No. 682,575. Patented Sept. 10, 1901.

J. A. SKILTON.

FOUNTAIN PEN.

(Application filed June 17, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig-1.

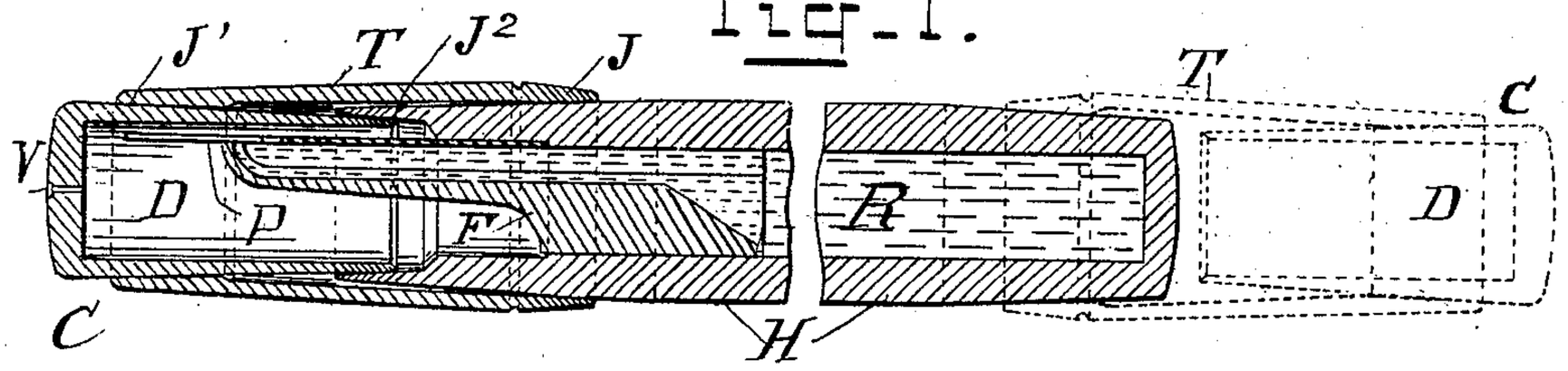


Fig-2.

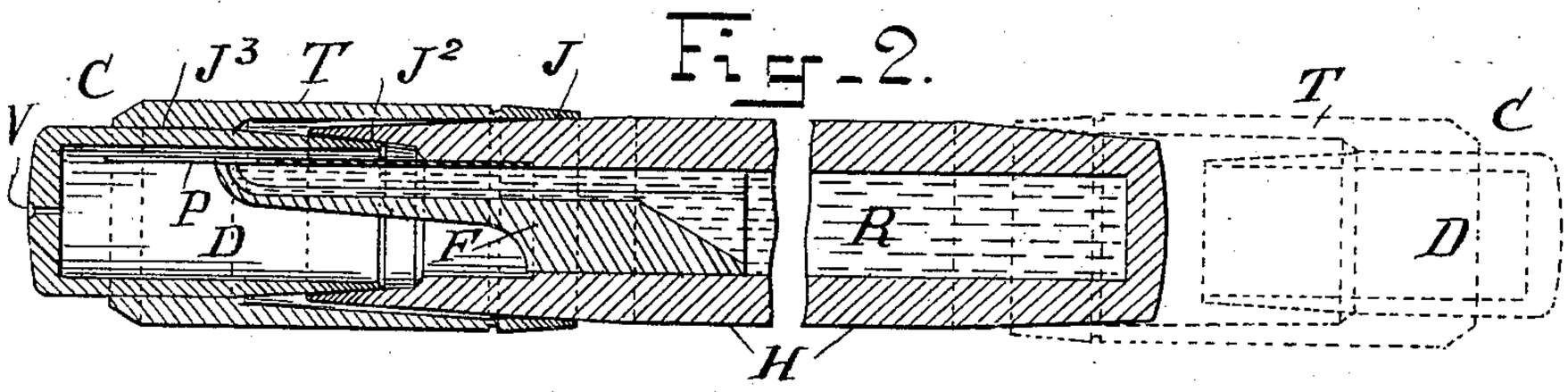


Fig-3.

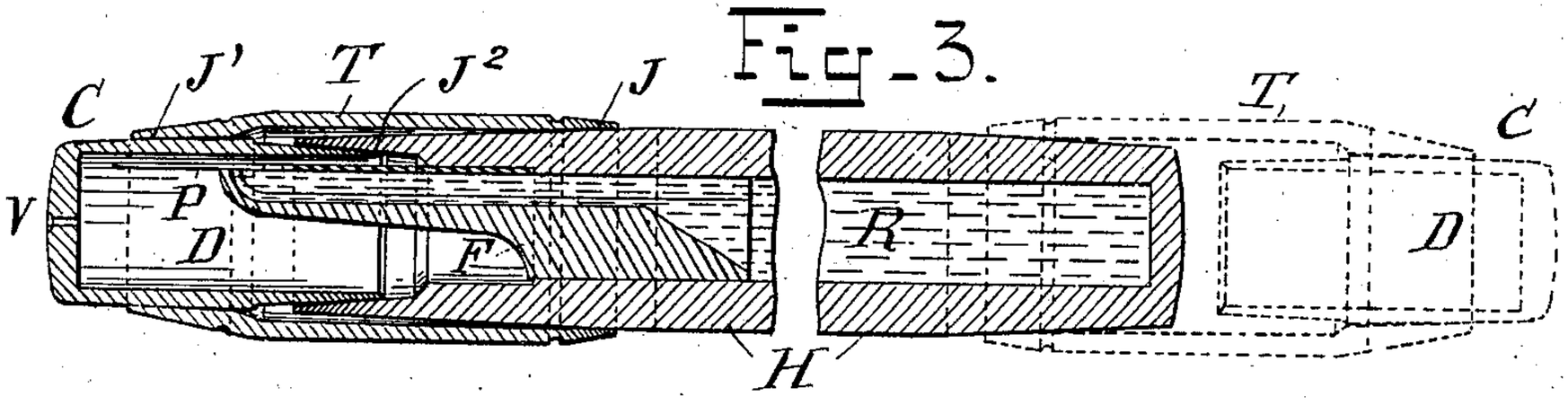


Fig-4.

