

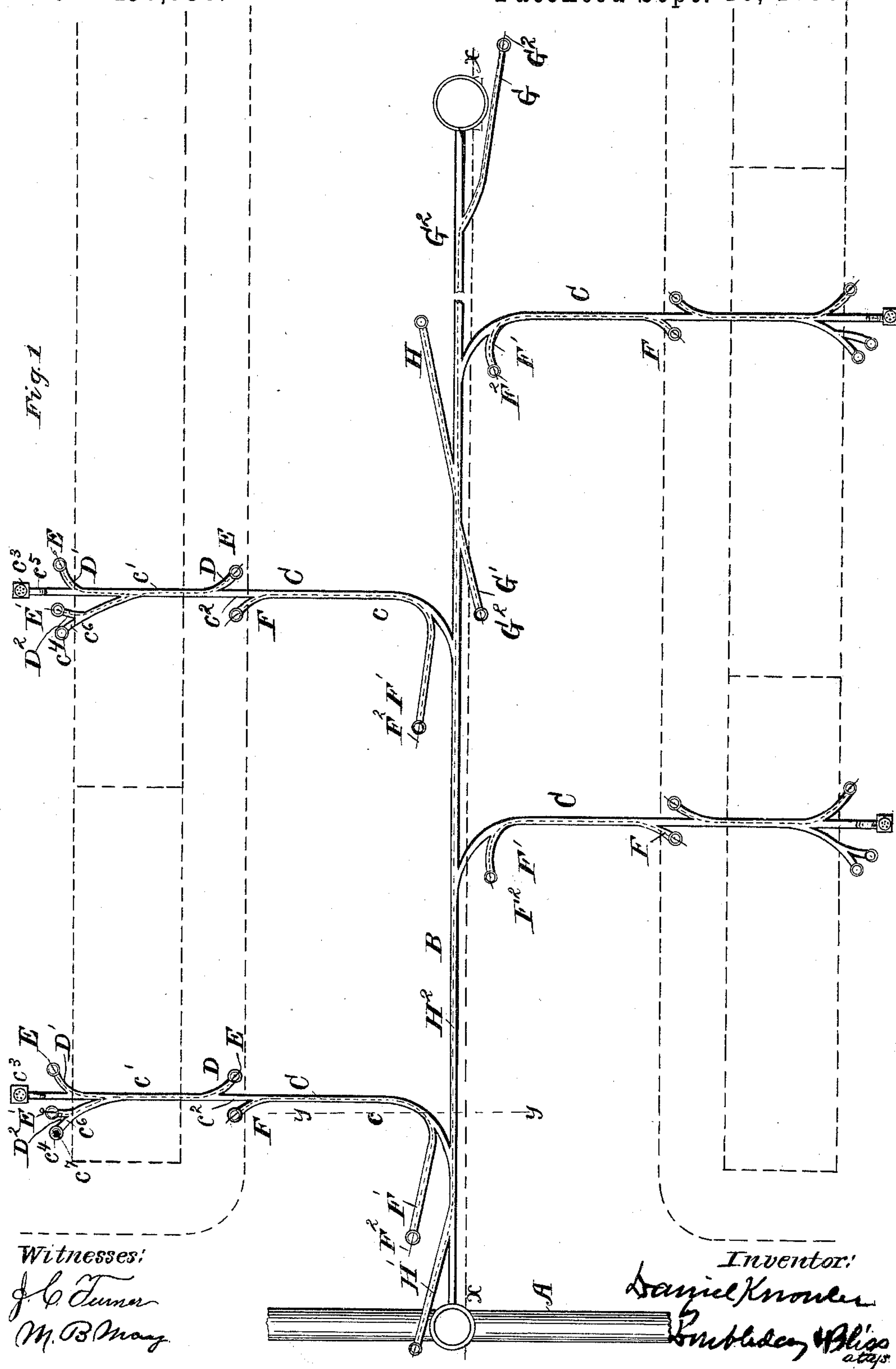
(No Model.)

2 Sheets—Sheet 1.

D. KNOWLES.  
SEWER.

No. 436,736.

Patented Sept. 16, 1890.





