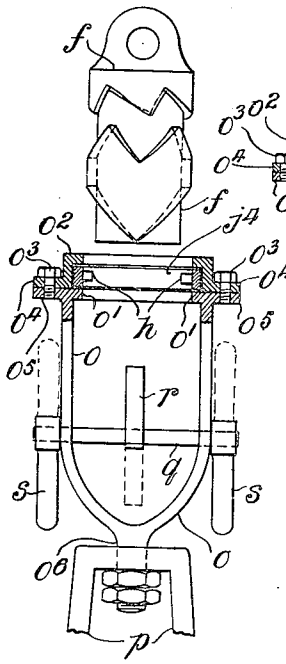


FIG. 9.

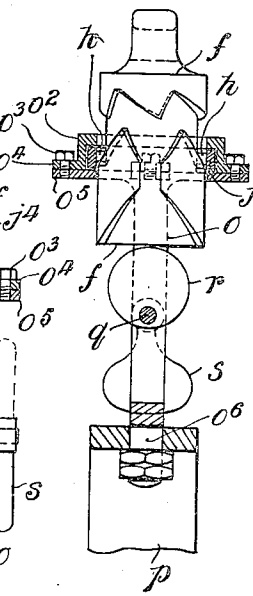


FIG. 10.

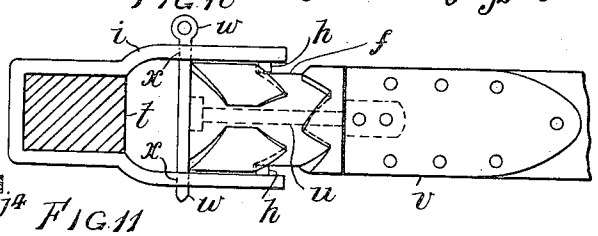


FIG. 11.

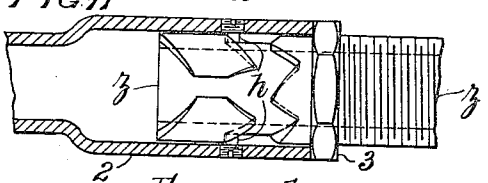
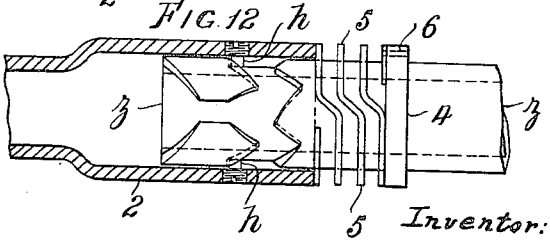


FIG. 12.



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3 SHEETS—SHEET 2.

FIG 13

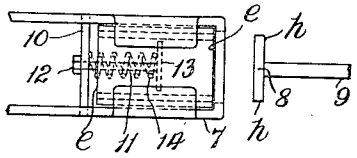


FIG 14

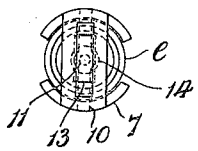
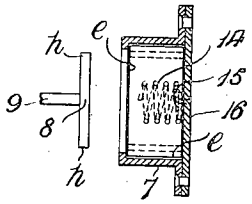