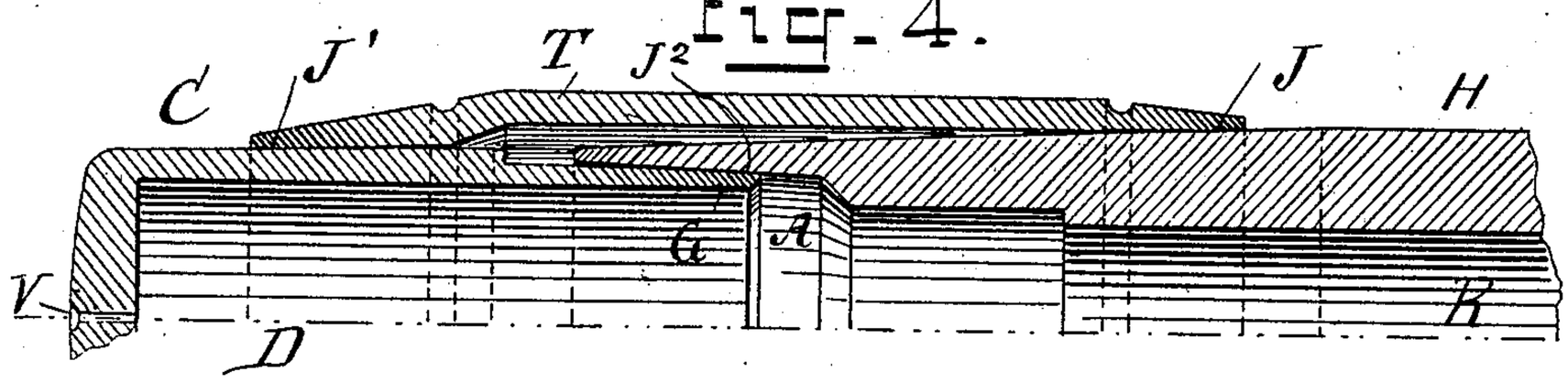


Fig-5.

Fig-6

Witnesses
Charles Hanimann
Edward S. Berrall.

Inventor
James A Skilton

No. 682,575. Patented Sept. 10, 1901.

J. A. SKILTON.

FOUNTAIN PEN.

(Application filed June 17, 1901.)

(No Model.) 2 Sheets—Sheet 2.

Fig-7.

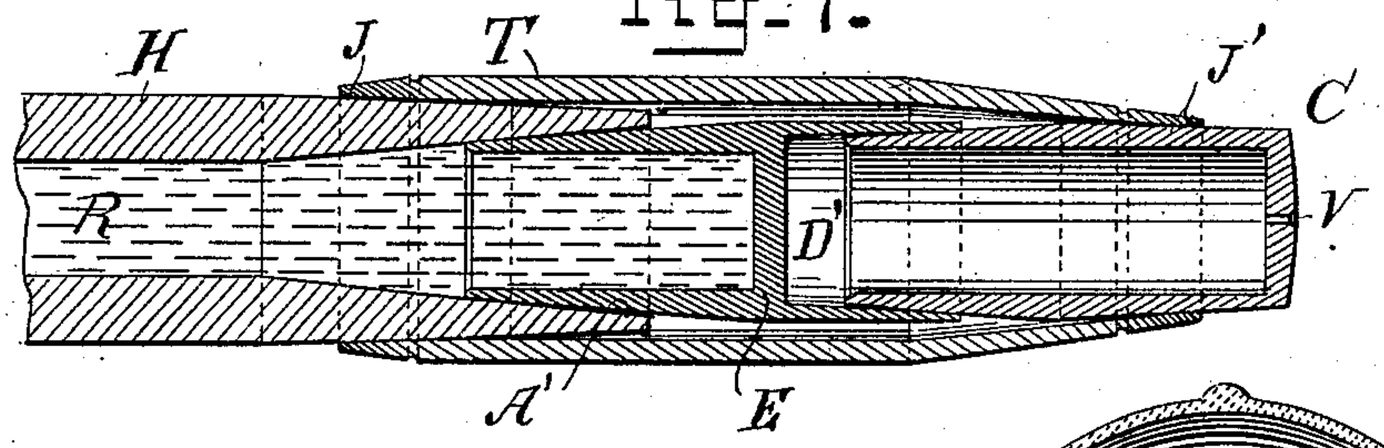


Fig-8-L

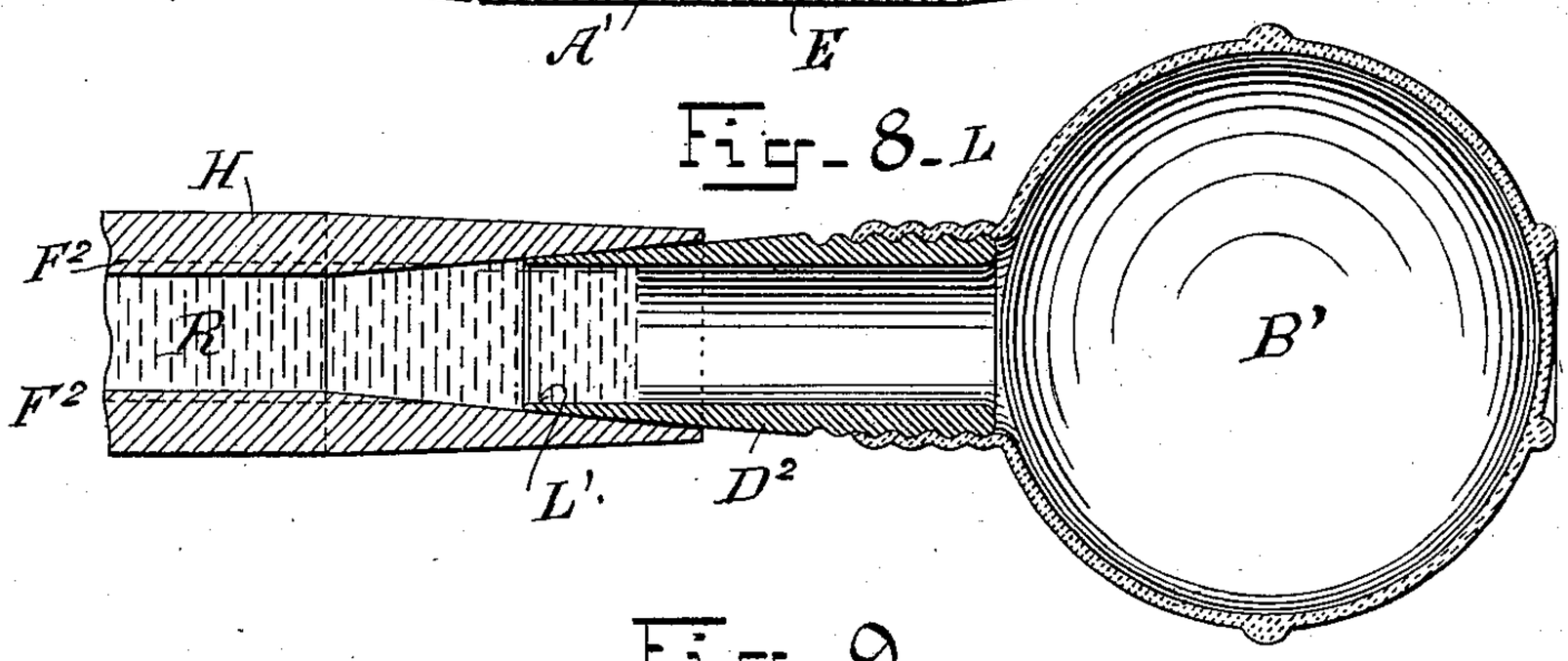


Fig-9.