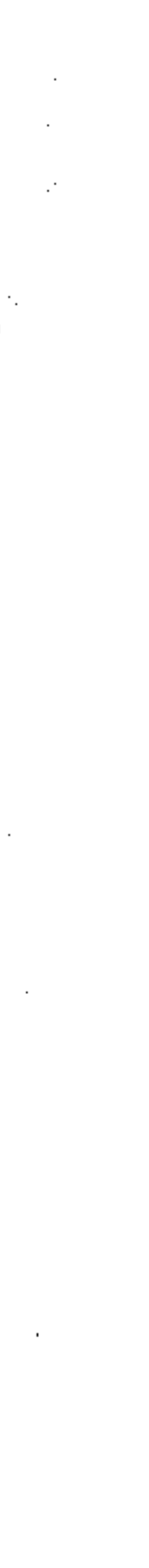
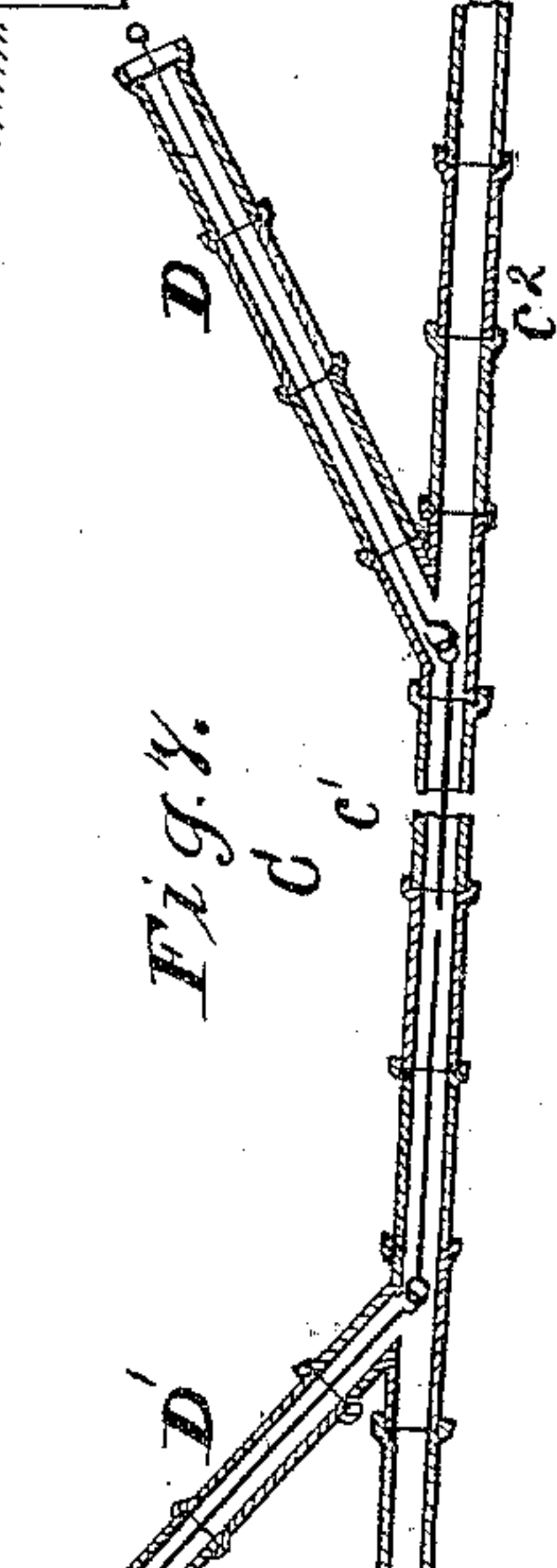
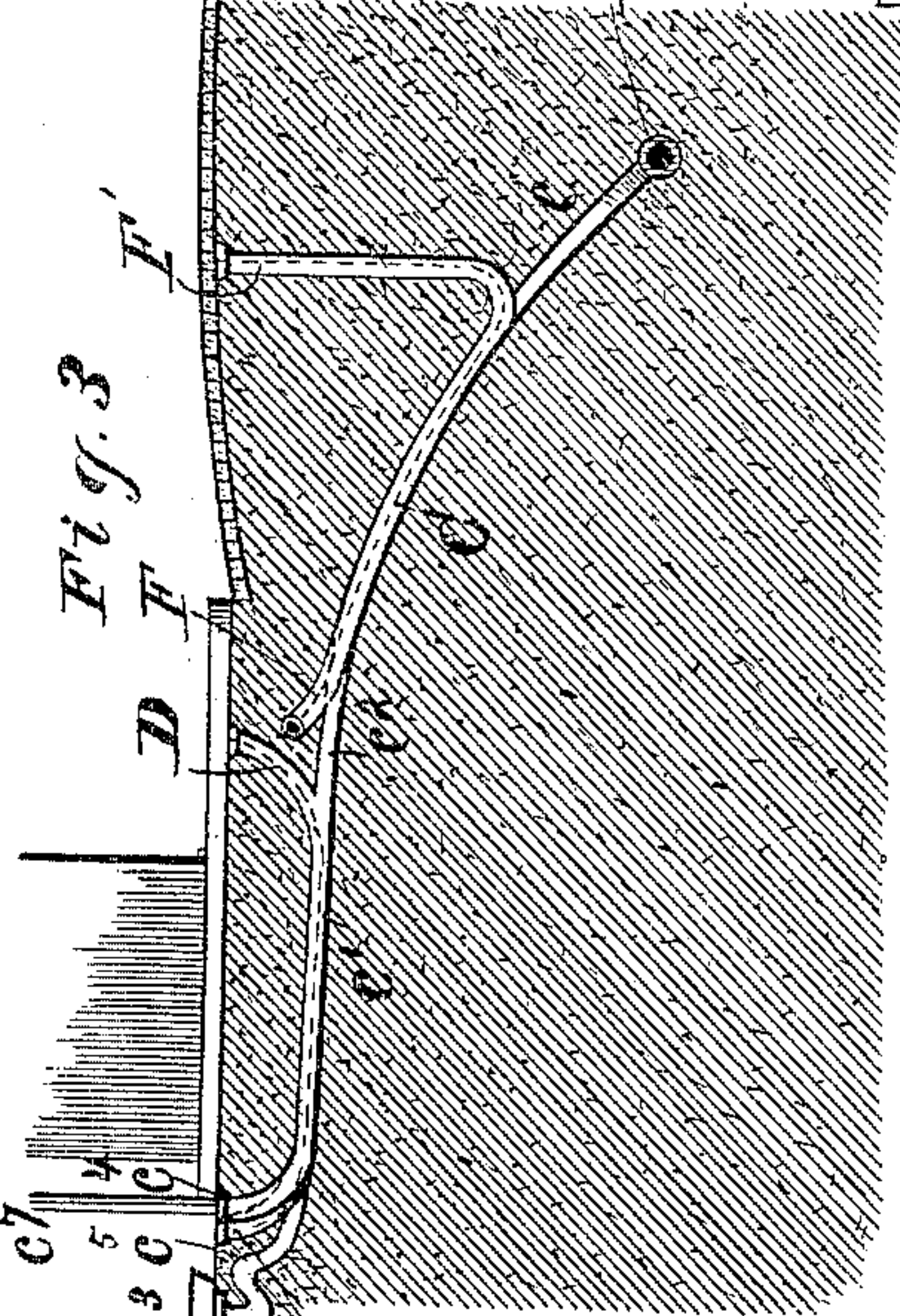
