June 8, 1937. T. F. MOORE 2,083,389

WELL POINT

Filed May 7, 1936

Fig. 1.

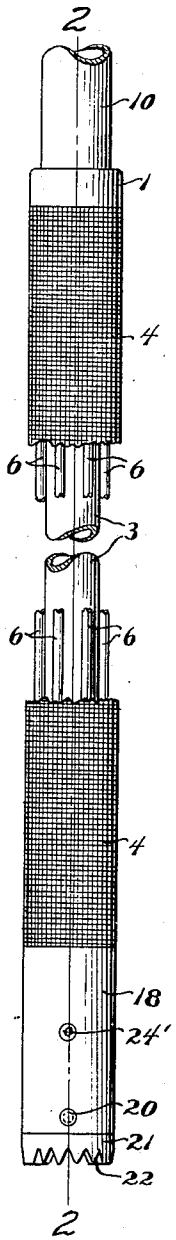


Fig. 2.

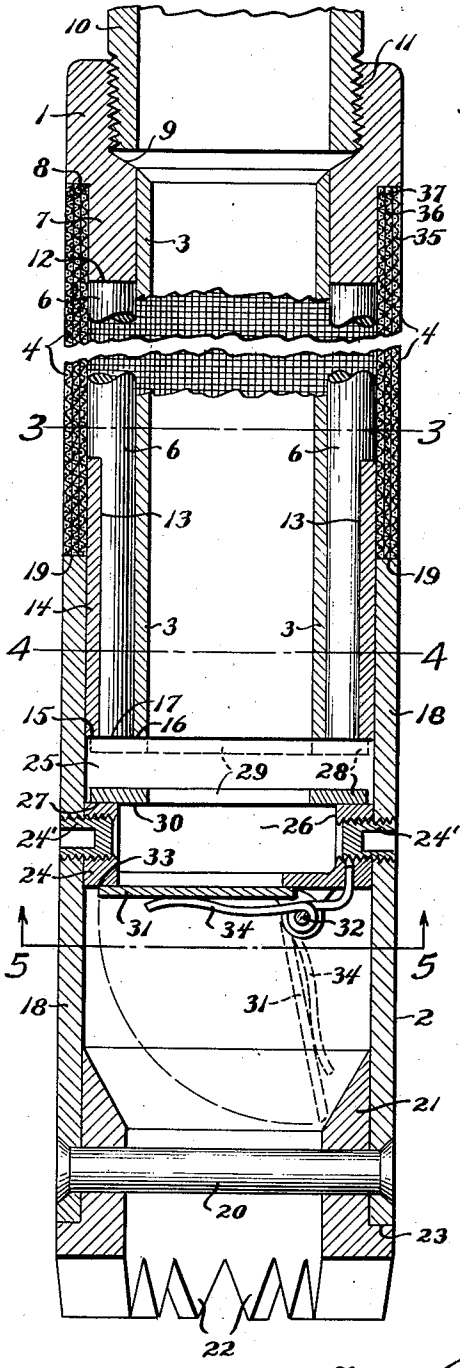


Fig. 3.

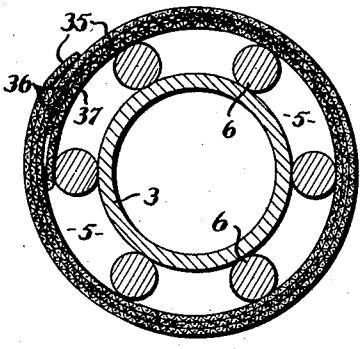


Fig. 4.

