No. 749,718. PATENTED JAN. 19, 1904.

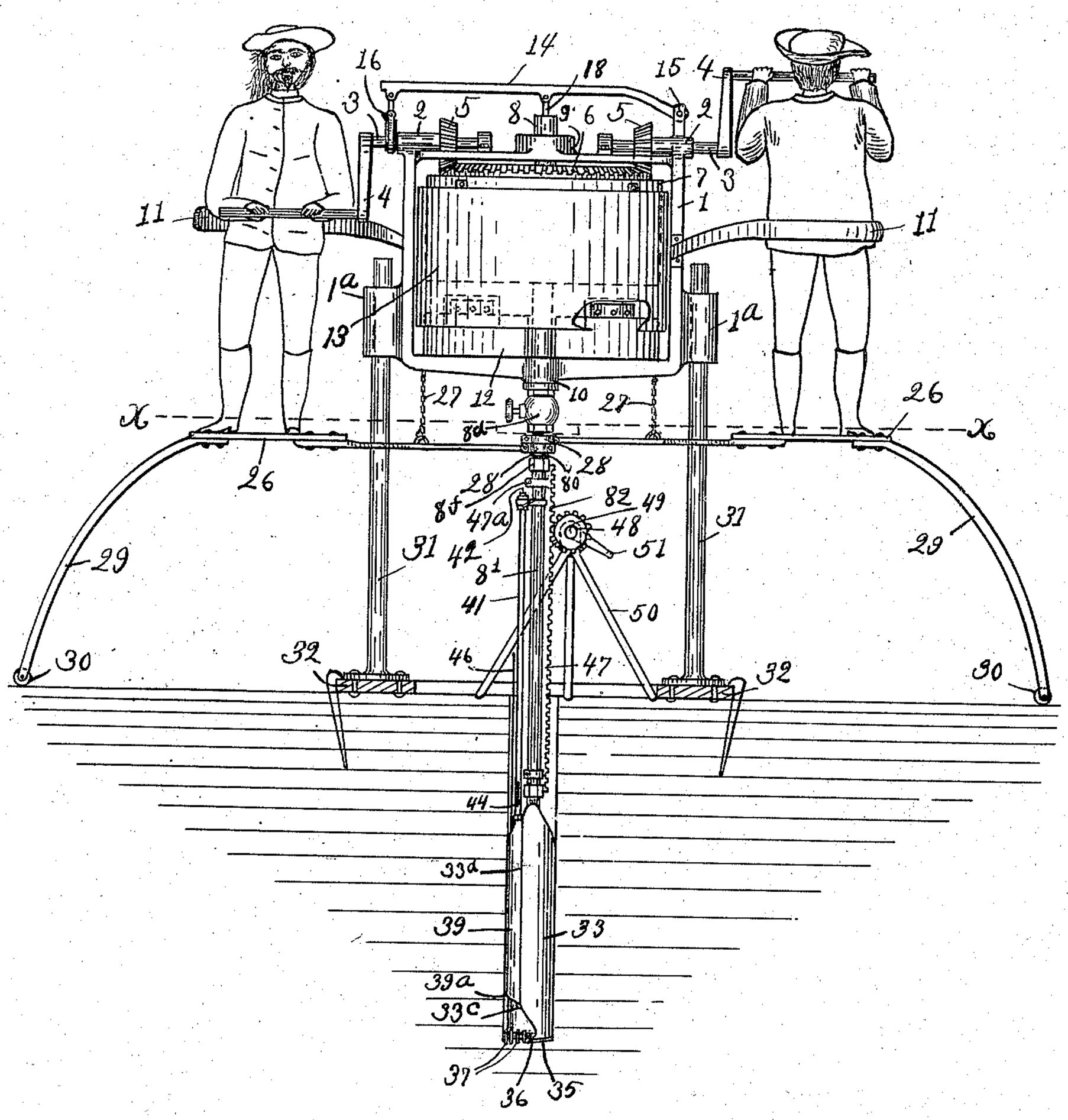
M. CHASE.

PROSPECTING INSTRUMENT.

APPLICATION FILED APR. 30, 1902.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1



Witnesses:
H. B. Davis.
J. L. Hutchinson.

