(No Model.)

M. T. CHAPMAN.

WELL SINKING APPARATUS.

No. 443,072. Patented Dec. 16, 1890.

Fig. 1.

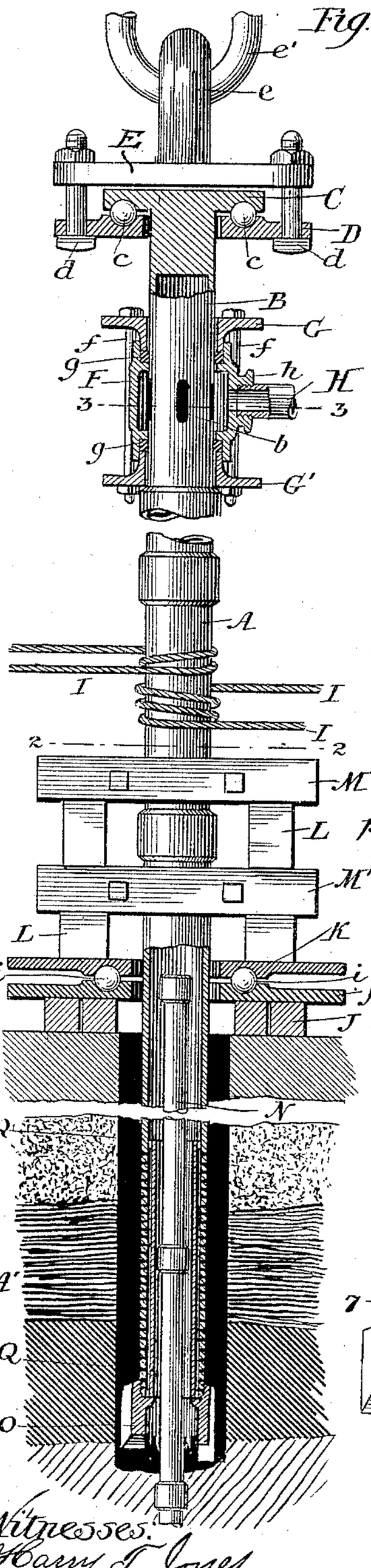


Fig. 2.

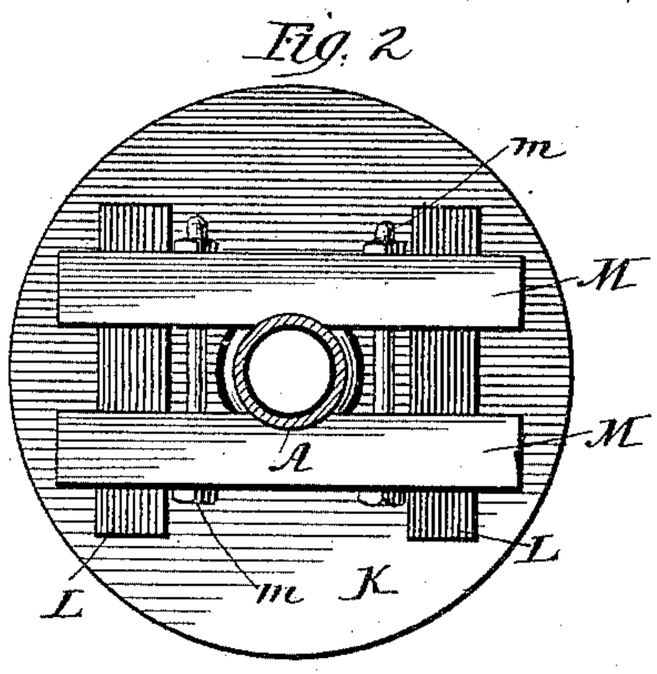


Fig. 3.

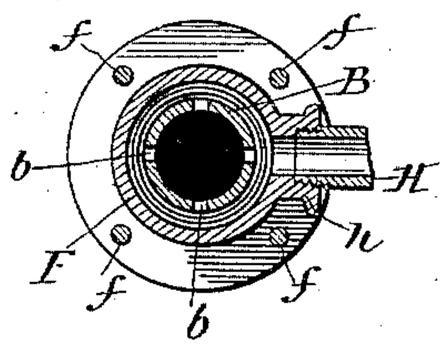


Fig. 4.