FIG 15



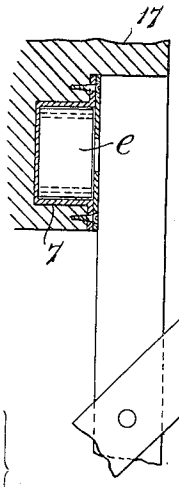


FIG 16

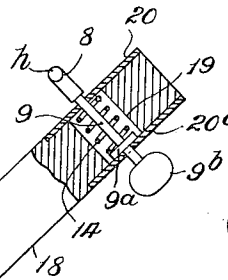


FIG 17

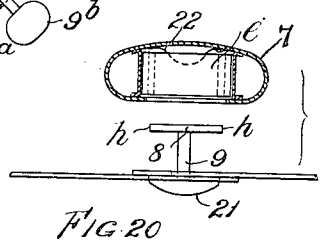


FIG 18

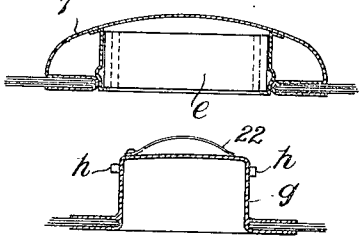


FIG 19

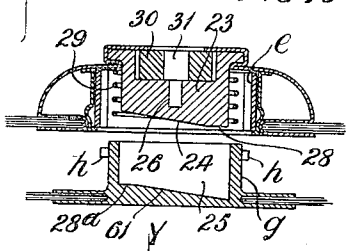


FIG 20

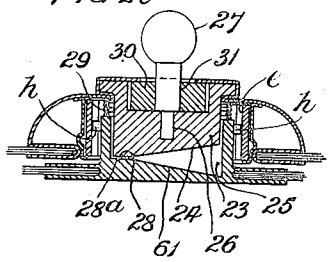


FIG 21

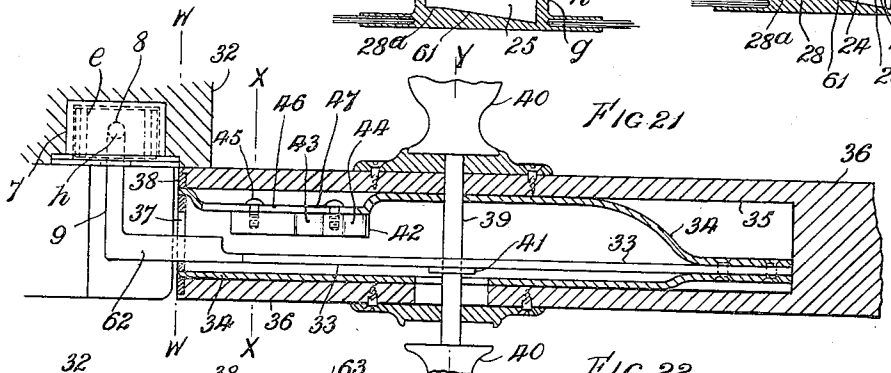
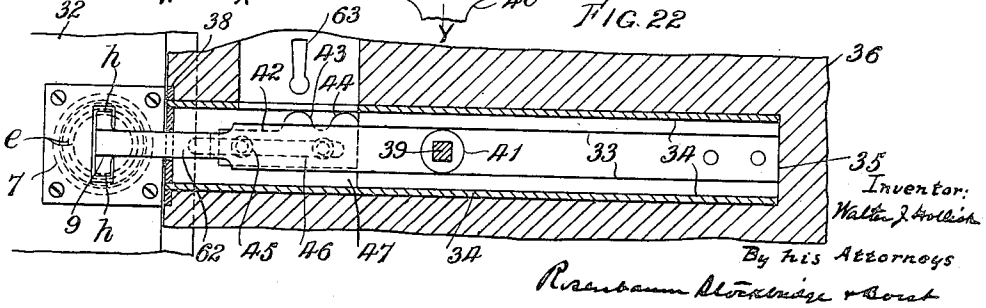


FIG 22



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COUPLING.

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3 SHEETS—SHEET 3.