Inventor:
Milton Chase
by Noyes & Kenyon
Attys

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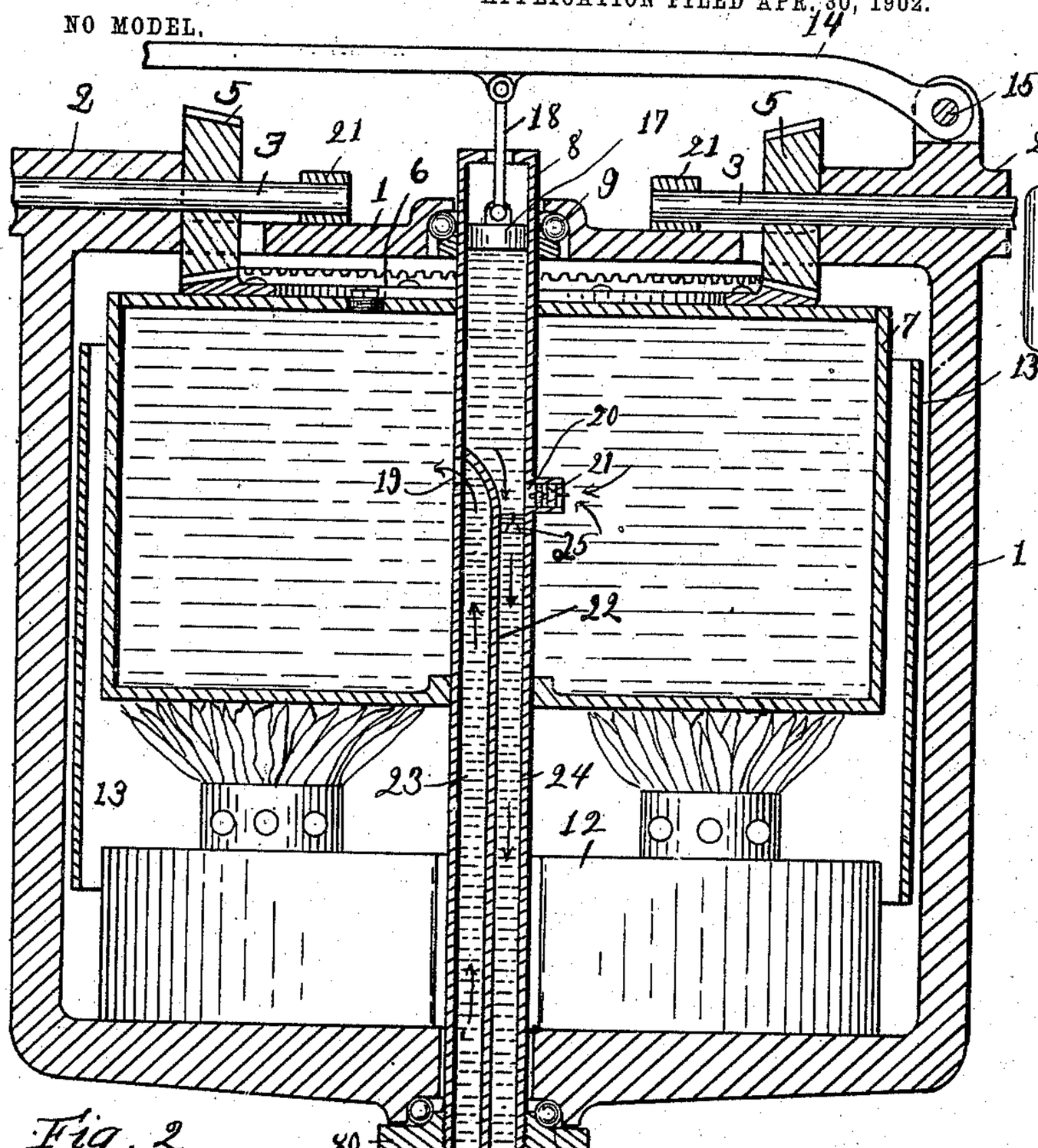