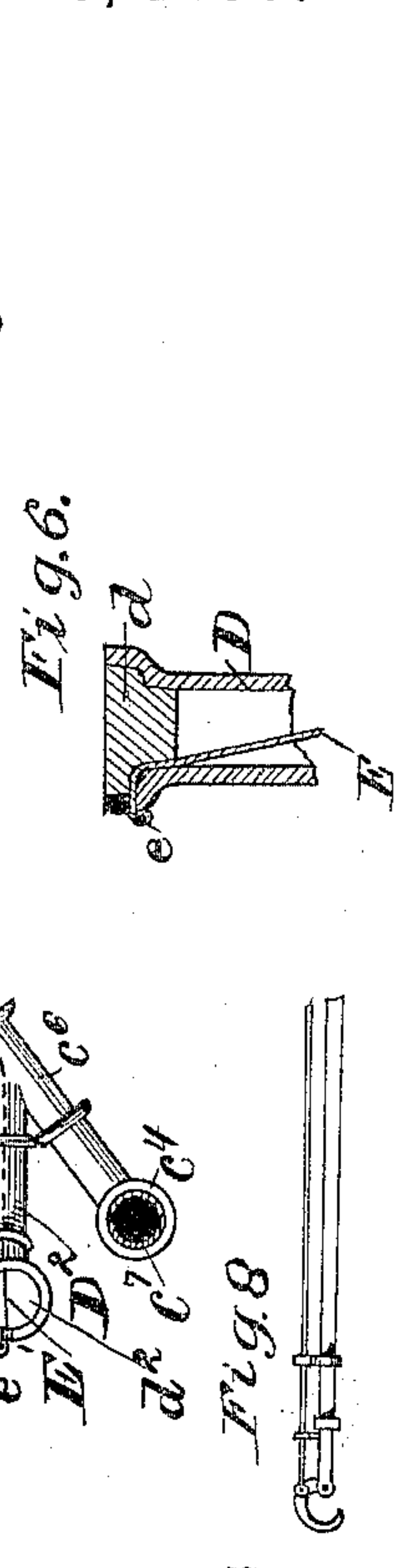
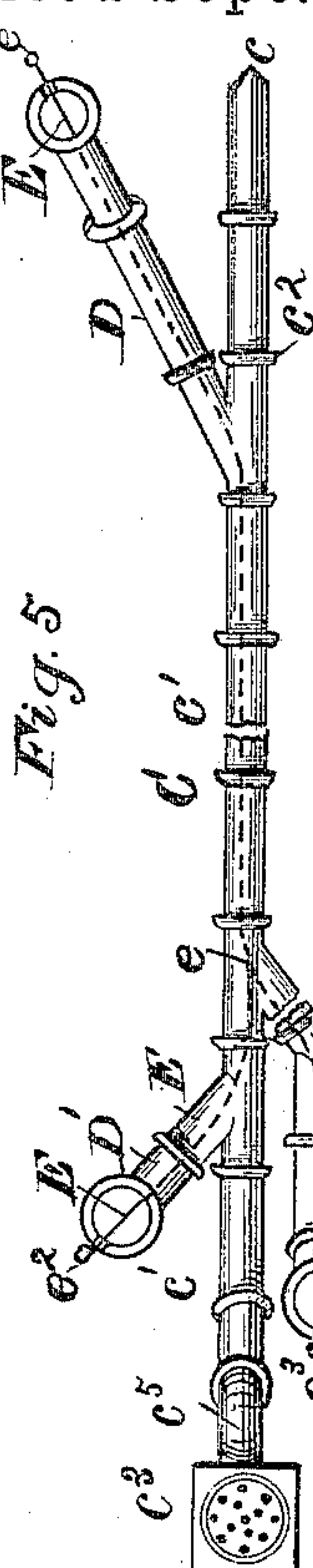
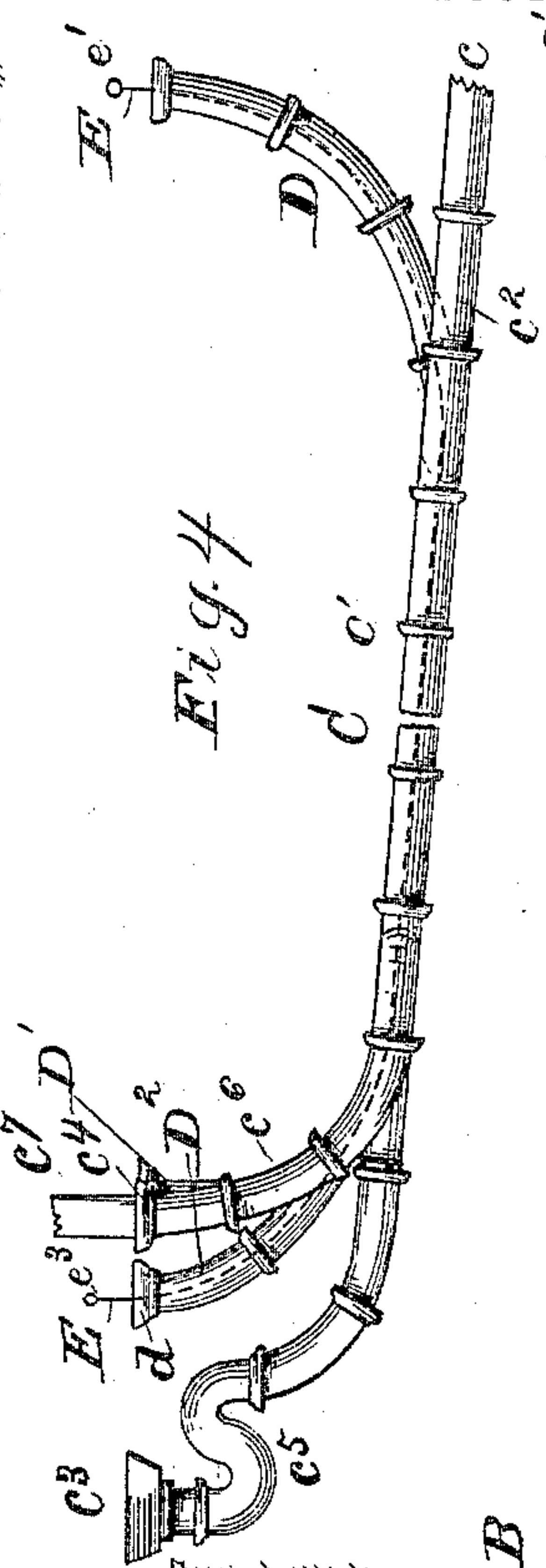