FIG. 23

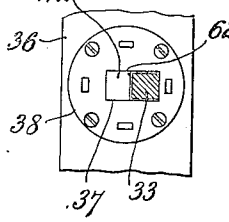


FIG. 24

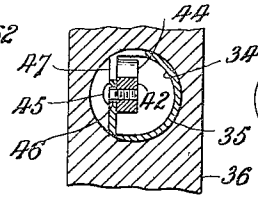


FIG. 25

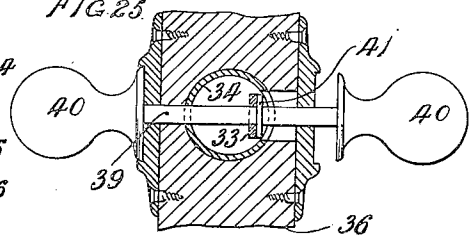


FIG. 26

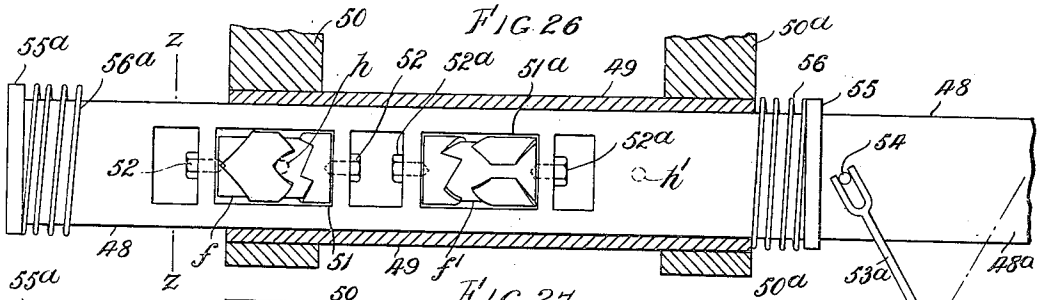


FIG. 27.

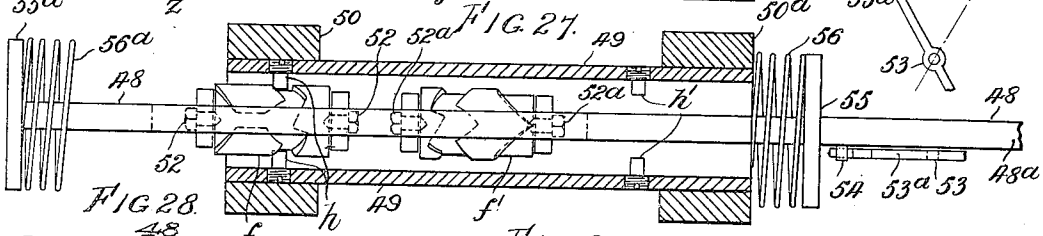


FIG. 28.

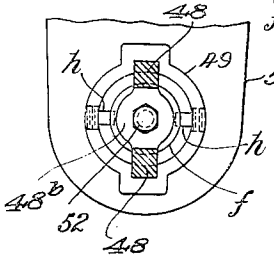


FIG. 29.

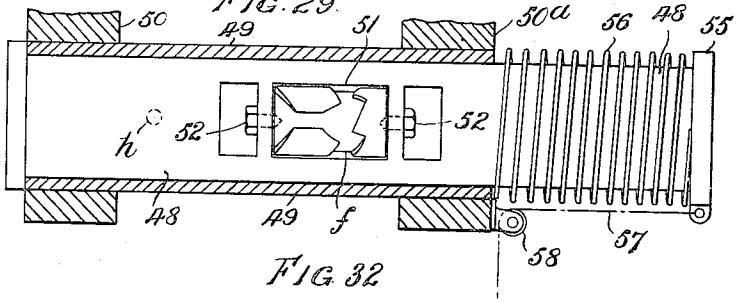


FIG. 30

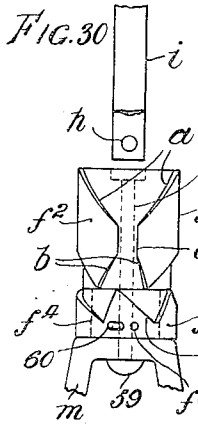


FIG. 31

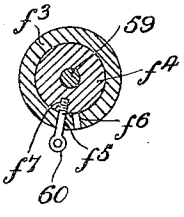


FIG. 32

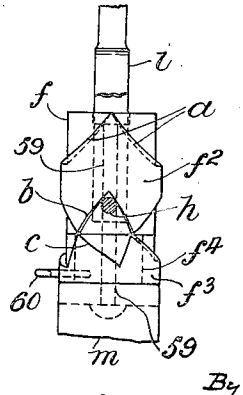
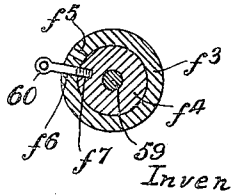


FIG. 33.



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UNITED STATES PATENT OFFICE.

WALTER JOHN HOLLICK, OF MANCHESTER, ENGLAND.

COUPLING.

1,425,525. Specification of Letters Patent. Patented Aug. 15, 1922.

Application filed May 19, 1919. Serial No. 298,242.

To all whom it may concern:

Be it known that I, WALTER JOHN HOLLICK, a subject of the King of Great Britain and Ireland, and a resident of Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Couplings, of which the following is a specification.