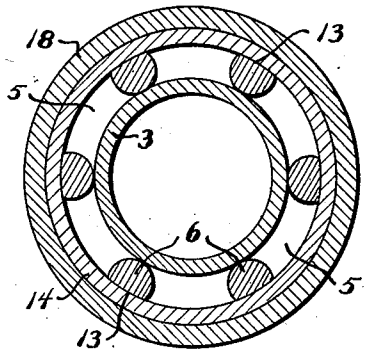
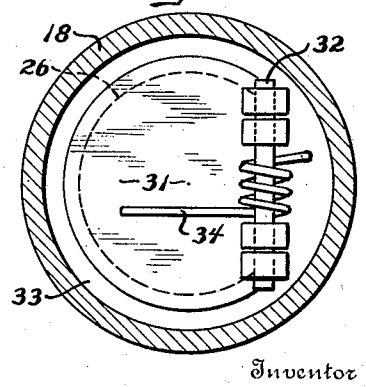


Fig. 5.



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2,083,389

WELL POINT

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Application May 7, 1936, Serial No. 78,460

4 Claims. (Cl. 166—5)

This invention relates to well points, and more particularly, to those types of well points which are adapted to produce a jetting action on the soil into which the well points are to be sunk, following which the well points are utilized for drawing off seepage or drainage fluids in the soil through a suction action.

The primary object of the present invention is to provide a well point construction of such a character as to be readily and easily fabricated or assembled, and which particularly lends itself to manufacture as a welded assembly or unit.

A further object of the invention is to provide a well point construction in which the various parts are of more simple design, and hence less expensive in manufacturing cost. In other words, it has been my aim to reduce, as much as possible, expensive machining operations in the fabrication of the well point, and eliminate intricate castings, such as have heretofore been employed. It has been found from actual experience that imperfections frequently occurred in these intricate castings formerly employed, even though considerable care and skill was exercised in the production of the castings. The elimination of such castings and the attendant objections thereto in respect to their structural deficiencies and the high cost of manufacture is of considerable advantage in the production of an inexpensive well point.

A still further object of the invention is to provide a well point having a direct unobstructed axial passage therethrough for the jetting fluid through the entire well point from top to bottom thereof, together with an improved valve assembly adapted to automatically control the jetting and drainage or suction actions.

Another object of the invention is to provide in a well point of the character hereinbefore referred to, an improved filtrate chamber construction from which the seepage or drainage fluid is directed into an unobstructed axial passage through the well point to permit the fluid to be withdrawn by suction, said filtrate chamber having a plurality of passages establishing communication between the same and the axial passage through the well point, and these communicating passages being formed by radially spaced concentric tubes or pipes, the lower ends of which terminate in the same plane and constitute a seat for a ring valve, the latter being adapted to automatically control the opening and closing of said communicating passages, according to whether the suction or jetting operations are being performed.

Other objects and advantages of the invention will be hereinafter described and the novel features thereof defined by the appended claims.

In the drawing:—

Figure 1 is a side elevation, partly broken away, of a well point embodying the essential features of my invention;

Figure 2 is an enlarged longitudinal sectional view, partly broken away, of the same well point, taken approximately on line 2—2 of Figure 1;

Figure 3 is a transverse sectional view taken approximately on line 3—3 of Figure 2;

Figure 4 is a transverse sectional view taken approximately on the line 4—4 of Figure 2; and

Figure 5 is a transverse sectional view taken approximately on the line 5—5 of Figure 2.

Like reference characters designate corresponding parts in the several figures of the drawing wherein the well point is illustrated as being of cylindrical or tubular form of any suitable length, and having a substantially uniform external diameter from end to end to enable it to be sunk endwise into the soil, so that when brought to the required depth, the fluid in the soil may be withdrawn through the well point by some suitable suction device (not shown) connected with the upper end of the well point.

As illustrated, the well point comprises, in general, an upper head 1, and a lower head or shell 2, these heads being spaced apart axially any desired distance, and having an inner coaxial jetting-and-suction pipe or conduit 3 extending therebetween and projecting into these respective heads at its opposite ends. A tubular filtering screen, generally designated 4, surrounds the pipe 3 in radially spaced concentric relation thereto to form an intervening filtrate chamber 5 for receiving the drainage or seepage fluid from the soil after passing through the screen. Rods 6 maintain the filtering screen 4 in radially spaced relation to the pipe 3, and these rods are arranged in uniformly spaced relation around the pipe 3, and are fixed thereto, as by welding. The rods also serve to reinforce the screen and prevent the same from being crushed inwardly, while affording unobstucted passages between the rods through which the seepage or drainage fluid may pass downwardly about the outer surface of the conduit 3.