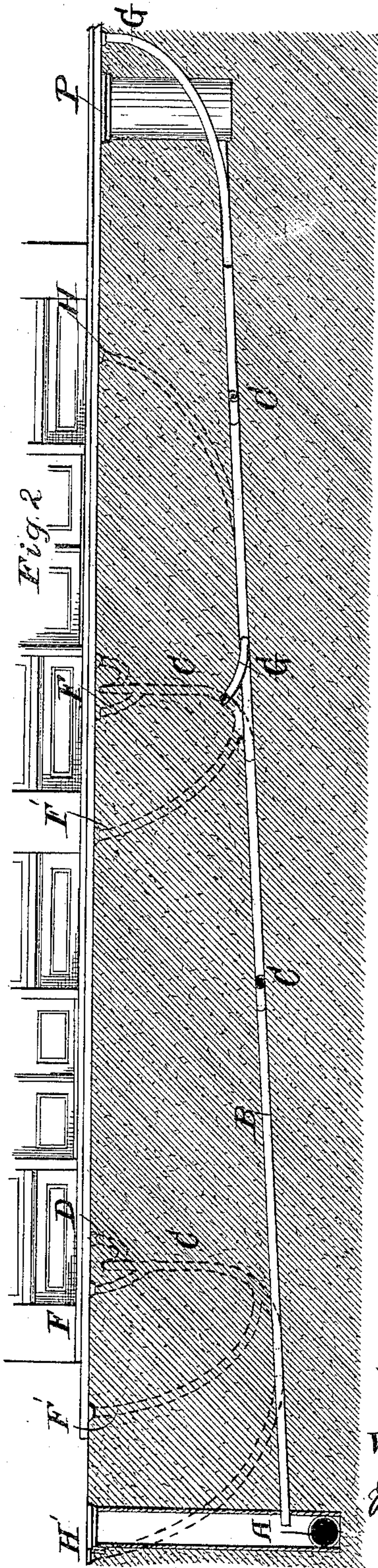
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2 Sheets—Sheet 2.