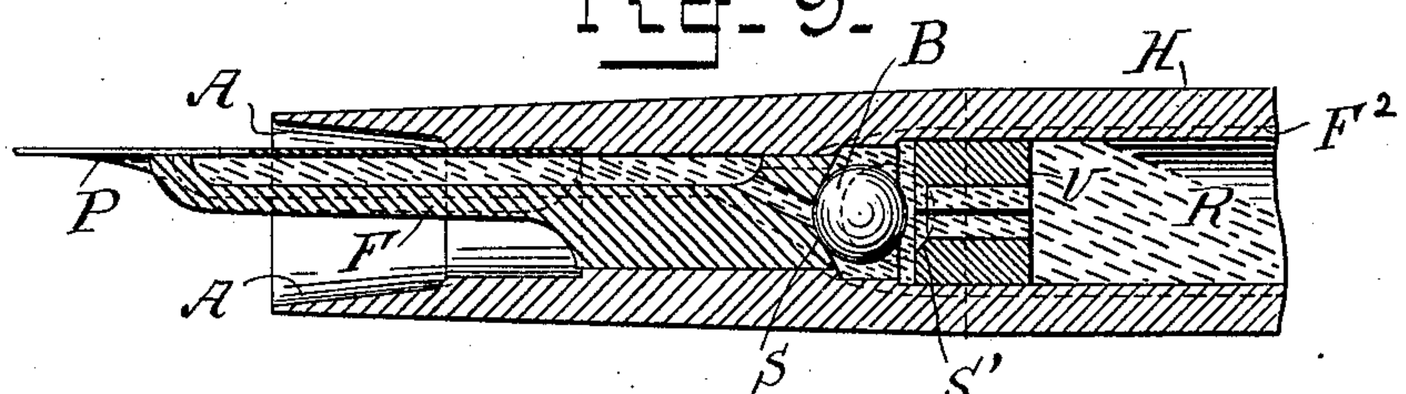


Fig-10.

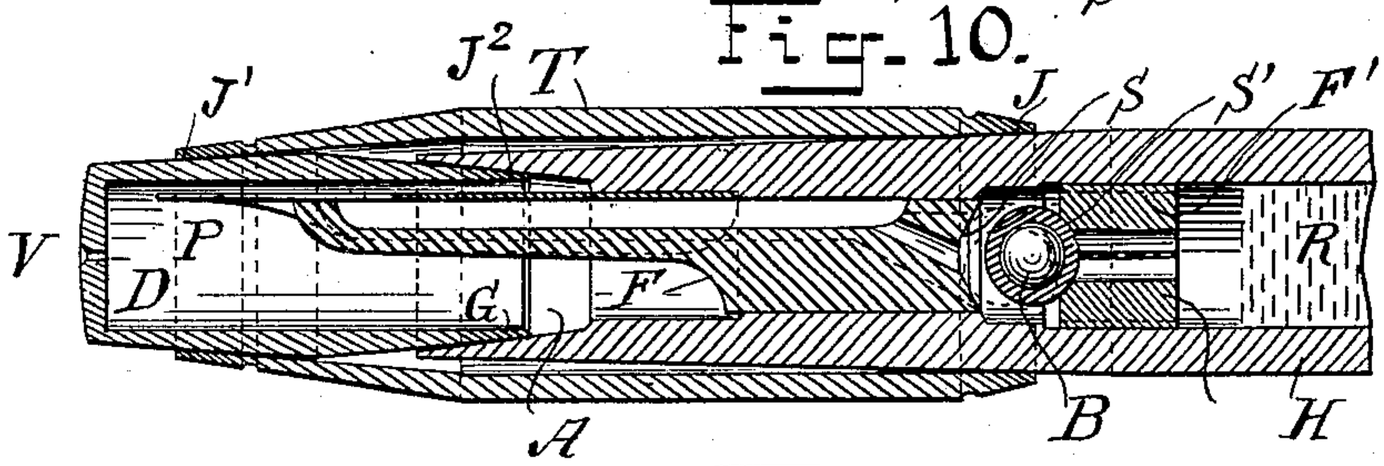


Fig-12.

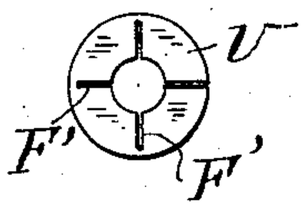


Fig-11.

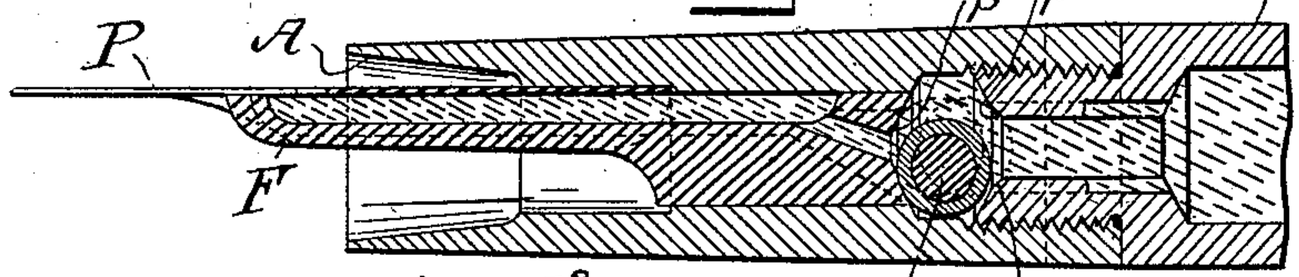


Fig-13

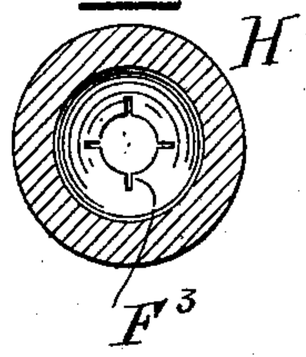
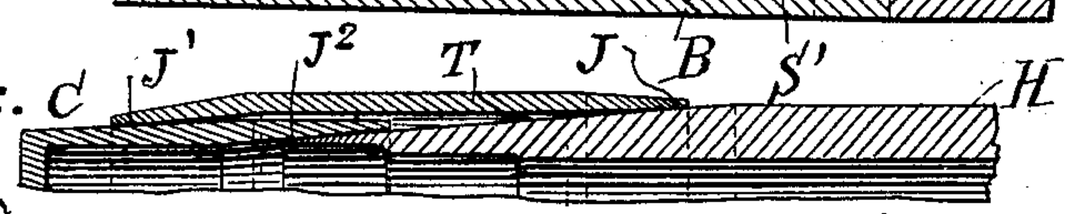


Fig-14.