Upper head

The upper head 1 is preferably provided with a reduced annular flange 7 depending from the lower end thereof, and outer and inner annular shoulders 8 and 9 respectively. When the well

point has been assembled, the filter screen 4 abuts against the outer shoulder 8 so as to form a smooth joint at this point, whereby the well point may be sunk into the ground and withdrawn without having any projections extending from the unit which would tend to resist the axial movement of the well point. The upper end of the head 1 is adapted to be connected with an extension pipe 10, as by a threaded connection 11, and the shoulder 9 forms a seat for the end of this extension pipe 10, preventing the latter from being screwed into the head farther than is necessary. The extension pipe may be of any desired length and is adapted to be connected at its upper end to a fluid pressure pump or other source of fluid supply from which the jetting fluid may be conveniently obtained, or it may be connected to a suction device for withdrawing the drainage or seepage fluid from the soil through the well point, as will more fully appear hereinafter. The inner diameter of the extension pipe 10 is preferably equal to, or slightly greater than, the inner diameter of the conduit 3 so that a substantially uniform flow of the fluid through the well point and the extension pipe 10 may be obtained.

Spacing rods

The spacing rods 6 are preferably cylindrical and are arranged in circumferentially spaced relation around and against the outer periphery of the conduit 3 and are welded thereto, if desired, to hold them in their uniformly spaced relation and with their upper ends abutting against the lower face 12 of the depending annular flange 7 of the upper head 1. The lower portions of the spacing rods 6 are machined down, as at 13, thereby affording recesses therein, as best seen in Figures 2 and 4. A relatively short length of pipe, such as designated by the reference character 14, fits over the assembly of rods 6 and seats within the recesses 13. The depth of the recesses 13 is preferably equal to the thickness of the pipe 14 so that the outer surface of the pipe 14 will be flush with the outer surfaces of the rods 6, as will be understood from reference to Figure 2. The pipe 14 is preferably secured to the rods 6, as by welding, and the lower end 15 of the pipe 14 terminates on a level with the lower end 16 of the conduit 3, as do the lower ends of the rods 6. In other words, the lower end faces of the pipe 14, the spacing rods 6 and the conduit 3, all lie in the same transverse plane, and these ends constitute a valve seat for one of the valves hereinafter described. The upper portion of the pipe 14 is preferably utilized to anchor the lower end of the filter screen 4, as by welding the latter to the outer surface of the pipe 14.

Lower head or shell

The lower head 2, according to my improved well point construction, comprises a tubular shell or pipe 18, instead of the usual heavy casting heretofore most commonly employed, and this pipe 18 is of uniform internal and external diameter throughout its length. The upper portion of the pipe 18 is adapted to fit snugly about the lower end of the pipe 14, and is preferably secured to the latter, as by welding. The upper end face 19 of the pipe 18 provides a shoulder similar to the shoulder 8 on the upper head 1, and the lower end of the filter screen 4 abuts the upper face 19 of the pipe 18 and likewise forms a smooth joint at this point.

Secured to the lower end of the shell or pipe 18, as by means of the diametrically extending rivet 20, is a pilot section 21 having teeth or serrations 22 on the lower end thereof. This pilot section facilitates the sinking of the well point in the soil inasmuch as the teeth 22 will break the soil loose below the well point pursuant to a rotary or oscillatory movement of the well point about its longitudinal axis. The upper end of the pilot section is reduced in diameter so as to fit snugly within the lower end of the shell or pipe 18, and thus provides a shoulder 23 adapted to abut against the lower end of the shell or pipe 18, as best seen in Figure 2. The rivet 20 not only serves to anchor the pilot member to the lower end of the shell or pipe 18, but also serves to prevent large stones and the like from being drawn or forced up into the interior of the well point.