This invention relates to coupling, suspension and like devices of the kind comprising two co-operating members, one of said members comprising one or more pins or the like (hereinafter referred to as pins) and the other of said members comprising three sets of ratchet-like teeth or cam surfaces (hereinafter referred to as cam surfaces), the cam surfaces of two of the sets being so connected by through slots that when the two members are brought together the pins of the one member are guided through the slots, or a set of slots, of the other member and strike the third set of cam surfaces and are thereby moved angularly relatively to the slots whereby a slight movement between the two members in the reverse or disengaging direction causes the pins to engage the second set of cam surfaces and couple or connect the two members; while on a further slight movement between the members in the initial or engaging direction, the pins again strike the third set of cam surfaces and are again given an angular movement so that on movement between the members in the disengaging direction the pins are guided through the slots, or a set of slots, and the members are separated.

Devices of the kind referred to are capable of only limited use or practical application owing to the fact that the relative movements between the members which result in their separation might at times occur unintentionally, or even be unavoidable, and unintentional separation take place. The object of this invention is to prevent unintentional separation of the members of a device of the said kind and so render such devices applicable for a considerably greater variety of uses or purposes than they are at present.

The invention resides, essentially, in combining with a device of the kind specified, latching or locking means which prevent unintentional relative movement between the members of the device or which render such movement ineffective.

In the accompanying drawings, Fig. 1 is a developed view of the three sets of cam surfaces and slots of one member of a device of the kind referred to, and Figs. 2 and 3 are respectively a section and an elevation of embodiments of such member. Fig. 4 is an elevation and a plan of one form of complementary pin member. Fig. 5 is an elevation of another form of pin member. Fig. 6 is an elevation, and Fig. 7 is a section of two embodiments of another form of complementary pin member. Fig. 8 is an elevation, partly in section, and Fig. 9 is a view, also partly in section and at right angles to Fig. 8, of one embodiment of the invention. Fig. 10 is an elevation, and Figs. 11, 12 and 13 are longitudinal sections, and Fig. 14 is a transverse section of Fig. 13 illustrating other embodiments of the invention. Fig. 15 is an elevation, partly in section, and Fig. 16 a section of further embodiments of the invention. Figs. 17, 18, 19 and 20 are sections of further embodiments of the invention. Fig. 21 is a sectional plan, and Fig. 22 a vertical section of another embodiment of the invention, and Figs. 23, 24 and 25 are sections on the lines W—W, X—X and Y—Y, respectively, in Fig. 22. Fig. 26 is a vertical section, Fig. 27 a sectional plan of a further embodiment of the invention, and Fig. 28 is a section on the line Z—Z in Fig. 26. Fig. 29 is a vertical section of a modification of the embodiment shown in Figs. 26, 27 and 28. Fig. 30 is an elevation and Fig. 31 a sectional plan thereof illustrating a still further embodiment of cam-surface member, and Fig. 32 is an elevation at right angles to Fig. 30, and Fig. 33 a sectional plan thereof, with the parts of the member in a different relative position.

In Fig. 1, *a* designates the first set of cam surfaces, *b* designates the second set, *c* designates the third set, and *d* designates the through slots between the first and second sets. The three sets of cam surfaces may be formed on the interior of a female part *e*, Fig. 2, or on the exterior of a male part *f*, Fig. 3. In the former case, the complementary coupling member is in the form of a male part *g*, Figs. 4 and 5, adapted to enter the female part *e*, Fig. 2, and carrying pins *h* to co-act with the sets of cam surfaces, *a*, *b*, *c*. In the second case, the complementary coupling member is in the form of a forked part *i*, Fig. 6, the limbs of which carry the pins *h* and are adapted to pass over the male part *f*, Fig. 3, or is in the form of a female part *j*, Fig. 7, carrying