Witnesses
Charles Hanimann.
Edward S. Berrall.

Inventor
James A Skilton

UNITED STATES PATENT OFFICE.

JAMES A. SKILTON, OF BROOKLYN, NEW YORK.

FOUNTAIN-PEN.

SPECIFICATION forming part of Letters Patent No. 682,575, dated September 10, 1901.

Application filed June 17, 1901. Serial No. 64,818. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. SKILTON, a citizen of the United States, residing in the borough of Brooklyn, county of Kings, city of New York, and State of New York, have invented a new and useful Improvement in Fountain-Pens, of which the following is a specification.

My invention relates to caps for fountain-pens, to joints between caps and holder sand between other parts of fountain-pens and closures, the caps and other parts of the fountain-pen being used to control ink and keep it in its proper channels or chambers, prevent its access to the outer and fingered portion of the fountain-pen, and also to facilitate the filling or feeding of the reservoir with ink directly by suction or directly by drop-filling at the upper end without opening the writing-pen end of the holder or fountain, unscrewing a nozzle, or changing the position of the feed devices, and without losing control of the ink and ink movements anywhere.

The special objects of my invention will appear more fully later in the body of the specification, and its nature is definitely set forth or defined in the claims.

I attain the objects of my invention by the mechanism illustrated in the accompanying drawings, in which—

Figures 1, 2, and 3 show longitudinal sectional views of the two opposite ends of the fountain-pen, Fig. 1 having a conical joint between the cap and the reinforcing-tube, with the larger end of the cone outward, Fig. 2 having a cylindrical joint between the reinforcing-tube and the cap, and Fig. 3 having a conical joint between the same parts, with the larger end of the cone inward. Fig. 4 shows an enlarged sectional view of the writing-pen end of the holder, of the cap, and of the reinforcing-tube—that is, of one side of the same. Fig. 5 shows a similar view with the mouth of the cap in first contact with the mouth of the holder. Fig. 6 shows a similar view of the cap and the holder without the reinforcing-tube. Fig. 7 shows a sectional view of the upper end of the holder, of the hollow stopper, of the cap, and of the reinforcing-tube. Fig. 8 shows the upper open end of the holder with the filler, the filler-terminal being located in the conical chamber or open mouth of the holder. Figs. 9, 10, and 11 show different sectional views of the forward end of the pen, Fig. 10 including the cap and the reinforcing-tube, and the different figures showing the ball in different positions. Figs. 12 and 13 show the ball-sockets, the former consisting of a split tube inserted into the forward end of the reservoir and the latter showing the ball-valve seat as formed in the outer end of the holder, also shown in horizontal sectional view in Fig. 11. Fig. 14 shows one side of a part of the holder, the cap, and the cannula, with the mouth of the holder entering the mouth of the cap and forming a hermetical joint between the holder and the cap at or near the extreme open end of the holder.

Similar letters refer to similar parts throughout the several views.

The holder H, which is preferably made in one piece and without, although it may have, a separate nozzle, is provided with a cap C, that makes a hermetical joint with a chamber in the extreme open writing-pen end of the holder, preferably by passing into the slightly-conical chamber A, with which the relatively thin and yielding end G of the cap C makes contact and forms a hermetical or non-capillary joint, from which the ink is excluded at and near the forward end of the cap or writing-pen cover, the hermetical joint there located preventing the entering of ink in any portion, preferably, and preventing all access to the finger portions of the pen. The cap C may be so constructed as to make outside contact with the extreme end of the holder, seated in a conical chamber in the mouth of the cap C and forming a joint at and near the extreme end and outer surface of the holder, as shown in Fig. 14, and in that way prevent the access of ink or condensation to the outer surface and fingered portion of the holder; but I prefer the first-mentioned method—namely, that in which the mouth of the cap is inserted into a chamber in the mouth of the holder—as being the most certain and advantageous, and particularly as keeping the ink farther away from the outside surfaces of the holder. Preferably all or either one of these joints should be of the progressive-wedge, the conical frictional, or the her-

metical conical joint type, in which the inner member is the yielding member or the relatively more yielding member, although the other form of conical frictional joint may be used, in which the hermetical feature of the joint is located at and near the mouth of the outer member, and, further, two joints—inner and outer—may be used in the same location or between the holder H and the cap C without avoiding my invention, as my invention seeks to avoid the use of the screw-and-shoulder hermetical joint altogether, and everywhere by means of the progressive-wedge or frictional conical joint of one or the other or both varieties mentioned used conjointly.

I contemplate the application and use alternatively or at will of the filler and filler-terminal at the lower or writing-pen end of the holder and the formation of a similar joint and relation to that made at the other or open end of the holder. In this position when the filler is filled with ink and the bulb is pressed the ball will be raised from its seat or socket and the ink forced up into the reservoir or down into it if the pen is held writing-pen uppermost, in which case the ball-valve will open by the action of gravity. The same operation may be performed by using a filler having a graduated tube open at top and so placed as to carry the ink into the reservoir by gravity. The filling of the reservoir from the lower or writing-pen end of the holder will of course be facilitated along with the other necessary or requisite manipulations of the operation by the removal of the stopper E, so as to allow the air in the reservoir to escape as the ink enters from below. When the filler is applied at the writing-pen end of the holder, as when it is applied to the other or upper end of the same, I prefer to make and use the frictional hermetical conical joint of the inner end and member species instead of the species that forms the joint at the outer end of the outer member, and this in part because in and to the latter species of joint the ink gets access and approach by capillary action and otherwise to or into the weaker end of the joint. However, these two species of joints belong to the same genus, and I contemplate the use of either and of the whole genus at will.