Mounted within the shell or pipe 18 so as to be preferably removable, is a frame 24, which is positioned in axially spaced relation to the lower ends of the pipe 14, spacing rods 6 and conduit 3, the frame being secured to the pipe 18, as by means of set screws 24'. For convenience of description, this intermediate space 25 is termed a valve chamber. The frame 24 is provided with a bore 26 which is preferably greater than the internal diameter of the conduit 3, and the upper face 27 of the frame constitutes a valve seat for the valve 28, which is disposed in chamber 25. This valve 28 is of ring-like form, and is preferably made of metal or some other hard material which is capable of resisting wear during operation thereof, and the diameter of the opening 29 through the valve 28 is preferably substantially equal to the internal diameter of the conduit 3, but less than the internal diameter of the bore 26 in the frame 24. Thus the ring valve 28 overhangs the bore 26, as at 30. During the jetting operation, the back pressure of the jetting fluid acts upon the lower face of this overhanging portion 30 of the ring valve 28 and causes the ring valve to be forced upwardly against the seat formed by the lower faces 15, 17 and 16 of the pipe 14, rods 6 and conduit 3. The seating of the ring valve 28 against its upper seat is represented by dotted lines in Figure 2, and when so seated, the ring valve closes the lower end of the passages between the spacing rods 6 which normally direct the drainage or seepage fluid from the filtrate chamber 5 into the valve chamber 25, from which this fluid may be withdrawn through the conduit 3 by suction, after the well point has been sunk to the required depth. During the suction operation, the ring valve 28 will fall of its own weight, to the bottom of the valve chamber 25 and rest upon its seat 27, as represented by full lines in Figure 2. The primary purpose in causing the ring valve 28 to be forced against its upper seat and close the drainage passages is to prevent the jetting fluid from passing into the filtrate chamber and out through the filter screen 4 during the jetting operation. If this outward flow of the jetting fluid through the filter screen were permitted, a considerable portion of the force of the jetting fluid would be lost, whereas by blocking the filtrate chamber against entrance of the jetting fluid during the jetting operation, the full force of the jetting fluid is obtained at the lower end of the well point where it is most de-

sired to erode the soil for the purpose of sinking the well point.

The frame **24** carries at its lower side a self-closing check valve **31**, hinged at one side, as at **32**, to the lower end of the frame so as to permit the valve **31** to swing open, as to the dotted line position indicated in Figure 2. When closed, the check valve **31** seats against the lower face **33** of the frame **24**, and thus closes the otherwise unobstructed axial passage extending from end to end through the well point. A relatively stiff yieldable spring **34** normally holds the check valve **31** closed against its seat **33**, and this check valve is preferably made of metal or some other relatively hard material to resist wear which tends to be produced by the repeated impact of the valve against its seat. When the valve **31** is swung to its open position, as shown in dotted lines in Figure 2, the axial passage through the well point is virtually unobstructed from end to end, and the jetting fluid will follow a straight or axial path through the well point, and hence will reach the lower end of the well point without any appreciable diminution of its force. This unobstructed straight line or axial passage of the jetting fluid through the well point is a material improvement over those well points heretofore employed which are so arranged that the jetting fluid must traverse a tortuous or irregular path in passing therethrough.

The spring **34** is tensioned against the under side of the valve **31** with sufficient pressure to firmly close the valve against its own weight as soon as the jetting operation ceases, and during the suction operation, the suction will aid materially in firmly holding the valve in its closed position to not only expedite the withdrawal of the drainage or seepage fluid, but also to prevent the passage of any underlying material into the suction device through the conduit **3**. The valve **31** may therefore be said to be self-closing; that is, it will automatically close as soon as the jetting operation ceases. To begin the jetting operation, the pressure of the jetting fluid on the upper side of the valve **31** automatically causes the valve to swing open and out of the path of the jetting fluid, and the valve will remain open as long as the jetting operation is continued, but automatically closing when the pressure of the jetting fluid on the valve is relieved.