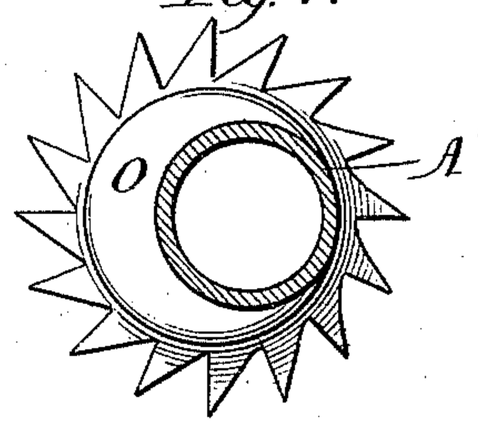


Fig. 7.

Fig. 5.

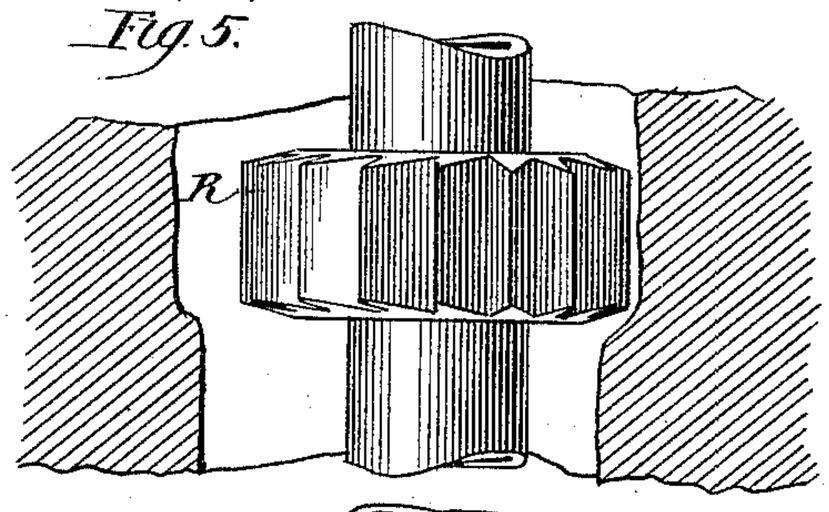
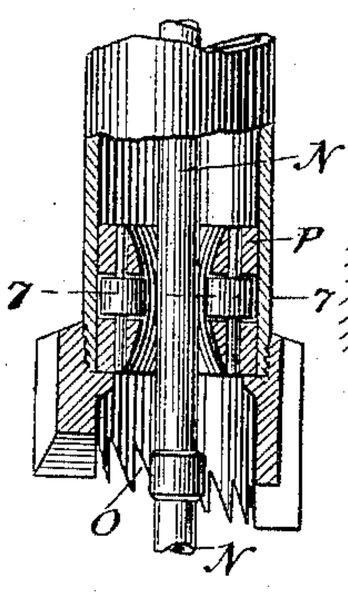
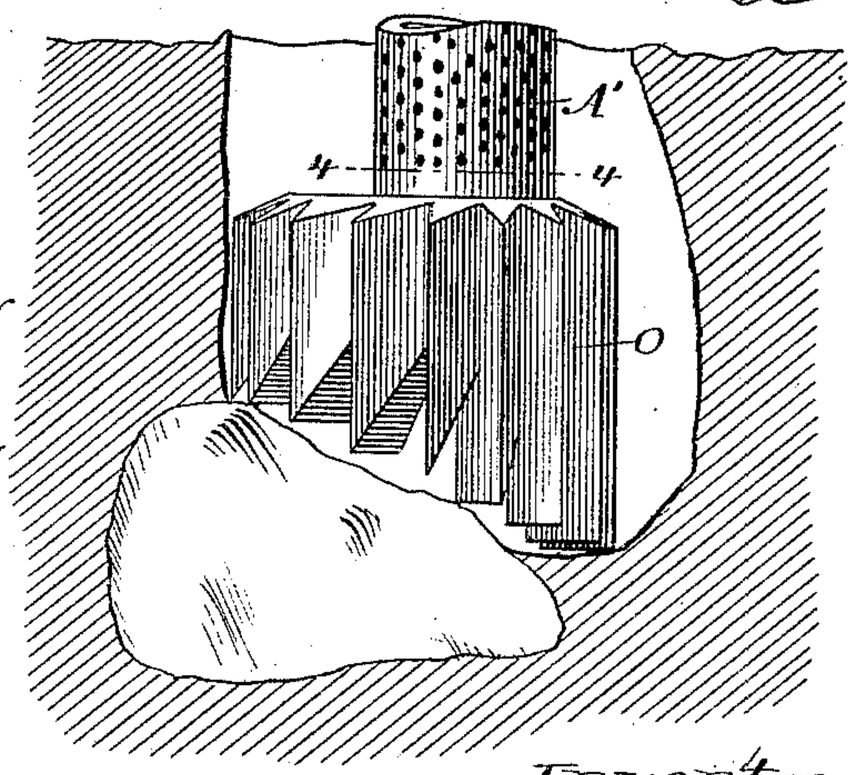


Fig. 6.