Fig. 2

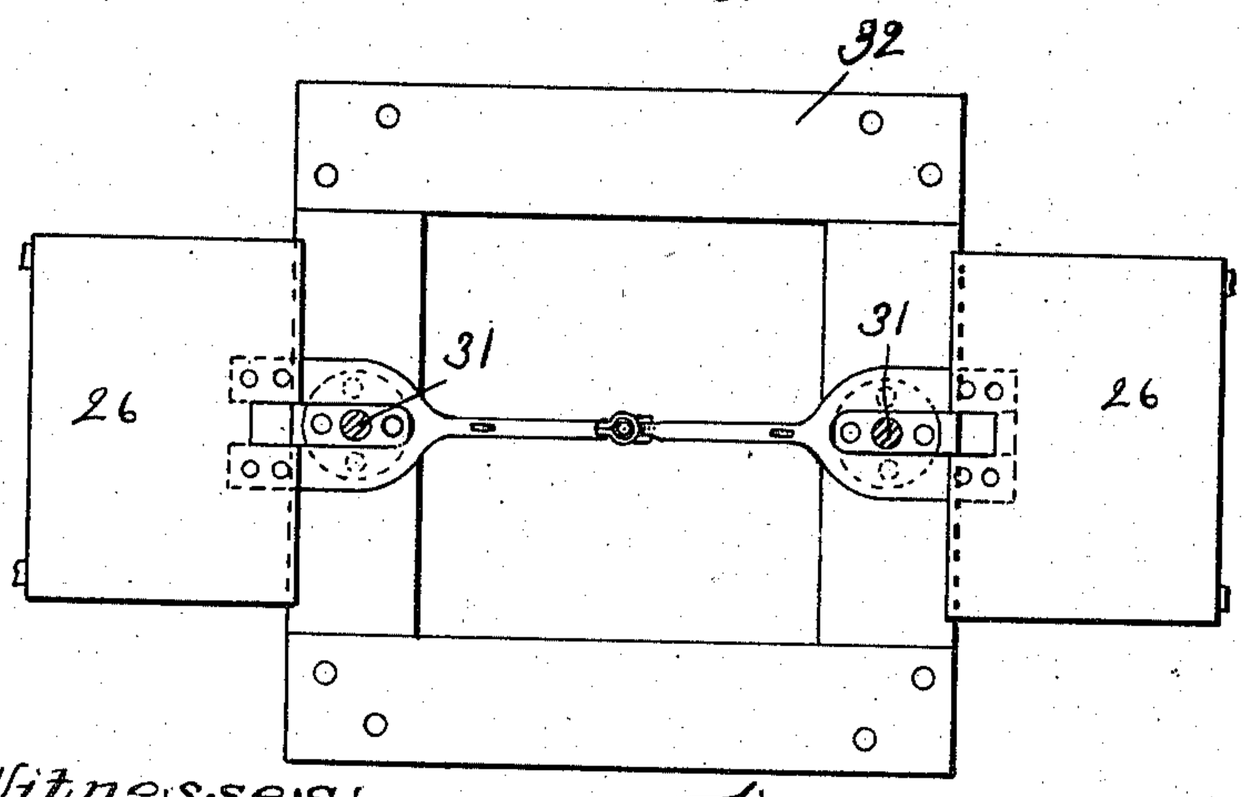

Fig. 3

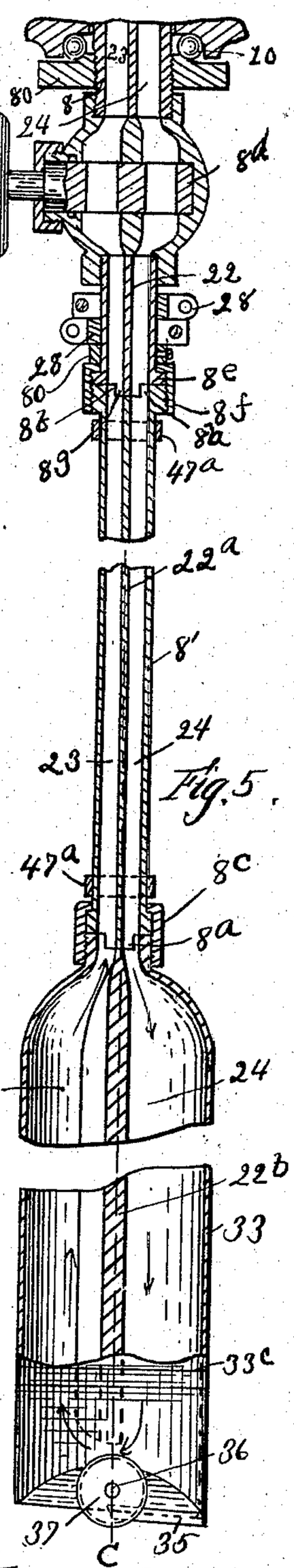

Fig. 5.

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NO MODEL. 4 SHEETS—SHEET 3.