In the joint indicated by the letter J the outer member of the joint is the yielding elastic conforming member of the joint, and the yielding elastic conforming action takes place at and near its mouth. In the joint indicated by the letter J^2 it is the inner member that has these characteristics of construction and methods of operation, and these take effect at or near the mouth of the inner member and upon its external surface or between its external surface and the inner surface of the outer member, in these respects characteristically differing from the joint indicated by the letter J. Being an interior joint formed at and upon the inner end of the interior member the ink is shut out entirely from the joint and also from the stop portions of the joint, which are located back of the mouth of the inner member, where the inner member is less yielding and elastic, and the joint is particularly adapted for closing the outlets or mouths of vessels for containing fluid because of these peculiar characteristics, which make this joint a peculiarly effective stopper or interior joint, whereas the joint J is an exterior joint, in which the inner and stop part of the joint is necessarily more or less exposed to the approach and access of ink between the inner and the outer members of the joint and also of air, both of which or either of which under pressure may more easily expand the outer yielding member of the outer joint, so as to open the joint, than in the case of the other joint, the joint J^2, in relation to which and the members of which joint internal pressure of ink or air will tend to press the flexible or yielding inner member outwardly against the walls of its chamber in such a way as to assist in closing the joint rather than to have the effect to open and nullify it or destroy it.

The contact-surfaces of this joint J^2 will preferably be conical, and the inner member will have a flatter cone or a cone formed at a smaller angle with the axis of the joint and of its parts. The inner member may, however, be externally cylindrical and still form an effective joint of the same generic or of a different specific type if the mouth of the inner member is made sufficiently thin, yielding, and elastic. The outer member, however, should always be conical or taper in form, so as to produce a compressing effect upon the inner yielding member when the inner member is forced within the outer member. Throughout this invention the inner member of the joint J^2 is made hollow or chambered and contains no plug, but is open and free, so as to give way or yield inwardly without resistance from within when forced into its seat, chamber, or socket for the purpose of forming the joint. The joint formed between these two parts or this joint will be in the early stages of the joint a union-joint, and so far a joint not necessarily hermetical, but capable of being made hermetical by the forcing of the inner member to a sufficient extent into the outer member. The joint is a frictional conical joint, because after making the first contact further movement is necessarily a frictional movement into a narrowing chamber which produces the compression and also the elastic resistance of the inner member. It also has a progressive frictional movement of an elastic wedge order and is progressive in the sense also that as the surfaces wear in use and by contact the joint is not only maintained, but made more perfect rather than less perfect, and is also progressed, through effects of friction and wear, to a further surface within the outer member and upon the inner member. In this joint J^2, as in the other joints indicated by the letter J, further, all shoulder-contact stop action is

avoided, the progressive-wedge stop action being employed in its stead as the means of arresting the movement of the members in and upon each other and the means of locating the two parts or members in relation to each other.

The terms "progressive-wedge joint" and "conical frictional joint" or "frictional conical joint" used in this specification distinguish these joints or this joint from a cylindrical frictional joint, which requires an independent shoulder or other positive stop to stop or locate the moving member and a frictional cylindrical contact of joint-surfaces to hold the two members together. They also distinguish the same from a conical joint formed between two parate or equal conical surfaces or conical surfaces having equal angles, in which the first contact is also the final contact, and the joint-surfaces are throughout also stop-surfaces, and there is no sliding frictional movement as a means or method of forming the joint, the joint-surfaces being shaped or formed in advance, so as to fit accurately in order to form the parate joint, and not depending on or to be brought into joint relation or to be improved by frictional contact. The progressive-wedge joint and the conical frictional joint are joints the joint-surfaces of which are disparate, and they are formed, made, or completed by the frictional progression of one of these surfaces upon the other, resulting in a conical or taper joint in which the stop-surfaces are not coincident with the joint-surfaces throughout, as in the parate joint, but are differentiated therefrom and localized at or near the rear end of the joint wherever and whenever made, and thereby give the more purely joint-holding surfaces play and opportunity to conform and make and maintain joint relations and even increase, intensify, or diminish those relations when the parts are frictionally progressed or retreated one upon the other, instead of relieving, undoing, or opening them, as in the case of the parate joint, when the parts are progressed in relation to each other.

The progressive-wedge joint is a joint that is not only progressive in the sense of relative motion of one part upon or into another, but also in the sense of increase of tension or grip or pressure of one part in or upon another part and also in the sense of progressive wear due to friction between the parts and the consequent change or advance of the positions of the parts or of the joint. There may also be said to be progression in the progressive-wedge joint in the sense of an increase of contact and joint surfaces or area of joint contact between first and final contacts and highest joint tension produced by progression. In a progressive-wedge joint at least one member should be a yielding member in order to conform to and perfect the joint with the opposite and usually unyielding member, and thereby meet the difficulties of making preliminary joint fit or joint fit in advance of or before the act of bringing the parts together.

In the case of the material (hard rubber) generally used in the manufacture of fountain-pens the progressive-wedge joint properly formed is improved by wear instead of being injured or destroyed thereby, as are the cylindrical frictional and conical parate joints of the prior art. Preferably both of the joint-surfaces are conical or taper and so shaped in advance; but they may be disparate without both being taper or conical. This joint is a joint that peculiarly is not and cannot be formed in the shop and in advance as a joint by the maker of the article and its parts, but is and must be made and unmade on the instant by the user each time the parts are brought together and separated, and the intensity or strength of the joint action may be varied by the user accordingly and by him only.

As first used in the Waterman patent of May 24, 1898, the term "progressive-wedge joint" identifies or designates a joint formed at or near and within the mouth of an outer comparatively yielding and elastic member progressed upon a necessarily-tapered unyielding inner member, and it is first made and the intensity of the joint grip is and always must be greatest at the outer or exposed end of the joint-surfaces.

One of the progressive-wedge joints of this present invention is a joint of a second and different species and is a joint in which the joint is formed at or near and on the outside of the mouth of a comparatively yielding and elastic inner member progressed into a necessarily-tapered seat or chamber that is comparatively unyielding at the point of joint contact. In this last joint the grip or the resisting pressures are first made and intensified and are the greatest at or near the opposite or inner or concealed or unexposed end of the joint-surfaces and end of the inner member. In the first of these two joints the inner member is an unyielding wedge and in the second it is a yielding wedge.

The terms "progressive-wedge joint" and "conical frictional joint" therefore cover and fitly characterize at least two different joints that are generically similar, but specifically different. They may therefore properly be called "generic terms" covering a new genus in or of joints, containing at the present time at least two new species of joints and of conical joints.

Whether thus perfectly or imperfectly described and characterized, both of these joints are shown in the drawings, the first of them indicated by the letter J and the second by the letter J^2.

The cylindrical frictional joint, but without an immediately-associated stop that belongs particularly to that joint, is shown in Fig. 2 of the drawings and is indicated by the letter J^3.