Filter screen

The filter screen **4** is tubular in form and preferably of special construction so as to obviate the use of external lengthwise reaming bars which have heretofore been employed, and comprises, in general, a laminated foraminous screen preferably composed of three layers, **35**, **36** and **37**, superimposed upon each other and wrapped as a unit about the spacing rods **6**, about the reduced end **7** of the upper head **1** and about the upper portion of the short tube or pipe section **14**, so as to lie snugly in between the shoulders **8** and **19**. The inner screen layer **37** and the outer screen layer **35** are preferably made continuous and of comparatively heavy wires interwoven to form a relatively coarse mesh, and of sufficient circumferential lengths to extend, in this instance, slightly more than two complete turns around the outer surfaces of the rods **6**, so that its ends may overlap, as shown in Figure 3. The other layer **36** is approximately one-half the length of the continuous layers **37** and **35**, to wrap around said rods slightly more than a single turn to enable its ends to overlap, and is composed of wires of comparatively small gauge interwoven to form a relatively fine mesh. The axial lengths of all the layers are approximately equal to each other, and equal to the distance between the shoulders **8** and **19**, as previously mentioned. The layers may be preassembled, one upon the other, with their corresponding ends in the same transverse plane, and may then be wrapped firmly around the outer surfaces of the rods **6** in such manner that the finer mesh layer will be interposed between the inner turn of the coarser mesh layers, as shown particularly in Figure 3, thus bringing approximately one-half of the coarser mesh layer in direct contact with the rods, and its remaining half around the outer surface of the finer mesh layer.

For example, as shown in Figure 3, one end of the coarse mesh layer **37** is welded or otherwise firmly secured to the outer surface of one of the rods **6**, after which, the corresponding end of the finer mesh layer **35** may be welded or otherwise secured to the outer surface of the coarser layer just beyond the line of securement of the latter layer to the rod, the two layers being then wrapped slightly more than one turn around the outer surfaces of the remaining rods **6**. The remaining portion, **35**, of the coarser mesh screen is then wrapped another turn around and upon the outer surface of the finer mesh layer **36**, and slightly beyond the first ends of both layers **37** and **36**, in overlapping relation, the free end of the layer **35** being welded or otherwise secured to the outer surface of the preceding turn so as to complete the tubular form of the laminated screen.

It will be clear that the coarser mesh layers **35** and **37** cover respectively the outer and inner surfaces of the finer mesh layer **36**, to protect the latter against injury by contact with the rods **6** and with the soil, and at the same time the screens, particularly the finer mesh layer, filter the seepage or drainage fluid as it passes from the soil into the well point, to the exclusion of the solids. Such an arrangement also prevents the finer mesh screen from becoming clogged as readily during sinking of the well point, as would be the case were this screen directly exposed to the soil, inasmuch as the outer coarser mesh layer displaces the contiguous soil as the well point descends. The rods **6** reinforce and stiffen the filter screen, and prevent the same from being crushed inwardly, thus insuring that the filtrate chamber **5** and the passages leading therefrom will be free to receive the drainage or seepage fluid. The maximum capacity of the filtrate chamber under widely varying external or internal radial pressures during the suction-and-jetting operations is therefore maintained.

Operation

The well point is usually placed in an upright position with its lower end resting upon the ground at the point where it is to be sunk, and its upper end is connected to a pressure pump or other source of supply of the jetting fluid, such as water, which is then caused to pass downwardly into the well point, through the conduit **3** and through the opening **29** in the ring valve **28**, thereby forcing check valve **31** open to allow the fluid to continue its unobstructed flow through the pilot section **21** to impinge against the underlying soil for erosion purposes.