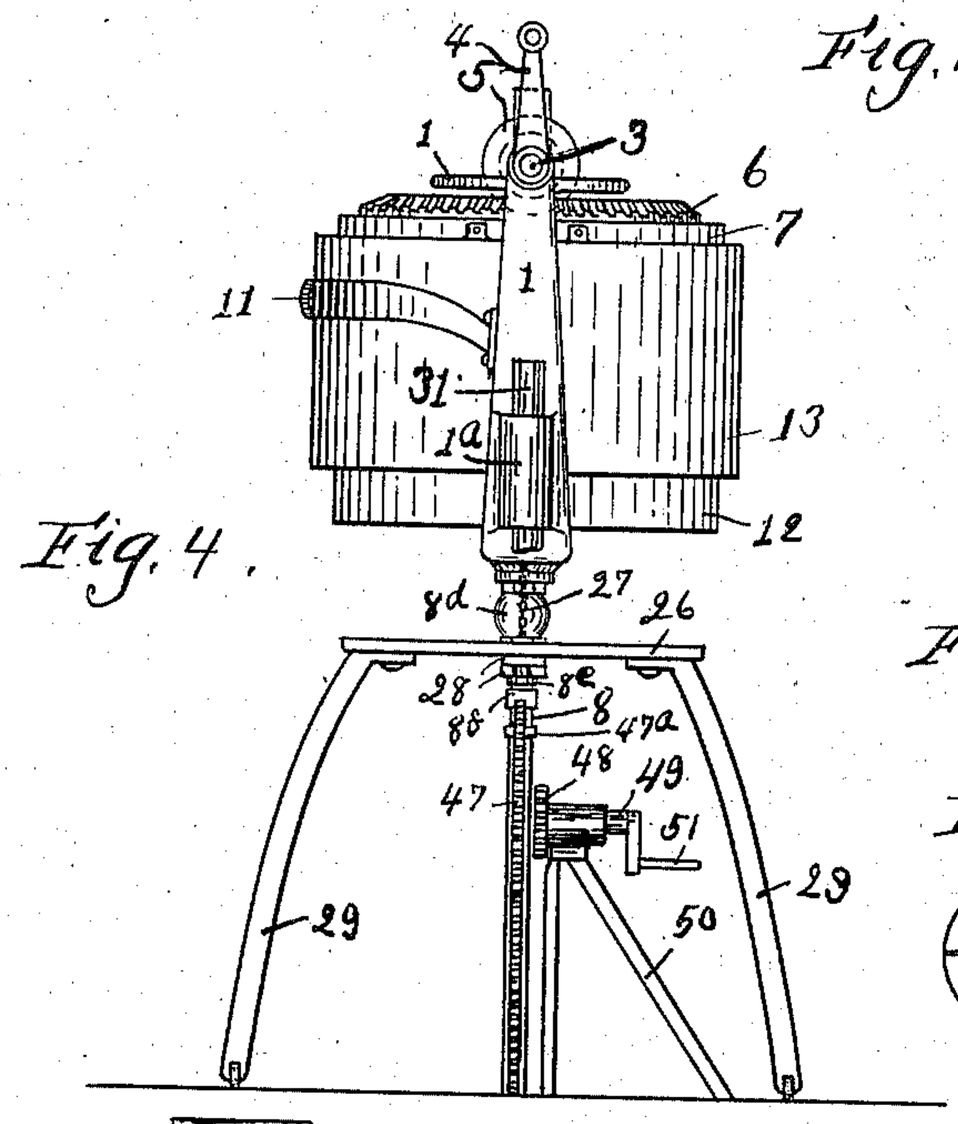


Fig. 4.

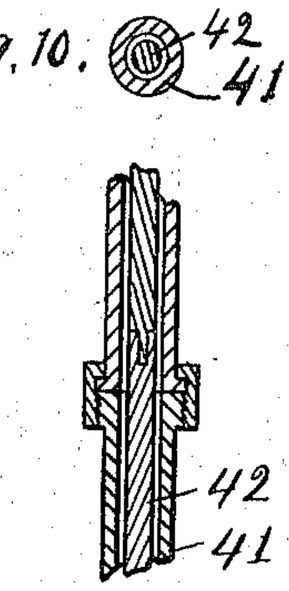


Fig. 11.

Fig. 10.

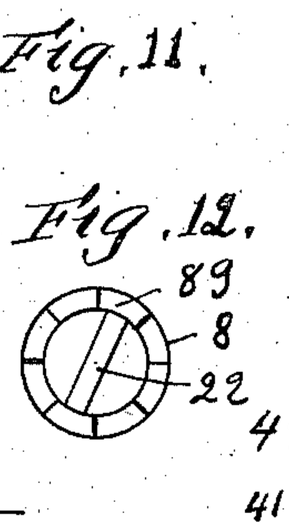


Fig. 12.

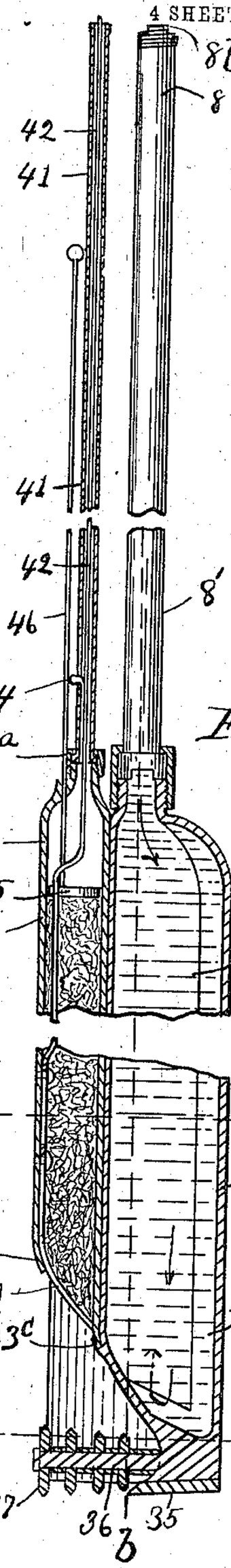


Fig. 6.

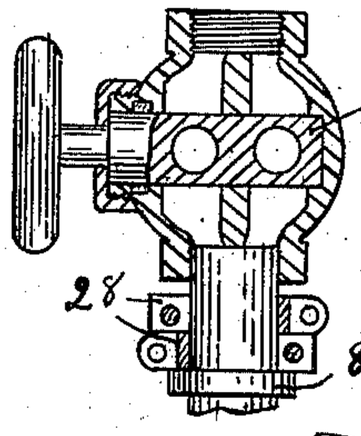


Fig. 15.