The disparate joint-surfaces of the progressive-wedge joint of this invention are to be so shaped and related that the moving surface cannot pass beyond or away from the opposite surface, so as to affect the joint by releasing the joint tensions and by separating the parts. In the parate joint the parate surfaces are necessarily so related that even if they fit tightly when the joint is formed slight progression will open the joint instead of producing tension, and this danger and difficulty is materially increased by the difficulty of making the parate parts fit tightly and remain so under the influence of heat, and consequently the slightest motion either makes or increases the opening of the joint and the destruction of the joint. In the disparate joint the proper construction provides for a reserve of joint surface and relation in order to produce the proper tension and prevent material opening of the joint and also to maintain these relations and conditions indefinitely, notwithstanding heat expansion, wear, or other and all causes of change.

As a reinforcement and as one means of sustaining or helping to sustain the cap C at both ends of the reservoir, I provide a cannula or tube T, which forms a union or a union and a hermetical joint at and near the forward end of the tube with the holder, as shown in solid lines in Figs. 1 to 5, inclusive, at the forward end and in dotted lines in Figs. 1 to 3, inclusive, at the upper end of the holder. The cap C may be related to the tube T and its outer end in any one of the three methods shown in Figs. 1, 2, and 3. In Fig. 1 the parts are so formed that the cap C is to be or may be inserted into the tube T from without after the tube T is placed on or engaged with the holder, the chamber in the outer end of the tube T being made conical, with the larger end of the cone located outwardly and the smaller end of the cone inwardly. In Fig. 2 the contact-surfaces of the cap C and of the tube T are shown as cylindrical, and the two parts are capable, therefore, of sliding motion in either direction while still acting in such a way as to give each other mutual support. In Fig. 3 the cone is shown as reversed, so that the cap must or may be seated in the conical chamber at the outer end of the tube by being passed in at the other end of the tube far enough to reach the conical seat or chamber in the tube T, the outer end of which is the smallest and the inner end is the largest. Whichever of these methods is adopted, the tube when applied at the other end of the holder, as shown in Figs. 1 to 3 in dotted lines, will hold the cap C in the outer end of the tube and without permitting it to make contact with the closed end of the holder and therefore without making any possible ink-transfer from the cap to that part of the holder, the intention being to keep the closed end and all other parts of the outer surface of the holder perfectly clean and free from ink-soiling.

Instead of closing the upper end of the holder, as shown in Figs. 1 to 3, however, I contemplate the opening of that end of the holder for filling purposes and the formation of a conical chamber A′ therein to receive the closing device E, which makes, with the chamber A′ in the holder, the progressive-wedge contact on the outer surface at the inner end of the closing device E and forms a hermetical or non-capillary joint that will retain the ink in the reservoir. In addition this closing device E may have an outer socket or chamber D′, into which the cap C may be inserted, so as to make contact at or near the mouth of the socket or chamber D′ away from the ink contact-surfaces, so as to prevent any transfer of ink from the cap thereto. Where this additional closure at the upper end of the holder is used, the tube T and cap C may be brought into contact at that end of the device in the manner shown in Fig. 7 or Figs. 1, 2, and 3.

One object of opening the upper end of the holder and closing it with the device shown is to avoid any necessity for using a separate nozzle at the writing-pen end of the holder, and thereby avoiding the expense of making the joint there near the fingered surfaces and to cheapen the pen generally, and still another object is to provide means for facilitating the filling or refilling of the reservoir R, which may be done by the device shown and to be described later acting by suction to draw the ink through the feed device at the front end of the pen and thence into the reservoir, or by filling from the upper and opened end of the holder, or by the use of the ordinary drop-filler. In both of which operations and connected with the devices for both operations I provide a ball B, preferably and properly weighted, and a ball-socket S at, in, or near the rear end of the feed-bar F, this ball being round and so related to the socket that it will remain in its seat only when the pen is held perpendicular, or nearly so, with the writing-pen end downward, and thereby prevent or check the escape of ink when the upper end of the reservoir is open while containing ink and will also permit the entrance of ink when the suction device is used to draw ink into the writing-pen end of the holder and its exit from the reservoir when held in the writing position and angle, and, further, the ball being round, properly balanced or weighted, and so shaped and related that when the pen is held at the angle or angles necessary for writing it will roll automatically out of its seat and permit the ink of the reservoir to reach the feed devices and be transferred thence to the point of the writing-pen P in any ordinary manner and will roll back again into its socket easily and without causing ink-spurt. I have shown a feed-bar of the Waterman type, which is of the preferable type; but any other feed device may be used without avoiding my invention.

Behind the ball B, I also provide or may provide a socket S′, in which the ball will be seated when the fountain-pen is held with the writing-pen upward, and thereby make a partial closure of the reservoir and at the same time hold the ball B in such relation to the socket S as to enable it to find a seat in the socket S without undue agitation of the ink whenever the holder is held perpendicular with the writing-pen downward. The socket S′ may be formed either in the body of the holder or reservoir, as shown in Fig. 13, or it may be formed in or by a separate piece of tubing U, Fig. 12, which may be cut through on one side, so as to have a little spring motion and capacity for yielding and conforming to the inner surface of the holder while and after it has been pushed into the holder up to the proper point or location. This part or collar U may be traversed by fissures F′—one or more—so located as to connect the space in front of the ball B with the reservoir by capillary channels, and thereby conduct any ink that may be caught in front of the ball and feed device when the holder is turned with the writing-pen upward around and back of the ball and into the reservoir.

I contemplate, further, the formation of one or more, and preferably four, fissures F^2, traversing the inner surface of the holder or reservoir, as shown, for the purpose of assisting the movement of ink from the filler and downward or in the opposite direction when the holder is reversed, and thereby assisting the movement of the air upward during the filling of the reservoir from the upper end and at other times and also that of ink, such filling to be effected by the use of the filler L. (Shown in Fig. 8.)

With the upper end of the holder open and held uppermost, with the ball B in its seat in or near the rear end of the feed-bar, the ink may be run into the reservoir by means of the ordinary drop tube and bulb, or instead the device L may be used for that purpose, pressure on the bulb being made to force the ink down into the reservoir or time being allowed for the ink to pass down by gravity action, aided by the fissures in the inner surface of the reservoir. The terminal L′ of the filler L may preferably be made of a conical piece of hard rubber, which is to make a hermetical joint in the upper open end and conical chamber of the reservoir in the manner shown in Fig. 8. This joint being made hermetical, the ink from the bulb and tube will be transferred to the reservoir and the air therein relegated to the bulb, whereupon the filler L is to be removed and the stopper E put in place, so that its conical forward end will make contact with the conical chamber in the upper end of the holder and permanently prevent the access of ink to the joint between the two surfaces and its escape from the reservoir. The filler L may have between the terminal that makes the joint contact with the holder and the bulb B′ a graduated glass tube, marked so as to measure the contents of reservoirs of different sizes and gage the quantity of ink to be taken up and held in the filler when it is put in its place for charging the reservoir with ink, as previously described.