internal pins h and adapted to be entered by the male part f. In either case the three sets of cam surfaces and the pins h must be capable of relatively angular movement. This may be effected as hitherto by adapting either the three sets of cam surfaces, or the pins, or both the set of cam surfaces and the pins, to have angular movement. Conveniently, the female part e, Fig. 2, and the male part f, Fig. 3, may be pivoted at k to rotate or swivel about a longitudinal axis in or on a shackle m or other support, or the pins h, Fig. 4, may be constituted by the ends of a cross-piece n pivoted on the male part g, or the pins may be provided on a ring j^4 rotatably mounted in a recess j^1 in the female part j, Fig. 7, and retained by an annular plate j^2 and screws j^3. In any case, when the two coupling members are brought together, the pins h are guided by the cam surfaces a through the slots d and strike the surfaces c^1, Fig. 1, of the third set c when, due to relative angular movement between the members, the pins are moved out of alignment with the slots so that on the members moving to a slight extent in the opposite direction, the pins engage the surfaces b^1 of the second set b and are retained in the angles between said surfaces and the following surfaces b^2. On the members being again moved in the initial direction the pins h strike the surfaces c^2 of the third set and are again given a relative angular movement whereby on the members being again moved in the opposite direction, the pins strike the surfaces b^2 of the second set b and are guided through the slots d.

As before stated, the present invention consists in providing a coupling or like device of the kind described with latching or locking means for preventing unintentional separation of the connected members of the device.

Various forms of latching or locking means may be employed according to the particular purpose for which the device is used and the particular arrangement of the device itself.

Figs. 8 and 9 illustrate an embodiment of the device and invention especially applicable for connecting ships' boats to their raising and lowering tackle. In this embodiment, the three sets of cam surfaces are formed on the exterior of a male member f which is connected to a block of the tackle. The pins h are provided on a ring j^4 rotatably mounted in a carrier at the end of a stirrup o. The carrier comprises a seat o^1 formed integral with the limbs of the stirrup, and a retaining annulus o^2 secured to the seat o^1 by bolts o^3 passing through lugs o^4, o^5 on the two parts. The end o^6 of the stirrup is mounted to swivel in a link or bracket p on the boat. In the limbs of the stirrup is mounted a rotatable shaft q formed with a cam-like enlargement r and provided with hand-levers s which are so weighted that the enlargement r is normally projected towards the pin ring j^4. To connect the members of the device, the shaft q is rotated by operating one of the levers s to withdraw the enlargement r, as shown in dotted lines in Fig. 8, when the male member f can then pass through the pin ring j^4 to engage with the pins h. The lever is then released and the shaft q thereby rotated to again project the enlargement r when, as shown in Fig. 9, the enlargement prevents axial movement between the member f and the pin ring sufficient to result in disconnection, and the members of the device are locked in the coupled position until the enlargement r is moved clear of the inner end of the member f.

The embodiment shown in Fig. 10 is especially applicable as a rope, chain or like connection for vehicle draw-gear, harness traces and such like. In this case, the pins h are provided on the limbs of a clevis i which is illustrated as embracing a vehicle frame member t, and the sets of cam surfaces are formed on a male member f mounted to rotate on a pin u carried by the trace v. When the members of the device are connected, a pin w is fitted in holes x provided for the purpose in the limbs of the clevis i which pin lies behind the male member f and prevents relative axial movement between same and the clevis, thus locking the members of the device in the coupled position. On the removal of the pin w the members of the device can be separated in the usual way.

In Fig. 11, which illustrates an embodiment especially applicable for conecting pipes, rods, chains and the like, the cam-surfaces are formed on a spigot member z and the pins are provided in the interior of a socket member 2. The spigot member z is screw-threaded to receive a lock nut 3, which, when the members are connected, is tightened up against the end of the socket member 2 to prevent relative movement between the members and disconnection thereof.

Fig. 12 illustrates a modification of the previous embodiment. In this case, the spigot member z is provided with an abutment 4 to which a spring washer 5 is attached by a rivet 6. On the two members being brought together to couple the spring washer 5 bears against the end of the socket member 2 and is compressed and then reacts to engage the pins h with the second set of cam-surfaces and maintain the engagement.

Figs. 13 and 14 illustrate another embodiment with spring latching means suitable for connecting rods, ropes, chains and the like. In this embodiment, the cam sur-

faces are formed on a female member *e* rotatably mounted in a holder 7 and the pins *h* are constituted by the ends of a cross-piece 8 on a stem 9. In the holder 7 is provided a cross-piece 10 in which a stem 11 is slidably mounted. One end of the stem 11 is furnished with a retaining nut 12 and its other end is provided with a head 13 between which and the cross-piece 11 a spiral spring 14 is mounted on the stem. When the cross-piece 8 enters the female member *e* it bears against the head 13 and compresses the spring 14 which re-acts to engage the pins *h* with the second set of cam surfaces and maintain the engagement.