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UNITED STATES PATENT OFFICE.

MATTHEW T. CHAPMAN, OF AURORA, ILLINOIS, ASSIGNOR TO HIMSELF AND MARK C. CHAPMAN, OF SAME PLACE.

WELL-SINKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 443,072, dated December 16, 1890.

Application filed December 9, 1889. Serial No. 333,116. (No model.)

To all whom it may concern:

Be it known that I, MATTHEW T. CHAPMAN, residing at Aurora, in the county of Kane and State of Illinois, and a citizen of the United States, have invented a new and useful Improvement in Well-Sinking Apparatus, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation, some parts being in section. Fig. 2 is a horizontal section at line 2 2 of Fig. 1. Fig. 3 is a cross-section at line 3 3 of Fig. 1. Fig. 4 is a cross-section at line 4 4 of Fig. 5. Fig. 5 is an enlarged side elevation of the cutter, showing the method of passing a stone. Fig. 6 is a vertical section through the cutter and centering block. Fig. 7 is a cross-section at line 7 7 of Fig. 6.

This invention relates to well-sinking apparatus.

The object of my invention is to provide an improved apparatus for sinking a well-tube outside of a pipe or tube which has already been sunk—such as a driven-well pipe or a well-tube sunk by rotary or other process—where it is desired to remove such pipe or tube already in the ground, and such pipe cannot be drawn out by any of the common methods, or where it is desired to enlarge the well already sunk, or to provide a new casing or tube in wells where the old tube has been rusted or eaten by the action of the strata through which it passes, or where the first tube cannot be sunk farther and it is desired to sink the well deeper.

A further object of my invention is to improve the construction and operation of well-sinking apparatus generally, as hereinafter explained. I accomplish these objects as hereinafter described, and illustrated in the drawings. That which I claim as new will be pointed out in the claims.

In the drawings, A represents a drill-tube, which consists of several sections coupled together as usual.

B represents a short section of tubing secured to the upper end of the tube A. This section B is closed at its upper end and provided with a circular head C. The lower face of the head C is provided with an annular groove to receive anti-friction balls. The section B is also provided with a number of holes *b* near its lower end.

D is an annular supporting-plate for the head C. It is provided with an annular groove corresponding to the groove in the head C to receive anti-friction balls *c*, on which the head C is supported and can freely rotate.

E is a block which is located above the head C and is connected with the plate D by bolts *d*, as shown in Fig. 1. The block E is provided with an eye *e* to receive the hook *e'* of a supporting-rope. (Not shown.)

F is a water-swivel placed on the section B, so as to cover the holes *b*. It is provided with a nipple *h*, to which is to be attached a hose H. The interior chamber of this swivel F is of sufficient diameter to permit water to enter the holes *b* on all sides of the tube-section B while the tube-section rotates and permit the water to descend therethrough to the tube A.

G G' are followers, which are located one G above and the other G' below the swivel F, and are drawn against packing-rings *g*, located in recesses in the ends of the swivel by bolts *f*, thereby forming a stuffing-box at the upper and lower ends of the swivel F around the tube-section B. The bolts *f* serve to draw both followers G G' against their packing-rings *g*.

I I' are ropes or bands for rotating the pipe or tube A. These ropes may be driven by any suitable driving-power, one driving from each side of the tube A, as shown in Fig. 1, so that the application of power on opposite sides tends to overcome any tendency of the ropes to bend or draw the tube to one side.

J is a frame which rests upon the ground, as shown in Fig. 1, and supports a plate *j*, which is provided with an annular groove to receive anti-friction balls *i*.

K is a rotating plate, which rests upon the anti-friction balls *i*, it being provided with an annular groove corresponding to the groove in the plate *j*.

L L are supports secured on the rotating plate K.

M M' are friction-blocks secured on the supports L, one set M being located a short distance above the other set M', as shown in Fig.