In Figs. 9, 10, and 11 the ball B is shown in three different positions. Fig. 9 shows the position with the holder perpendicular and the writing-pen end downward. Fig. 10 shows the position of the ball with the writing-pen in reversed position, and Fig. 11 shows the ball B in position when the pen is held at an angle from the perpendicular or when being used in writing. The ball B may be loaded or weighted by making the center to consist of a leaden ball, or a spherical chamber may be loaded with quicksilver or any other suitable metal, or means may be used to assist in giving it the proper motions and at the proper times. The ball B should be so weighted as to move with certainty, but not too suddenly, for obvious reasons.

The passage-way between the ball-chamber and the reservoir must always be large enough to prevent holding up or stopping ink-flow to the feed devices. When the pen is held in the position shown in Fig. 10 and surplus ink is caught in the feed-bar or forward of the ball B, with the writing-pen end uppermost, it will gradually find its way back into the reservoir through the fissures F′, formed in the collar U, (shown in Fig. 12,) or through the fissures F^3. (Shown in Fig. 13, which is an end view looking toward the seat and chamber of the ball B and the writing-pen and feed-bar in Fig. 11.)

In the act of filling with the drop-filler in the usual way, the ball B being seated in the rear end of the feed-bar or in its socket located at that end of the pen, the ball while not making hermetical joint contact with its socket will check the flow of ink, make it capillary, and thereby allow a sufficient amount of time to elapse before it will escape from the forward end of the feed-bar or reservoir or holder to complete the operation of closing the upper end of the reservoir by the stopper E. At the same time and as an additional precaution, the cap C being in place, any surplus ink that may escape will find its way into the chamber in the cap C, from which on reversing the holder it will return to the feed-bar and eventually to the reservoir. When the filler L is used, the ball B will be lifted or tilted from its seat while the ink is passing in and will drop into its seat and close the outlet when the flow stops and when the filler is removed.

I have shown the ventilating-hole V located in the extreme rear end of the cap C; but it may be located on the side and so as to leave a certain portion of the inner chamber of the reservoir in the form of a closed pocket, from which the ink cannot escape if peradventure in the act of filling ink should escape into the cap or feed-bar, or the hole

V may be temporarily stopped by the finger if the pen is used with that hole normally open.

The different progressive-wedge, frictional conical, or conical hermetical joints shown at both ends of the pen are preferably of the type that form the joint on the outer side near the mouth of the inner and more flexible member; but the opposite form of joint may in some or all of these places be used instead, being the joint shown in the Letters Patent granted to L. E. Waterman, No. 604,690, dated May 24, 1898. Both species of progressive-wedge or frictional conical joint are easily and cheaply made, do not require careful preliminary fitting or conformation, since one or both of the parts is yielding and will conform to the other when it is unyielding. So, also, the double joint, frictional conical, or progressive-wedge joint may be used and formed between any two of these parts, one at the inner end of the inner member and the other at the outer end of the outer member, each of these parts being capable of yielding and conforming to the opposite part with sufficient accuracy and to hold thereto with sufficient grip and tenacity to overcome capillary force and attraction and maintain the hermetical joint or seal, as well as union-joint relations.

The outer and open chamber D′ in the stopper E may be omitted, leaving the closed end of the stopper rounded like the upper end of the holder in Figs. 1, 2, and 3, and the cap C and the tube T may be related to that end of the holder, with the stopper in place in the way shown in Figs. 1, 2, and 3; but when the chamber or socket D′ is provided to receive the open end of the cap C the greatest stability would be obtained, and in case the tube T is omitted there will still remain provision for securing the cap at that end of the holder when the pen is in use as a writing instrument without danger of soiling or communicating ink to any outside or exposed part of the holder, from which it may reach the fingers or the clothing. The tube U is preferably made thin and elastic, and when made thicker it must be made sufficiently yielding to be capable of reaching its seat in the forward end of the holder in condition to be held in its place by elastic relations to the reservoir. The joint between the forward end of the tube T and the holder, as well as that between the other end of the tube and the cap, as well as that between the cap and the chamber in the upper end of the holder, are more properly of the type that forms the joint union or hermetical at and near the mouth of the outer member, but in the latter case particularly the other or inner end and member joint may be used with reasonable efficiency.

When the filler L is used or associated with the pen, an additional advantage is obtained through the facility furnished for the washing out of the reservoir, and particularly of the fissures throughout the pen and feed devices by sucking and forcing water back and forth through them by the proper use of the filler and its bulb. To the advantages already indicated are secured or added by the use of the open socket D′ at the outer end of the stopper E the advantage of a double means of securing the cap at that end of the holder, so that when the tube T happens to be misplaced or lost, as well as when purposely omitted, there will still be a means of securing the cap C at that end of the holder without bringing the ink-surfaces of the cap into contact with the holder.

In the drawings several types or species of the conical, union, and hermetical joints are shown. The joint indicated by the letter J is the same as shown in the Waterman patent of May 24, 1898. The joint J′ is in some respects a similar joint, but formed between the tube T and the exterior conical surface of the cap C. The joint indicated by the letter J^2 is a joint of the conical, progressive-wedge, hermetical, and frictional type formed between the extreme end of an inner member and the surface of the chamber into which it is inserted or into which the cap C is inserted. The joint indicated by the letter J^3 is a cylindrical joint or joint in which the opposite surfaces are cylindrical, and therefore without any implied or included stop, such as forms a part or is coincident with the conical joint of the frictional type, and the joint indicated by the letter J^4 is a joint formed between the outer end of the chamber in the holder and the outer surface of the cap C. In the presence of ink or other fluid these different kinds of joints act or perform their joint function in different ways and with different results that are important in fountain-pen construction, methods of operation, and use, as elsewhere shown in this specification.

I do not intend to confine myself to the precise form and construction shown in the drawings and described herein, as the parts may in these respects be varied without departing from the principle of the invention. The parts are shown enlarged for the purpose of better showing their form and their relations to each other; but these proportions may be in many respects varied without avoiding my invention.

I claim as my invention—

1. In fountain-pens, a cap or cover and holder engaged and held together by a frictional joint in which the cap or cover is the inner member and its mouth enters the mouth of the holder, substantially as shown and described.

2. In fountain-pens, a cap and a holder engaged and held together by a conical, union, hermetical, progressive-wedge and frictional joint, in which the cap is the inner member of the joint, substantially as shown and described.

3. In fountain-pens, a cap and a holder engaged and held together by an elastic, progressive-wedge, union joint in which the cap

is an inner and elastic member of the joint, substantially as shown and described.