Fig. 15 illustrates a further embodiment with spring latching means which is especially applicable for use as a door stop, and for securing hinged, pivoted and sliding doors, hatches, lids, flaps, drawers, windows and the like. In this form of device the pins *h* are, as in the previous case, constituted by the ends of a cross-piece 8 on a stem 9 and the cam surfaces are formed in a female member *e* rotatably mounted in a holder or casing 7. The latter also has mounted in it a spiral spring 14, one end of which is secured, conveniently by a screw 15, to the base or back plate 16 of the holder or casing.

In the modification of the last embodiment illustrated in Fig. 16 and shown applied to a pivoted window, the holder or casing 7 is mounted in the window frame 17 and the stem 9 is mounted on the window 18 to slide through a recess 19 therein and cover-plates 20, 20[a]. A spiral spring 14 is mounted on the stem 9 and thrusts against the cover plate 20 and a collar 9[a] on the stem. The latter is provided with a finger piece 9[b] whereby it can be pushed forward against the action of the spring to cause it to co-act with the third set of cam surfaces provided on the interior of the female member *e* in the holder or casing 7, and rotate the member *e* so that on the stem 9 being released and retracted by the spring, the pins either engage the second set of cam surfaces and are retained in engagement therewith, or are free to pass through the slots *d*, Fig. 1.

Figs. 17, 18, and 19 and 20 illustrate embodiments applicable as press-button or like fasteners for gloves, cuffs, boots and other articles of wearing apparel, music and like cases, bags, pouches, belts, wristlet straps, the fabric coverings of tents, motor vehicle hoods and the like, as collar studs, and other purposes for which such and like devices are used. In Fig. 17, the pins *h* are constituted by the ends of a cross-piece 8 on a stem 9 which is provided with an enlarged or other appropriate base 21, and the sets of cam surfaces are formed on the interior of a female member *e* rotatably mounted in a button or cap member 7. The latter has fixed in it a blade spring 22 against which the cross-piece 8 presses when it enters the female member *e* and which maintains the engagement between the two members when connected. In Fig. 18, the pins *h* are provided on a male member *g* and the spring 22 is mounted on the end of the member. In Figs. 19 and 20 the button or cap member 7 has also rotatably mounted in it a block 23 the end 24 of which is inclined. The male member *g* is formed with a cavity 25 so that it passes over the block 23 when it enters the female member *e*. The bottom 61 of the cavity is inclined correspondingly to the end 24 of the block 23 which is formed with a recess 26 for the insertion of a key 27, Fig. 20, whereby the block can be rotated. On connecting the two members of the device and rotating the block 23 by the key 27 the inclined surface 24 co-acts with and rides up the inclined surface 61, and the block 23 thus prevents relative axial movement between the two members of the device and locks the pins *h* in engagement with the second set of cam surfaces until it (the block) is again rotated by the key into the position shown in Fig. 19, when relative axial movement to separate the members can be effected. Flats 28, 28[a] may be formed on the inclines 24, 61 to assist in retaining the block 23 in its locked position. A spring 29 may also be fitted in the button or cap 7 to bear against the end of the male member *g* and press the two members of the device apart. The button or cap member 7 may also have rotatably mounted in it a guard block 30 through a hole 31 in which the stem of the key passes. The hole 31 and the stem of the key may be so shaped that only the correct key can be employed to rotate the block 23.