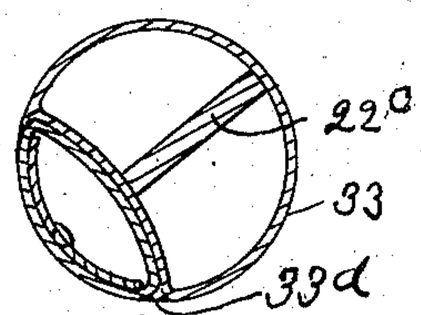


Fig. 7

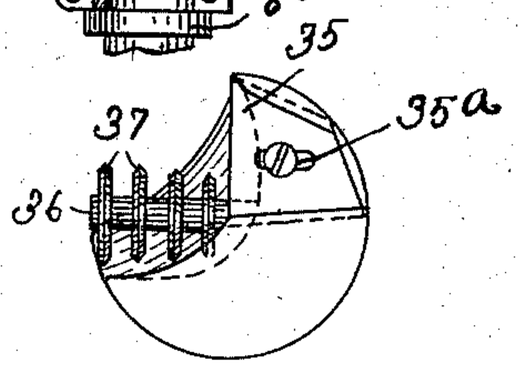


Fig. 9

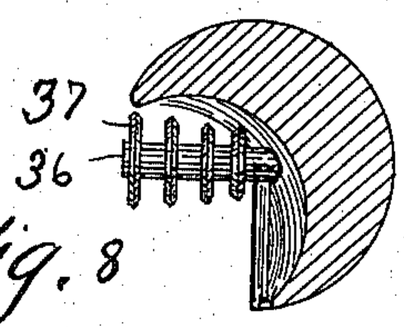


Fig. 8

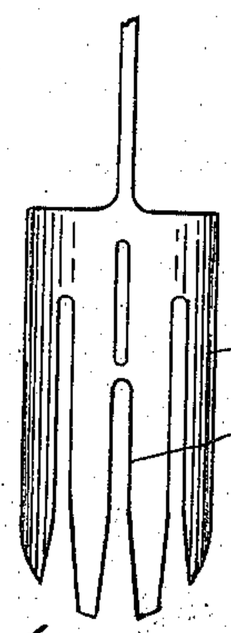
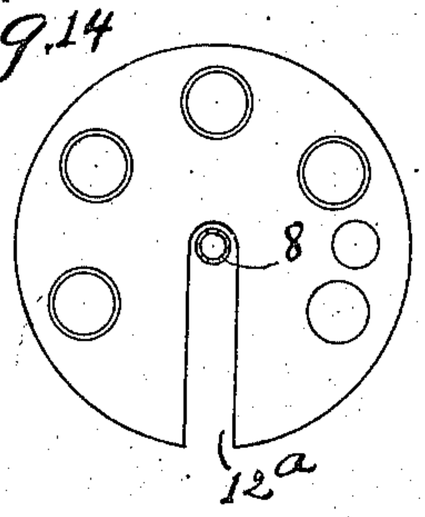


Fig. 13.

Fig. 14



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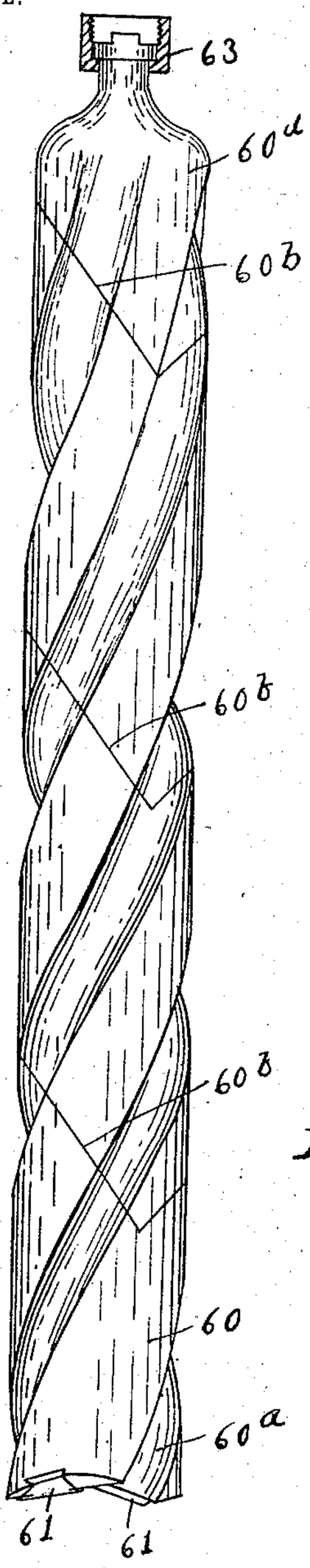


Fig. 16.