D. KNOWLES.  
SEWER.

No. 436,736.

Patented Sept. 16, 1890.



Witnesses:  
J. C. Turner  
Per. B. May.

Inventor:  
Daniel Knowles  
by S. M. Blinn  
att.



# UNITED STATES PATENT OFFICE.

DANIEL KNOWLES, OF NORFOLK, VIRGINIA, ASSIGNOR OF ONE-FOURTH TO  
GEORGE W. JOHNSTON, OF SAME PLACE.

## SEWER.

SPECIFICATION forming part of Letters Patent No. 436,736, dated September 16, 1890.

Application filed January 17, 1890. Serial No. 337,233. (No model.)

*To all whom it may concern:*

Be it known that I, DANIEL KNOWLES, a citizen of the United States, residing at Norfolk, in the county of Norfolk and State of Virginia, have invented certain new and useful Improvements in Sewers, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a plan view showing, conventionally, a system of sewers embodying my improvement. Fig. 2 is a vertical section on line *x x*, Fig. 1. Fig. 3 is a vertical section on line *y y*, Fig. 1. Fig. 4 is a side view of the parts, enlarged, constituting a house-connection. Fig. 5 is a plan view of what is shown in Fig. 4. Fig. 6 shows the upper end of one of the cleaning-ducts when the cover or sealing device is applied. Fig. 7 is a sectional view showing a modification of the wire cleaning device. Fig. 8 shows the end of the tool or wire-grasping device illustrated in Fig. 7.