Figs. 21 to 25 illustrate an embodiment applicable as a lock for a door or the like. The sets of cam surfaces are provided on the interior of a female member *e* rotatably mounted in a casing or holder 7 which is fitted to the door frame 32. The pins *h* are constituted by the ends of a cross-piece 8 on a stem 9 carried at the outer end of a spring blade 33. The blade 33 is mounted in a tubular casing 34 which is fitted in a recess 35 in the door 36, and the inner end of the blade is secured between the sides of the end of the casing which are closed together. The front end of the blade passes through a slot 37 in a cover plate 38 to the casing 34. The spindle 39 of the knobs 40 passes through the blade 33 and has fixed on it a stop 41 which engages the blade and which on axial movement of the spindle 39 operates the stem 9 against the spring of the blade to engage and disengage the pins *h* with and from the second set of cam surfaces of the female member *e*. In the casing 34 is provided a slidable bolt 42 adapted to be shot and un-shot by a key co-operating

with lugs 43, 44 in the known way, and inserted through the key-hole 63. The bolt 42 is supported and guided in its sliding movements by screws 45 which pass through a slot 46 formed in the flattened part 47 of the casing 34. When the pins h are engaged and the bolt 42 shot, the latter lies between the thicker part 62 of the blade 33 and the flattened part 47 of the casing 34 and prevents operation of the blade 33 by the spindle 39 to disengage the pins h.

Figs. 26, 27 and 28 illustrate an embodiment for holding a slidable member in either of two positions, such embodiment being especially applicable for use as a driving belt shifter and for holding parts of machines or apparatus in a projected or extended position and a retracted position. In the embodiment, the member 48 is slidably mounted in a tubular carrier 49 carried in appropriate supports 50, 50^a. Two male members f, f^1, each having three sets of cam surfaces formed on its exterior, are rotatably mounted in apertures 51, 51^a in the member 48. Conveniently, the members f, f^1 are pivoted between pairs of set screws 52, 52^a mounted in bosses 48^b and they are oppositely disposed, as illustrated. The carrier 49 is provided with two sets of internal pins h, h^1 to co-act with the cam surfaces of the members f, f^1, respectively. The member 48 is adapted to be slid in the carrier 49 by a lever 53, the forked arm 53^a of which engages a projection 54 on the member 48. The member 48 is also provided with stops 55, 55^a and has mounted on it spiral springs 56, 56^a adapted to thrust between said abutments and the ends of the carrier 49. The end 48^a of the member 48 carries or is connected to the part to be operated. In the position of the parts shown in full lines, the member f is engaged with the pins h and the engagement is maintained by the thrust of the spring 56 between the stop 55 and the adjacent end of the carrier 49. On moving the arm 53^a of the lever slightly counterclockwise to disengage the member f from the pins h by the action of the pin upon the cam surfaces which rotates the latter to bring an exit slot into alignment with a pin and then on moving the arm 53^a clockwise into the position indicated in dotted lines, the member 48 is slid in the carrier 49 and the member f^1 engaged with the pins h^1, the pins by their engagement with the cam surfaces of f^1 causing a rotation thereof to lock the parts, the engagement being maintained by the spring 56^a thrusting between the stop 55^a and the adjacent end of the carrier until the lever 53 is again operated.

Fig. 29 illustrates a modification of the previous embodiment in which only a single cam surface member f and a single set of pins h are employed. A single spring 56 acting between a stop 55 on the slidable member 48 and the carrier 49 normally holds the member 48 in the projected position. The slidable member 48 is retracted against the spring 56 by means of a cord 57 connected to the stop 55 and passing over a pulley 58, to engage the member f with the pins h, the spring maintaining the engagement until the cord 57 is again operated to release the member f from the pins h when it (the spring) again projects the slidable member 48.

Figs. 30 and 33 illustrate another way of preventing unintentional separation of the two members of the device when connected. In this arrangement the three sets of cam surfaces are provided on the exterior of a male member f, which is made in two parts f^2, f^3. The two sets of cam surfaces a, b and the slots d are formed on the part f^2 and the third set of surfaces c is formed on the part f^3. The part f^2 is formed with a spigot or reduced portion f^4 whereupon the part f^3, which is of annular form, is mounted and adapted for rotation relatively to the part f^2. The two parts f^2, f^3 are connected together by a bolt 59, which also serves to swivel the member f to a shackle or other support m. The part f^2 is formed with a tapped hole f^7, and the part f^3 with two holes f^5, f^6 for a pin 60 whereby the two parts are locked together in the desired relative angular position. Normally, the pin 60 is passed through the hole f^5 into the hole f^7, as shown in Figs. 30 and 31, so that connection and disconnection between the member f and the complementary member i can take place. To prevent separation of the members when the pins h of the member i are engaged with the second set b of cam surfaces of the member f, the pin 60 is removed, the part f^3 of the member f adjusted angularly relatively to the part f^2, and the pin 60 inserted through the hole f^6 into the hole f^7, as shown in Figs. 32 and 33. The angular adjustment of the third set of cam surfaces relatively to the second set b confines the pins h between the two sets of surfaces, and while allowing the pins h to move axially between the two sets of surfaces, prevents the pins from being moved angularly by the third set c to pass out through the slots d.