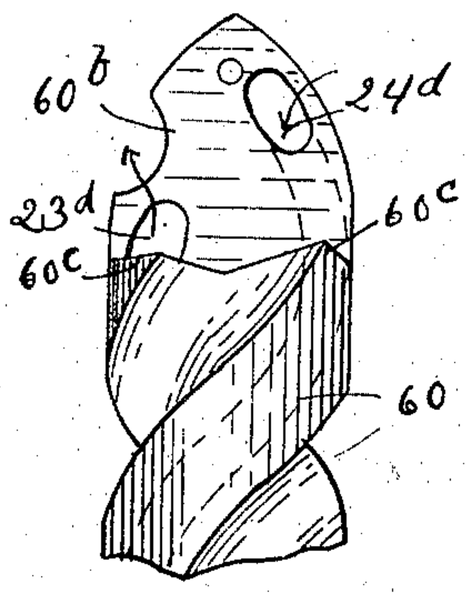


Fig. 17.

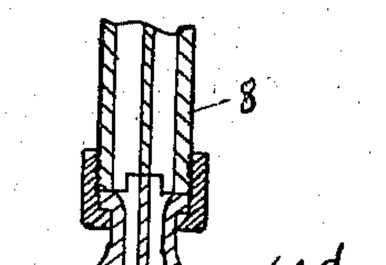


Fig. 20.

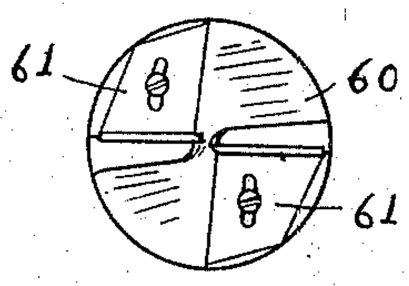


Fig. 21

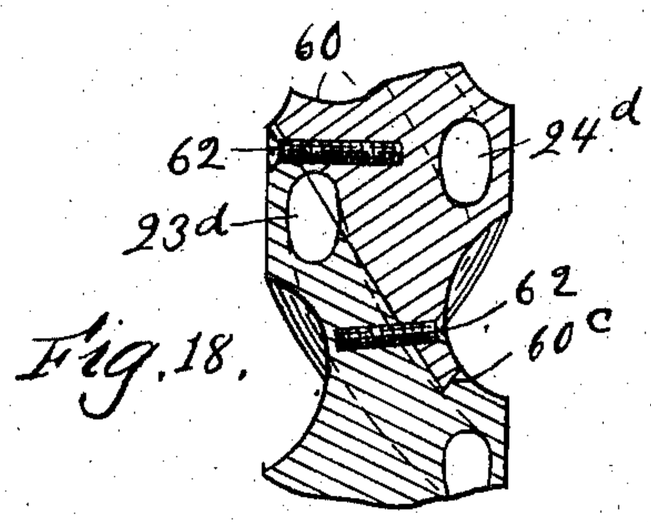


Fig. 18.

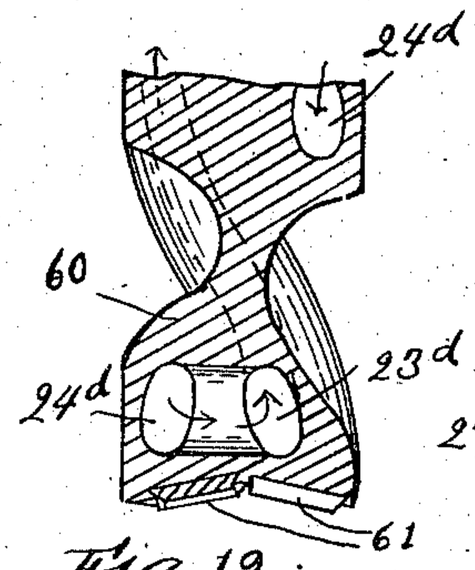
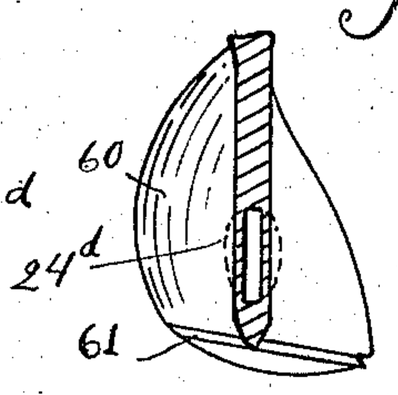


Fig. 19.

Fig. 22.



Witnesses:

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Inventor:

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by Noyes & Hamman

Attys

No. 749,718. Patented January 19, 1904.

UNITED STATES PATENT OFFICE.

MILTON CHASE, OF HAVERHILL, MASSACHUSETTS.

PROSPECTING INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 749,718, dated January 19, 1904.

Application filed April 30, 1902. Serial No. 105,261. (No model.)

To all whom it may concern:

Be it known that I, MILTON CHASE, of Haverhill, county of Essex, and State of Massachusetts, have invented an Improvement in Prospecting Instruments, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

My invention relates to means for boring holes to a considerable depth in the ground for the purpose of prospecting or securing samples of the earth before sinking a shaft; and its special object is to provide a means for accomplishing the above purpose which is especially adapted to be used in boring through frozen earth and which is provided with means with which samples of the earth may be conveniently drawn to the surface, so that the boring-tool may be cleared and the character of the borings ascertained.