Many of the features of the present invention can be employed in constructing and operating sewers of any of the ordinary styles. I have illustrated them as being applied in a system of sewers having mains, as at A, laterals, as at B, and house-connections, as at C, each of these being constructed of terra-cotta pipe of the proper dimensions. The house-connections C C are joined to the laterals B, and the last in turn empties into the main at A. Each lateral may be of any desired length, so long as it is operative in carrying the materials to the mains, and at the upper terminal and at other suitable points there are placed flushing-tanks, as is indicated at P, which, being of well-known construction, need not be here illustrated or described in detail. The house-connections C C are joined to the laterals in a suitable way—as, for instance, by means of “Y’s” or branched sections of the terra-cotta. In fact, as illustrated, all of the branch ducts are joined to those from which they diverge by means of Y-connections, although in some of the figures the pipes or ducts are shown by continuous lines as a conventional illustration required by the reduced size.

Great trouble and expense have been inci-

dent to the use of sewers of this class, from the fact that solid and heavy materials are constantly accumulating at one place or another in the house-connection pipes at C C and in the laterals B, these accumulations resulting in such a stoppage of the ducts that they become useless, as the water is prevented entirely from flowing through them. Heretofore when they have occurred it has been necessary to tear up the streets, or the pavements, or the alley-ways, or cellars, or yards of the houses in order to locate the places where the stoppages occur and in order to get access to the interior of the pipes for removing the accumulations. This is a tedious matter and one entailing constant and large expense in maintaining sewers of this kind.

I am aware of the fact that in using and maintaining sewers of the systems having exceedingly large mains as well as large laterals, employment has been made of scoops, scrapers, and other similar implements, which could be introduced from time to time for the purpose of cleaning the sewers and laterals, they generally requiring that one or more men should descend to and enter the sewers for the purpose of manipulating such devices; but I am not aware of the fact that this difficulty has been overcome in operating the smaller sewer-pipe connections or in respect to the laterals of small diameters.

In my system I begin at the time of the laying of the sewer, lateral, or house-connection, and as the pipes are being laid I form branches connecting with the pipes and bring them to convenient points at or near the surface and then place permanently in them the means for opening or cleaning the pipes through which the water passes, said means generally consisting of wires, chains, ropes, or equivalents, one end of each of which lies in one of the said branches and extends to the surface, where it is permanently fastened, and the other end lies in another of said branches located at a suitable distance from the former, the body part of the cleaning device lying permanently but quiescently in the main duct through which the water passes. One way of doing this is illustrated in the drawings. (See Figs. 1 to 5.) The house-connection running



to the lateral, and indicated as a whole by C, as aforesaid, is composed of the part  $c$ , lying between the lateral and the curbstone of the sidewalk or some other suitable and equivalent point, and the part  $c'$ , extending from said point inward to the house. Ordinarily the house-owner is responsible for the condition of the sewer from the point  $c^2$  inward, and the city is responsible for its condition between the point  $c^2$  and the lateral. The part  $c'$  is shown as extending into the rear side of the house and having two terminals, one at  $c^3$  and one at  $c^4$ , the former being a yard sink or cesspool at the end of a branch  $c^3$  and having a trap at  $c^5$ , and the latter being at the end of a branch  $c^6$ , with which the main waste-pipe  $c'$  from the house is connected and which joins to the main part  $c$  by one of the aforesaid Y's.

Now it frequently becomes necessary to clean the pipes at some point between the terminus of  $c^6$  or the trap at  $c^5$  on the one hand and the point  $c^2$  on the other hand. To provide for this I, while the pipes are being laid, carry off branches at D D' D<sup>2</sup>—that is to say, at a proper place I insert a Y-section, and with it connect a series of sections and carry them to a point at or near the surface. The branch D has its upper terminus immediately below the bricks of the pavement. Each of these should be bent or curved as gradually as possible away from the line of the main pipe, for reasons to be described. The branch D' is carried up to the surface in a similar way from a Y near the trap at  $c^5$ , and the branch D<sup>2</sup> is taken off from the waste-pipe at  $c^6$ . It will be noticed that the branches D' and D<sup>2</sup> are curved away from the direction in which the part D is curved—that is, they are curved backward and up, while the latter is curved forward and up.