What I claim as my invention, and desire to secure by Letters Patent is:—

1. A coupling device comprising two relatively movable elements to be coupled, one of the elements having a member with a zigzag cam groove therein extending transversely of the direction of relative movement and also exit and entrance slots therein leading to spaced sections of the groove, the other of the elements having a member with a cam follower for engagement with the slots and groove whereby upon relative movement of the elements in opposite direc-

tions the follower will enter the cam groove by means of one slot to couple the elements and upon continued relative movements of the elements in opposite directions will be released through the other slot, and means for locking the elements against relative movement when the cam follower is in the cam groove intermediate of the slots to thereby prevent uncoupling of the elements.

2. A coupling device comprising two relatively reciprocating parts, one of which has a plurality of cam surface means and the other of which has follower means, one of the means being rotatable with respect to part which carries it, a limited reciprocation of the parts causing the rotatable means to be shifted by its engagement with the other means into a locking position in which separation of the parts is prevented and upon further reciprocation to be shifted into unlocked position in which the parts can be separated, and means for resisting reciprocation of the parts when the means are in locked position.

3. A coupling device comprising two relatively and longitudinally reciprocating parts having inter-engaging means operable upon limited longitudinal reciprocations of the parts to lock and then unlock the parts, and means effective when the parts are in locked position to resist limited longitudinal reciprocations to unlock the parts.

4. A coupling device comprising two relatively and longitudinally reciprocating parts having inter-engaging means operable upon limited longitudinal reciprocations of the parts to lock and then unlock the parts, and means effective when the parts are in locked position to prevent limited longitudinal reciprocations to unlock the parts.

5. A coupling device comprising two relatively reciprocating elements, a cylindrical cam part carried by one element and having a zig-zag cam groove in the same with a plurality of cam slots leading thereto, a follower part on the other element adapted to enter the groove through one of the slots and by reaction with the walls of the groove during slight relative reciprocations of the elements cause a relative rotary movement of the parts progressively and by steps into a locking position in which the elements are locked against separation, and then through further reciprocations cause a further relative rotary movement of the parts to position the follower part opposite another slot and permit of a separation of the elements, and a device effective when the parts are in locking position for resisting reciprocations to unlock the parts.

6. A coupling device comprising two relatively reciprocating elements, a cylindrical cam part carried by one element and having a zig-zag cam groove in the same with a plurality of cam slots leading thereto, a follower part on the other element adapted to enter the groove through one of the slots and by reaction with the walls of the groove during slight relative reciprocations of the elements cause a relative rotary movement of the parts progressively and by steps into a locking position in which the elements are locked against separation, and then through further reciprocations cause a further relative rotary movement of the parts to position the follower part opposite another slot and permit of a separation of the elements, and a device effective when the parts are in locking position for positively preventing reciprocations to unlock the parts.

7. A coupling device comprising two relatively reciprocating elements, a cylindrical cam part carried by one element and having a zig-zag cam groove in the same with a plurality of cam slots leading thereto, a follower part on the other element adapted to enter the groove through one of the slots and by reaction with the walls of the groove during slight relative reciprocations of the elements cause a relative rotary movement of the parts progressively and by steps into a locking position in which the elements are locked against separation, and then through further reciprocations cause a further relative rotary movement of the parts to position the follower part opposite another slot and permit a separation of the elements, and a device effective when the parts are in locking position to be manually set to prevent reciprocations to unlock the parts.

8. A coupling device comprising two relatively and longitudinally reciprocating parts having inter-engaging means operable upon limited longitudinal reciprocations of the parts to lock and then unlock the parts, and means carried by one of the parts and engaging with the other of the parts effective when the parts are in locked position to resist unlocking longitudinal reciprocations of the parts.

In witness whereof I have hereunto set my hand.

WALTER JOHN HOLLICK.