A further object of my invention is to provide means for driving the boring-tool which are especially adapted to be operated by hand-power.

I accomplish the above-named objects by providing a boring-tool with passages through which a heated liquid may be circulated to heat the tool, so that it will melt the frost or ice in the earth, and thus render the work of driving the tool much less than if it were not heated. I further provide an earth receiving and excavating device which is attached to the tool and is adapted to receive the earth as it is discharged from the cutting-blade thereof, said device being adapted to be withdrawn when desirable, so that the tool may be freed of borings and the quality of the earth be tested. I further provide a movable platform on which the persons who drive the boring-tool may stand, so that their weight will act to force the tool downwardly while they are operating the tool-rotating mechanism.

For a more complete understanding of my invention reference is made to the accompanying drawings, in which—

Figure 1 is a side elevation showing the manner of using my invention. Fig. 2 is a central vertical cross-section of the tool rotating, liquid-circulating, and heating means. Fig. 3 is a plan view, partly in cross-section, on the line *x x* of Fig. 1. Fig. 4 is an end elevation of the tool-rotating mechanism. Fig. 5 is a partial cross-section on the line *b* of Fig. 6. Fig. 6 is a cross-section on the line *c* of Fig. 5. Figs. 7 and 8 are cross-sections on the lines *d d* and *e e*, respectively, of Fig. 6. Fig. 9 is a bottom plan view of the drilling-tool. Figs. 10 and 11 are detail views of the handle of the earth-removing device, Fig. 10 being a cross-section and Fig. 11 a central longitudinal section. Fig. 12 is an end view of one of the shaft-sections. Fig. 13 is a detail view of a part of the earth-removing device. Fig. 14 is a plan view of the burner. Fig. 15 is a detail view showing the valve in a closed position. Fig. 16 is an elevation of a modified form of boring-tool. Fig. 17 is an elevation of the upper end of one of the sections thereof. Fig. 18 is a central longitudinal section of the tool shown in Fig. 16 through one of the joints between two sections. Figs. 19 and 22 are similar views of the lower end of the tool on sectional planes at right angles to each other. Fig. 20 is a similar view of the upper end of the tool. Fig. 21 is a bottom view thereof.

As shown in the drawings, the combined tool rotating, heating, and liquid-circulating apparatus comprises a rectangular-shaped frame 1, which is provided with bearings 2 2 and 21 21 in its upper end, in which a pair of shafts 3 are journaled, said shafts being provided with cranks 4 at their ends and being arranged in alinement. Each shaft is provided with a gear 5, which is adapted to engage a circular rack 6, the latter being firmly secured to the top of a metal tank 7. Said tank 7 is cylindrical in form and is secured to a tubular shaft 8, which is centrally arranged therein in a vertical position. Said shaft 8 is journaled in ball-bearings 9 and 10, which are respectively arranged in the upper and lower horizontal portion of the frame, as shown in Fig. 2. An oil-burner 12 is arranged beneath the tank 7 and supported by the frame, the reservoir of said burner being provided with a slot 12^a, (see Fig. 14), which is adapted to receive the shaft 8, so that said reservoir may be concentrically arranged with respect to the shaft 8 and the tank 7. An an-

nular shield or chimney 13 is secured to the tank 7 and projects below the bottom thereof, as shown in Fig. 2.

A pair of platforms 26 are flexibly connected to the lower end of the frame 1 by chains 27, their adjacent ends being jointed to collars 28, which are swiveled on the lower end of shaft 8 and supported by a collar 80, which is secured to said shaft. Curved legs 29, having rollers 30 at their lower ends, are connected to the outer ends of said platforms and are adapted to rest on the ground. Curved arms 11 are rigidly secured to the vertical portions of frame 1 and extend along the side of each platform for a suitable distance thereabove.

The frames 1 are provided with integral guide-lugs 1^a at each side thereof, which are adapted to receive vertical standards 31, said standards being firmly secured to a rectangular frame 32, which is in turn firmly secured to the ground by any suitable means. A pump-lever 14 is pivoted at 15 to one side of the frame, and its opposite end is connected to an eccentric 16 on one of the shafts 3, as shown in Fig. 1, so that said lever will be swung as the shaft is rotated. A piston 17 is arranged in the upper end of the tubular shaft 8 and is connected to said lever 14 between its ends by a piston-rod 18. A partition 22 extends centrally and longitudinally of the tubular shaft and divides the same into two passages 23 and 24, said partition being bent obliquely and connected at its upper end to the inner surface of the shaft nearly on a level with the middle of the tank. The passages 23 and 24 are respectively connected to the tanks by means of openings 19 and 20, the latter being provided with an inwardly-opening check-valve 21. A check-valve 25 is also arranged in the passage 24 a short distance below the check-valve 21.

A double-turning plug-valve 8^d is arranged in the tubular shaft 8 just below the frame 1, said valve being adapted to either simultaneously close or open both of the passages 23 24. The casing of the valve 8^d is preferably brazed or otherwise permanently secured to the shaft 8, and therefore practically forms an integral part thereof. The end of the shaft 8 which projects below the valve-casing and on which the collars 28 are swiveled is provided with a flange 8^e at its lower end on which a union coupling-ring 8^f is swiveled.