E indicates a wire, chain, cord, series of jointed rods, or other suitable equivalent devices. When the pipes are originally laid, this wire or equivalent is inserted in the way shown in the drawing, one end being secured in or near the cap  $d'$ , which seals the end of branch D, and the end being secured to or at the cap which seals up the branch D'. Now if it be found that there is a stoppage somewhere between the trap-connection at  $c^5$  and the point  $c^2$ , the caps of the parts D and D' are removed and the wire E made free, so that it can be drawn through the pipes. If this wire is itself depended on to effect the cleaning, either alone or with the assistance of some attachments to scrape or engage with the accumulated materials, a rope, chain, or the like is secured to one end, so that the wire can be drawn back and forth until the obstruction is removed. As soon as this is accomplished the end of the wire is drawn back to place and secured to the cap or other fastening and the branches D D' again sealed up; or, instead of using the wire for the purpose of cleaning, another device may be inserted—such as a rope or chain with scrapers or clean-

ing devices attached—in which case the latter is secured to the end of the wire, and it is drawn through the pipes and carries with it the cleaning apparatus. When the end of the latter appears at the branch toward which it is drawn, the wire may be detached, and then the cleaning rope or apparatus may be drawn back and forth until the obstruction is removed. After that the wire E is again attached to the rope, and as the latter is withdrawn the wire is again introduced into the pipe and brought so that its ends can be secured at or near the sealing-caps; but if the stoppage should be found to be in the part  $c^6$  the wire E' is used. It may extend continuously from the cap at  $d^2$  independently of that indicated by E; but I prefer to join the wire E' to wire E, as indicated at  $e$ , as I thereby avoid having more than one wire in the main pipes at  $c'$ , and consequently avoid as much as possible the presence of bodies in the pipe which will cause the stoppage of materials passing through. When the wires are thus joined, as at  $e$ , the manner of cleaning the sewers is as follows: First, a rope, cord, or equivalent is secured to the end  $e^2$  of wire E and another secured to the end  $e^3$  of wire E'. Then a pull is exerted at the end  $e'$  of wire E, which results in drawing the wires E and E' and their attached devices through the branches D' D<sup>2</sup>, pipe  $c'$ , and branch D. When both ends of the attached ropes or equivalents appear at the upper end of branch D, one of them is made fast and the other (after being released from the wire) is utilized either to effect the scraping or to carry back the cleaning mechanism, and afterward it is drawn back to the position last described, and the other rope is similarly used until both branches of the pipes are cleaned. Then the ropes are again attached to the ends  $e^2$  and  $e^3$  of wires E and E', and they are drawn back, bringing the wires E and E' again in the position shown in the drawings, after which the branches D, D', and D<sup>2</sup> are all sealed up.

It will be seen that in any case I leave permanently in place in the sewers devices which can be utilized directly for effecting the cleaning of them, or which can be utilized as instrumentalities for drawing a cleaning apparatus through the ducts.

In order to be able to clean that part of the house-connection between the point  $c^2$  and the lateral, I provide at the time the sewer is being laid branches at F F', one as near as possible to the point  $c^2$  and the other as near as possible to the lateral, and place therein and in the main pipes  $c'$  another wire or equivalent F<sup>2</sup>, which is secured in place so as to be accessible at the upper ends of the branches F F', and in case of a stoppage in this portion of the pipes they can be cleaned by the means just described.

The laterals B are provided with branches and cleaning devices substantially similar to those above set forth.

G indicates a branch running off from the



lateral as near as practicable to the terminal thereof and thence up to the surface of the earth, the upper end being sealed and covered in any suitable way—as, for instance, by the paving-stones of the street. Then at a suitable distance from the last said branch G (ordinarily in the neighborhood of two hundred and fifty feet) I construct another branch G', the end of which is also placed at or near the surface, so as to be accessible. G<sup>2</sup> is a wire or equivalent extending from one to the other of these branches G G'. This is repeated along the lateral as often as is required—that is to say, pairs of oppositely-extending branches are run out and up from the lateral to the surface, as shown at H H', and each is provided with one of the wires or cleaning mechanisms. It is unnecessary to describe the occasion for or the manner of using the wires at G<sup>2</sup> H<sup>2</sup>, as they are similar to those above set forth in connection with the parts adjacent to the house at D D' D<sup>2</sup>.