The resistance of the soil to the free passage of the fluid through the outlet at the lower end of the well point causes more or less of the fluid

to become trapped in the lower end below the conduit 3, resulting in an upward deflection of a part of said jetting fluid, with a tendency to escape through the drainage passages and filtrate chamber 5 and out through the filter screen 4, but this upwardly deflected fluid immediately impinges against the under side of the overhanging portion 30 of the ring valve 28 and lifts the same into engagement with its upper seat formed by the radially spaced lower ends 15 and 16 of the pipe 14 and the conduit 3, thus closing off the filtrate chamber and drainage passages, and allowing the full force of the jetting fluid to be directed against the underlying soil for displacing the same to cause the well point to sink therein under its own weight. During this jetting operation, the sinking of the well point may be aided by a rotary or oscillatory motion of the well point about its vertical axis.

The sinking operation is preferably continued until the entire length or major portion of the tubular screen 4 is brought below the level of the fluid in the soil to be drained, to allow the drainage of the fluid from the soil through the tubular screen 4 into the filtrate chamber 5. It is to be understood that as long as the jetting operation continues, the valve 31 will be held open by the downward pressure of the jetting fluid against the action of the spring 34, and that the upward pressure of the trapped fluid in the well point below the ring valve 28 will effectively close the latter against its upper seat to prevent the escape of the jetting fluid outwardly through the screen 4.

When the well point has been sunk to the required depth, the jetting fluid is shut off, thus permitting the check valve 31 to be closed automatically by its spring 34, and at the same time, the ring valve 28 will drop by its own weight onto its lower seat 27, thus opening communication between the filtrate chamber 5 and the valve chamber 25 to allow the seepage or drainage fluid from the soil to pass through the filter screen 4 into the filtrate chamber and thence downwardly through the passages between the lower ends of the rods 6 into the chamber 25, from which the fluid may be withdrawn by a suitable suction device applied to the upper end of the well point. The suction, which may be derived from any suitable suction device (not shown) aids in holding the check valve 31 in its closed position as long as the suction operation continues, to prevent any possibility of the underlying soil passing upwardly through the well point into the suction pump. By reason of the fact that the valve 31 remains closed during the suction operation, the entire suction force may be directed to the withdrawal of the fluid from the soil, leaving the lower part of the well point below the valve 31 free from the influence of the suction action. It will be understood that the operations of both valves 28 and 31 are entirely automatic during the jetting-and-suction periods, and that the suction action is confined entirely to the withdrawal of the seepage or drainage fluid which enters the filtrate chamber through the filter screen, and the force of the jetting fluid is confined entirely to the erosion of the soil below the well point, thus contributing materially to the economic and expeditious sinking of the well point into the soil and removal of seepage or drainage fluids therefrom.

In case the area of the soil to be drained is relatively large, a proportionate number of the well points may be similarly sunk in or around said area and connected to a common source of supply for the jetting fluid so that all of them may be sunk simultaneously or in quick succession and they may be similarly connected to the same suction device for removing the seepage or drainage fluid from the soil in one operation.

From the foregoing description of the various elements from which the well point is fabricated, it should be obvious that the assembly is quite simple, and when the parts are completely assembled, the well point is virtually a rigid integral unit, and is quite rugged. Moreover, it will be noted that the major portion of my new well point is composed of comparatively inexpensive stock materials such as tubing, rods, screen, etc., all of which are readily procurable and comparatively inexpensive. When the various elements are assembled, the well point unit is of substantially uniform diameter from end to end, and has no shoulders or projections on the outer surface thereof which offer resistance to the axial movement of the well point into or out of the soil. In other words, the surface of the well point unit is continuous and of substantially uniform smoothness from end to end.

While the details have been herein shown and described, the invention is not confined thereto, as changes and alterations may be made without departing from the spirit thereof as defined by the appended claims.

What I claim as new and desire to secure by Letters Patent, is—

1. In a well point adapted to be sunk into fluid containing soil, an inner tubular conduit, a tubular filter surrounding said conduit in spaced relation thereto to form an intervening filtrate chamber, a lower head comprising a tubular shell coaxial with the inner conduit and into which the lower end of the latter extends, a pipe section having a portion thereof received within the upper end of the shell and extending above the upper end of the latter, said shell being secured to the pipe section and said pipe section being secured to the inner conduit in spaced relation to the latter, the lower end of said conduit and the lower end of said pipe section being disposed in the same transverse plane and constituting an annular valve seat, an inflexible ring valve means within the shell adapted to coact with said seat, and supporting means for said valve means normally supporting said valve means in spaced relation to said seat to establish communication between the filtrate chamber and the inner conduit so as to permit withdrawal of the drainage fluid from the filtrate chamber when suction is applied to the conduit, and said valve means being adapted to automatically close against said seat when a jetting fluid is passed through the conduit.