4. In fountain-pens, a conical, union, hermetical, progressive-wedge and frictional joint formed between the cap and the holder at or near the mouth of the holder, the inner member of said joint being comparatively yielding, and in which the inner member of the joint is so proportioned as to make first contact with the outer member and form the joint on and by the outer surface of the inner member at or near the mouth of the outer member, substantially as shown and described.

5. In fountain-pens, a conical, union, hermetical, progressive-wedge, and frictional joint formed between a cap and a holder at or near the mouth of each, the inner member being a yielding member, and so as to prevent the ink from escaping from the inner surface of the holder and from reaching the outer surface of the holder.

6. In fountain-pens, a cap and a holder engaged and held together by a conical, union, hermetical, progressive-wedge and frictional joint located at or near the mouth of each, the mouth of the cap entering a chamber in the mouth of the holder and forming the said joint by and between the exterior surface of the cap at or near its open end and the opposite surface of the chamber in the holder, substantially as shown and described.

7. In fountain-pens, a hollow, elastic stopper for the upper and open end of a holder and the holder open at its upper end and provided with a conical seat or chamber engaged and held together by a conical, union, hermetical, progressive-wedge and frictional joint formed between the outer surface of the hollow stopper at or near its open end and a conical chamber in the upper end of the holder, substantially as shown and described.

8. In fountain-pens, a hollow, elastic stopper for the upper and open end of a holder and the holder open at its upper end and provided with a conical seat or chamber engaged and held together by a conical, union, hermetical, progressive-wedge and frictional joint, substantially as shown and described.

9. In fountain-pens, a stopper for the upper and open end of a holder the outer end of which is provided with a chamber to receive the open end of a fountain-pen cap and hold the same in place while the pen is in use for the purposes of writing, and a holder, said stopper and holder being held together by a conical, union, hermetical, progressive-wedge and frictional joint, substantially as shown and described.

10. In fountain-pens, a cap and a holder engaged and held together by a conical, union, hermetical, progressive-wedge and frictional joint, in combination with a reinforcing-tube which at one end makes a conical, union, progressive-wedge and frictional joint with the holder and at the other end with the cap, substantially as shown and described.

11. In fountain-pens, a cap and a holder engaged and held together by a conical, union, hermetical, progressive-wedge and frictional joint, in combination with a reinforcing-tube that makes a frictional union-joint at one end with the holder and at the other end with the cap, substantially as shown and described.

12. In fountain-pens, a holder and a reservoir open at the upper end and provided with a stopper for closing the same, provided also with feed devices and with a ball and ball-valve seat located at or near the inner end of the feed devices for closing the writing-pen end of the reservoir while the reservoir is being filled, and also with a cap which forms a conical, hermetical joint with the writing-pen end of the holder while the reservoir is being filled, substantially as shown and described.

13. In fountain-pens, a ball and a ball-valve seat located at or near the inner end of the feed devices, consisting of a feed-bar provided with a groove and capillary fissures, the ball covering and closing the inner end of the groove or air-duct in the feed-bar, but leaving the fissure or fissures in the feed-bar open or uncovered, substantially as shown and described.

14. In fountain-pens, a ball and a ball-valve seat located at or near the inner end of the feed devices and also provided with a valve-seat for the ball back of the ball and in the holder or reservoir, substantially as shown and described.

15. In fountain-pens, a ball of a ball-valve in combination with two ball-valve seats, one located in front of the ball at and near the inner end of the feed-bar and the other located behind the ball at and near the outer or writing-pen end of the reservoir, substantially as shown and described.

16. In fountain-pens, a ball of a ball-valve in combination with two ball-valve seats, one located in front of the ball at and near the inner end of the feed-bar and the other located behind the ball at and near the outer or writing-pen end of the reservoir, the feed devices in front and the valve-seat behind the ball being provided with capillary fissures for the movement of ink in either direction between the reservoir and the point of the writing-pen, substantially as shown and described.

17. In fountain-pens, a holder and a reservoir open at the upper end and provided with a stopper for closing the same, also provided with a ball and ball-valve seat located at or near the inner end of the feed devices for closing the writing-pen end of the reservoir sufficiently while the reservoir is being filled and the pen is held perpendicular, the ball being so balanced as to roll out of its seat and open the way for the air to enter and the ink to pass from the reservoir to the feed devices when the

fountain-pen is held in position for writing, substantially as shown and described.

18. In fountain-pens, a holder and reservoir provided with a ball and ball-valve seat located at or near the inner end of the feed devices for closing the writing-pen end of the reservoir, the ball being so balanced as to roll out of its seat and open the way for the air to enter and the ink to pass from the reservoir to the feed devices when the fountain-pen is held in position for writing, substantially as shown and descsibed.

19. In fountain-pens, a filler and filler-terminal and a holder engaged and held together by a conical, union, hermetical, progressive-wedge and frictional joint formed by and between the filler and the holder at the writing-pen end of the holder, substantially as shown and described.

20. In fountain-pens, a filler and filler-terminal and a holder engaged and held together by a conical, union, hermetical, progressive-wedge and frictional joint formed by and between the filler and the holder, alternatively, either at the upper and open end or at the writing-pen end of the holder, at will, the filler-terminal and the chambers at the opposite ends of the holder being made of such relative dimensions as to make contact and form such joint at either end of the holder, substantially as shown and described.

21. In fountain-pens, a filler and a holder engaged and held together by a conical, union, hermetical, progressive-wedge and frictional joint formed between the holder and the terminal of the filler at the upper end of the holder, in combination with a ball-valve and valve-seat located at and near the inner end of the feed devices as and for the purposes set forth, substantially as shown and described.

22. In fountain-pens, a hollow stopper for the upper and open end of the holder the outer end of which is provided with a chamber to receive the fountain-pen cap and hold the same in place while the pen is in use for the purposes of writing, and a holder, said stopper and holder being held together by a conical, union, hermetical, progressive-wedge and frictional joint, substantially as shown and described.

23. In fountain-pens, a hollow, elastic stopper for the upper and open end of a holder the outer end of which is provided with a chamber to receive the fountain-pen cap and hold the same in place while the pen is in use for the purpose of writing, and a holder engaged and held together by a conical, union, hermetical, progressive-wedge and frictional joint and stop located at or near the mouth of the inner member, substantially as shown and described.

24. An elastic non-capillary joint for the convenient opening and hermetically closing of the outlets of vessels to contain fluids, consisting in a conical progressive-wedge, hermetical, and frictional joint in which the inner member is a hollow, comparatively-yielding, elastic member and the joint is formed at or near the extreme open end and on the outside of the inner member, substantially as shown and described.

JAMES A. SKILTON.

Witnesses:
CHARLES HANIMANN,
EDWARD S. BERRALL.