When branches are formed—such as are shown at D D' D<sup>2</sup> G H, &c.—they are started from Y's, as aforesaid, in the main pipes, and the Y part is laid down in a horizontal position in relation to the body of its pipe-section, so that the cleaning-wire which passes through it shall when out of use lie as closely as possible along one side of the pipe, and this arrangement is better than to have the Y part turned upward, as in the latter case the wire will tend to sag in at least two places across the main body of the pipe, and thus induce the lodging of materials to form obstructions.

In Fig. 7 I have illustrated the fact that the wire E need not have its ends brought up through the branches and fastened at the surface, as shown in the other figures. In this case it is of such length that its ends can lie in the main water-duct; but they are adjacent to the ends of the branch duct, so that access can be had through the latter to them. A tool is shown in Figs. 7 and 8, it being one of the many sorts that can be made available for picking up the wire. There are some advantages incident to this arrangement of the parts, among others being this, that the wire is so disposed in the sewer that it does not act to catch or impede the materials passing through the duct. When the ends of the main wire are carried up through the branch ducts, there are bends at the lower ends of said branches, to which bends there is incident the danger of causing stoppages. In this arrangement, however, in Figs. 7 and 8 there are present the essential features of my invention, as the branch ducts or openings at D D' D<sup>2</sup>, &c., still permit access to the wire and permit its free manipulation and the wire is left permanently in place.

What I claim is—

1. In a sewer system, the combination, with a water-duct, of a flexible wire or equivalent situated permanently in said water-duct and adapted to be drawn through it, said water-

duct having apertures or branches extending to the surface of the ground or to a place where its ends can be exposed to permit access to the said wire or cleaning device, substantially as set forth.

2. In a sewer system, a water-duct and branch ducts arranged in pairs, those of each pair communicating with the same water-duct and extending upward therefrom in opposite directions, in combination with a flexible wire or equivalent situated permanently in said water-duct and having one end lying in or accessible through each one of the said pair of branch ducts, whereby it can be drawn in either direction, substantially as set forth.

3. In a sewer system having a water-duct with two water-supplying branches, the combination therewith of a two-part flexible wire or equivalent lying in the said water-duct, one part thereof lying partly in one of the said branches and one part lying in the other of the said branches, both of which parts are accessible from the surface of the ground, and said water-duct having an aperture or means of access independent of or remote from the aforesaid water-supplying branches for reaching the said wire, substantially as set forth.

4. In a sewer system, the combination of the water-duct C, having branches, as at c<sup>6</sup> c<sup>8</sup>, and the flexible wire or equivalent E, situated permanently in the said duct C and having a branch in the duct c<sup>6</sup> and a branch in the duct c<sup>8</sup>, substantially as set forth.

5. In a sewer system, the combination, with the main water-duct having water feeding or receiving branches, as at c<sup>6</sup> c<sup>8</sup>, and a branch duct or aperture remote from said branches c<sup>6</sup> c<sup>8</sup>, as at D, of a cleaning-wire or equivalent situated permanently in one of the said branch water-ducts, a cleaning-wire situated permanently in the other of said branch water-ducts, and a cleaning-wire situated permanently in the main water-duct, said cleaning-wires being joined together and being accessible through the aperture or duct at D, substantially as set forth.

6. The combination, with the street main or lateral, of the house branch or connection having the part c, extending from the main to the pavement, and the part c', extending to the house waste-pipes, a cleaning-wire, as at E, lying permanently in the said part c' and having its ends accessible at the surface, as described, and the cleaning-wire F<sup>2</sup>, situated permanently in the aforesaid part c of the duct, substantially as described, whereby the said two parts of the branch duct can be independently cleaned, substantially as set forth.

7. As an instrumentality for cleaning the water-ducts of a sewer or connection, a wire or equivalent, as at E, permanently secured in place and lying more or less in the said water-passage, the ends thereof being accessible without effecting an entrance into the in-



terior of the said water-duct, substantially as set forth.

8. In a sewer, a wire or equivalent, as at E, located permanently in said sewer and having a substantially smooth and unbroken surface from end to end that is without lateral projections, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

DANIEL KNOWLES.

Witnesses:

JAMES ERWIN,  
GEO. W. JOHNSTON.