1. Each set of blocks M M′ is composed of two blocks, which are drawn toward each other so as to clamp the tube A by bolts *m*, as shown in Fig. 2. These bolts may be tightened or loosened, thereby varying the amount of friction on the tube A. As the tube A is rotated by the ropes I, the blocks M, which are clamped against the tube, their supports L, and the rotating plate K rotate with the tube A. The amount of friction between the blocks M M′ and the tube A is sufficient to support the weight or a part of the weight of the tube A, thereby relieving the cutter of as much of the weight of the tube as may be deemed desirable, so that the feed of the cutter can be regulated according to the different strata through which it passes, and the cutter relieved of the weight or a portion of the weight of the tube A, which increases as the length of the tube increases.

N represents an old or fixed tube or pipe which had been sunk prior to the sinking of the tube A and outside of which it is desired to sink the tube A. The plate *j* is to be placed at the surface of the ground, so that the tube A will be held concentric with the tube or pipe N, as shown in Fig. 1. The lower section A′ of the tube A is perforated to form a water-filter.

O is a rotary cutter or pipe-sleeve provided with teeth secured on the lower end of the section A′. This cutter O, as shown in Fig. 4, is made eccentric to the pipe or tube A′—that is, it has its teeth on one side at a greater distance from the center of rotation than the teeth on the opposite side, and the teeth on the side which are nearest to the center of rotation are longer or extend downward farther than the teeth on the opposite side, for the purposes hereinafter explained.

P is a centering-block placed in the tube A at or near the cutter O and supported therein on a shoulder, as shown in Fig. 6. This block has a central circular opening which is concentric with the tube A and of sufficient diameter to pass down over the tube or pipe N and its couplings. This block P serves to keep the lower end of the tube A concentric with the pipe N. To reduce the friction of the centering-block P on the tube or pipe N, I place anti-friction rollers *p* in the block P, which are best seen in Fig. 7.

Q is a short interior tube placed in the perforated tube-section A′. It is of sufficient length to cover the perforations of the section A′, and is provided with a packing-ring at its upper end to prevent the passage of water downward outside of it or between it and the tube A′. If desired, it may be provided with a packing-ring at its lower end also.

R is a toothed collar secured on the tube A a short distance above the cutter O.

The frame J and the rotatable supporting devices for the tube A are placed centrally over the tube or pipe N, around which it is desired to sink the tube A. The tube A, with its cutter O, is then placed in position concentric with the tube N, and is sunk by rotation around said tube N. The upper end of the tube A is guided and partially supported by the plate D, on which its head C is free to rotate. Water is supplied to the section B through the holes *b* by the water-swivel F, which surrounds the section B at the holes *b* and remains stationary while the section B rotates with the tube A. The stuffing-boxes formed by the followers G G′ at the upper and lower ends of the swivel F prevent any leakage around the section B. If the tube N is a flowing well, the water flowing therefrom may be utilized with the water supplied through the swivel F, it being forced downward through the tube A outside of the tube N. In some instances the flow of water from the tube N may be sufficient without any water from the swivel F, in which cases the supply of water to the swivel F may be closed. The driving-ropes I will rotate the tube A steadily, and will wind upwardly on the tube A as the tube descends, thereby not interfering with the gradual descent of the tube A. The number of coils of ropes I around the tube A may be varied according to the amount of the work to be done, the number of coils being increased as the work increases. The ropes I will permit the couplings of the tube A to pass downward without interfering therewith, as they will readily wind over such couplings. The rotatable support for the tube A, formed by the friction-blocks M M′, and the rotating plate K will keep the tube A concentric with the tube N at the surface of the ground and at the same time support the tube A, as hereinbefore described. When a joint or coupling of the pipe A descends to the blocks M, the lower set of blocks M′ is to be tightened, so that it alone will support the tube A, and the upper set may then be loosened, allowing the coupling to pass downward. When the coupling has passed the set of blocks M, they are to be tightened, and the blocks M′ may be loosened, allowing the coupling to pass them, when both sets of blocks may be set as before. The centering-block P maintains the cutter O and lower part of the tube A concentric with the tube N. It also aids in preventing the cutter O from catching on any of the couplings or rough places on the tube N. When the tube A and its interior tube Q are of sufficient diameter only to pass the couplings of the tube or pipe N, the centering-block P cannot be used, as there will not be sufficient space between the tube A and the tube N; but when the tube A is larger relative to the tube N the centering-block must be used. When the tube Q is of such small diameter relative to the tube N, it acts as a centering-block. The cutter O, being provided with a tooth or teeth on one side which are longer than the teeth on the remaining portion of the cutter, will readily pass couplings, bends, and rough portions of the tube N, as the long tooth travels around the tube or pipe N, and will slip past or downwardly