2. A well point having a tubular upper head, a tubular filter screen secured at its upper end about said head, a conduit located within and spaced from said filter screen and secured to said head in concentric relation thereto, thus providing a drainage space intermediate the filter screen and conduit, spacing members secured to the conduit about the outer periphery thereof, a pipe section disposed about the lower ends of said spacing members and secured thereto, whereby to provide drainage passages below the drainage space in open communication with said drainage space, the upper end of said pipe section projecting within the lower end of said filter screen, the lower end of said pipe section and the lower end of said conduit terminating in the same transverse plane to provide an annular valve seat at the lower end of the drainage

passages aforesaid, a tubular shell extending about the lower end of said pipe section and secured thereto, a ring valve within said tubular shell adjacent to said seat aforesaid and actuatable by the rearward deflection of a jetting fluid to cause the valve to seat against the aforesaid seat and close the drainage passages, means for normally supporting said valve in spaced relation to said seat, and a normally closed check valve mounted within the tubular shell and actuatable by said jetting fluid to permit discharge of the jetting fluid from the lower end of the shell.

3. A well point comprising tubular axially spaced heads, a conduit extending between said spaced heads and fixed thereto in concentric relation therewith to provide a straight axial fluid passage through the well point from end to end, the lower end of said conduit extending into the upper end of said lower head in radially spaced relation thereto whereby to form an annular passage therebetween, a tubular filter screen interposed between said heads and surrounding said conduit in radially spaced relation thereto to provide a filtrate chamber therebetween communicating with the annular passage aforementioned, a pipe section surrounding the lower end of said conduit in spaced relation thereto and having its lower portion disposed within the upper end of the lower head, and its upper portion extending within the lower end of said tubular screen, the lower end of said pipe section and the lower end of said conduit terminating in the same transverse plane to provide an annular valve seat, valve means mounted within the lower head and adapted to coact with said valve seat, said valve means being of ring-like form, and means for normally supporting said valve in spaced relation to said valve seat to establish communication between said filtrate chamber and the lower end of said conduit through the annular passage between the conduit and the pipe section, and said valve means being further adapted to move against said seat and close the lower end of said annular passage responsive to the passage of a jetting fluid through the well point.

4. A well point comprising an upper tubular head adapted to be interchangeably connected at will with a source of jetting fluid and with a suction pump, a tubular conduit depending from said head and coaxial therewith, a tubular pipe section surrounding the lower end of the conduit and radially spaced therefrom, a tubular foraminous filter surrounding said conduit and spaced therefrom and coaxial therewith, said filter being secured at its upper end to the upper head, and at its lower end to the upper portion of the pipe section, a tubular shell having its upper end extending about the lower portion of the pipe section, but terminating at its upper end below the upper end of said pipe section, said shell extending a substantial distance below the conduit and filter, a frame secured within the shell below the lower ends of said conduit and pipe section in axially spaced relation thereto, said frame having an axial bore therethrough, an inelastic ring valve interposed between the frame and the lower ends of the conduit and pipe section and having a portion of the body of the ring disposed in overhanging relation to the bore of the frame, the upper side of the frame constituting the lower seat for the ring valve, and the lower ends of the conduit and pipe section together constituting the upper seat, and a self-closing valve mounted on the frame and normally adapted to seat against the lower side thereof to close the bore through the frame, said ring valve being adapted to automatically seat on its upper seat and said self-closing valve being adapted to automatically open responsive to the passage of a jetting fluid through the conduit whereby to direct all of the jetting fluid through the shell and outwardly at the lower end thereof.

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