over such places in some point of its travel or rotation, even though the coupling or portion of the pipe be non-concentric with the remaining portion. The supply of water will be prevented from passing out through the perforations of the tube-section A′ by the interior pipe Q, thereby carrying the water-supply to the point of cutting of the cutter O, from which it will pass upward outside of the tube A to the surface of the ground. When the well has been completed, the short tube or pipe Q may be readily drawn out, leaving the perforated tube-section A′ as a filter at the lower end of the well. The teeth or cutting-edges of the cutter O are eccentrically arranged in relation to the tube A, as shown in Figs. 4 and 5, and the teeth on the side most distant from the center of the tube or the center of rotation are the shortest. This construction causes the shorter teeth to cut a path on a wider circle than the longer ones, so that the cutting-points are distributed around the entire periphery of the cutter. While the tube A and cutter O are descending outside of the tube N, the center of rotation of the cutter is the center of the tube N, the tube A rotating on its longitudinal axis. When the cutter has descended below the lower end of the tube N or the tube N has been withdrawn wholly or partially, so that the centering-block is not in contact with the tube N and a stone or other obstruction has been struck, which is particularly liable to occur or be the reason of the inability to sink the first tube N farther, and for the purpose of passing which the outside tube A is sunk, the longest tooth or cutting-edge of the rotary cutter O will first engage with the stone or other obstruction, as shown in Fig. 5, and the continued rotation of the tube A will cause the tube and the cutter to gyrate or swing on an axis through the point of contact of the tooth with the stone or obstruction, thereby causing the cutter and tube A to pass down at one side of the stone, instead of drilling on its top and cutting through it. The path of the cutter and tube during such swinging or gyrating is illustrated in Fig. 5. The toothed collar R on the tube A follows downwardly in the path or hole cut by the cutter O without cutting, as it is of substantially equal radius with the longest radius of the eccentric cutter O; but when the cutter O and tube A gyrate, as above explained, the teeth of the collar R cut against the sides of the hole, as shown in Fig. 5, enlarging the hole to give room for the gyrating tube, and at the same time tending to cause the cutter to descend in a straight line after it has passed the stone or obstruction. The collar R also acts to guide or steady the tube A at all times.

In place of using one set of bolts *f* for drawing and holding the followers G and G′ tight against the packing-rings *g* separate sets of bolts may be used for each follower. In that case there must be a flange on the water-swivel F at each end to receive the bolts *f*.

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

1. The combination, with the rotating tube-section B, having on its upper end the head C, of the supporting-plate D, the intermediate anti-friction balls *c*, the block E, having an eye *e*, and the bolts *d d*, connecting said plate and block, substantially as shown and described.

2. The combination, with a rotary well-drilling tube and a cutter carried by said tube, of the driving-ropes I, applied to said tube from opposite sides for the purpose of rotating said tube, substantially as described.

3. The combination, with the drill-tube A, of the frame J, the grooved plate *j*, supported on said frame, the rotating grooved plate K, the intermediate anti-friction balls *i*, the supports L L, the two independent sets of friction-blocks M M′, and clamping-bolts *m m*, substantially as shown and described.

4. The combination, with a fixed or sunk tube, as N, of the well-tube A, a cutter thereon, and mechanism for sinking the tube A outside of the pipe or tube N, substantially as and for the purpose specified.

5. The combination, with a fixed or sunk tube, as N, of the well-tube A, a cutter thereon, mechanism for sinking the tube A, and a centering-block at the lower end of the tube A, substantially as and for the purpose specified.

6. The combination, with a fixed or sunk tube, as N, of the well-tube A, a cutter thereon, mechanism for sinking said tube A, a centering-block at the lower end of said tube, and a support at the surface of the ground maintaining the tube A concentric with the pipe N, substantially as specified.

7. The combination, with a rotating tube, of an eccentric rotary cutter having a tooth or teeth on one side longer than the teeth on the remaining portion, substantially as and for the purpose specified.

8. The combination, with the rotating tube A and a cutter thereon, of a centering-block having anti-friction rollers *p* and a fixed tube N, substantially as and for the purpose specified.

9. The combination, with a rotating tube and the eccentric cutter thereon, of a toothed collar, as R, secured on said tube above the cutter, substantially as and for the purpose specified.

10. The combination, with a perforated lower tube-section A′, of an interior tube Q, fitting within the section A′, covering its perforations, and adapted to pass over a fixed tube, as N, substantially as and for the purpose specified.

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