The lower end of the shaft 8 is provided with a regular series of longitudinally-extending lugs 8^g, (see Figs. 5 and 12,) and the central partition 22 extends to the lower end of said shaft 8, as shown in Fig. 5.

A tubular shaft 8′, having a centrally-arranged longitudinally-extending partition 22^a, is provided with lugs 8^a 8^b at opposite ends, lugs 8^b being adapted to fit into the notches between the lugs 8^g at the lower end of the shaft 8 and the end of the shaft 8′ at which lugs 8^b are located being threaded to receive the coupling-ring 8^f, the opposite end thereof being provided with a similar coupling-ring 8^c, which is swiveled thereon. The partitions 22 22^a of said shafts 8 8′ are so arranged that when the lugs of one shaft engage the notches of the other and the two shafts are connected by the ring 8^f the end of one partition will register with the end of the other, so that they will be substantially continuous.

A boring-tool having a hollow body 33 is provided, the upper end of which is identical in every particular to the threads, notches, and lugs of the threaded end of the shaft 8′, and as the lower end of the shaft 8′, having the ring 8^c, is formed the same as the lower end of the shaft 8 the upper end of said tool may be connected to the lower end of the shaft 8′, as shown in Figs. 1, 5, and 6, or directly to the end of the shaft 8. As shown in Figs. 5, 6, and 7, the body 33 is concavo-convex in cross-section and is divided by a partition 22^b, the upper end of which abuts against and is continuous with the partition 22^a of the shaft 8′ when the latter is connected to the upper end of the tool, as shown in Fig. 5, or which will be continuous with the partition 22 when the tool is connected directly with shaft 8. The hollow portion of the body 33 extends nearly to its lower end, and said partition 22^b extends nearly to the bottom of said hollow portion, so that a passage-way is left below the lower end of the partition which connects the two chambers into which the body of the tool is divided by said partition. When the parts are connected as above described, it will be clear that the passages 23 24 extend to the lower end of the tool, where they are connected, so that when the pump-piston 17 is reciprocated the liquid will be forced down the passage 24 into the lower end of the passage 23, then up the latter and back into the tank.

The lower end of the tool 33 is provided with a blade 35, which has tapered and beveled side edges which fit into a correspondingly-tapered and dovetailed groove in the lower end of the body, as shown in full and dotted lines in Fig. 9 and at 61 in the modification shown in Figs. 16 and 19, hereinafter referred to, and has its cutting edge radially arranged with respect to the axis of rotation of the tool. (See Fig. 9.) A screw 35^a passes through a slot in the blade and is threaded into the lower end of the body 33. This screw is not intended to hold the blade in place when the tool is rotated forwardly in the operation of cutting, as the tapering side of the groove in which the blade is located serves to perform this function; but said screw acts to prevent the blade from becoming displaced when the tool is rotated in the opposite direction. A shaft 36 is firmly secured to the body of the tool and extends radially from its axis substantially at right angles to the cutting edge of the blade 35, and a series of knife-edged

disks 37 are loosely journaled on said shaft, the edges of said disks preferably extending slightly below the cutting edge of the blade. Said tool 33 is also provided with an earth-removing device which consists of a tube 39, open at its lower end and of double-convex shape in cross-section and which is adapted to be fitted between the guides 33^d at the edges of the concave side of the tool-body 33, (see Fig. 7,) the side of said tube 39 next the concave side of the tool-body fitting said concave side, and the opposite side of said tool being continuous with the convex side of the body, so that when said tube is in place between the guide-ribs 33^d the tube and body will unite to make substantially a perfect cylinder, as shown in Fig. 7. The concave side of the body is provided with a lip 33^c, against which the lower edge of the inner side of the tool 39 abuts, as shown in Fig. 6, said concave side being curved inwardly below said lug, forming an earth-receiving recess which extends to the edge of the blade 35. The tube 39 is provided with a closed plate 40, of flexible metal, which is fitted to the inner surface of the outer wall of the tube 39, said plate being provided with a series of forks 40^a at its lower end. Said plate is connected to a jointed rod 42, which extends upwardly through the upper end of the tube 39 and is arranged within a tube 41, which is in turn connected to the threaded upper end of the tube 39 by a union coupling-ring 41^a. The lower end of the outer wall of the tube 39 is bent inwardly to provide an obliquely-extending lip 39^a, above which the lower end of the plate 40 is normally supported. When said plate 40 is moved downwardly, said lip 39^a will engage the prongs 40^a of the plate 40 and bend them to an oblique position, as shown in Fig. 6, so that the ends of the prongs will engage the inner side of the tube. The lower ends of said plate are curved, (see Fig. 13,) so that when it is moved down to its lowest position it will fit against the opposite wall of the tube. The tube 41 is threaded at its upper end, so that similar sections of tubing, likewise having a coupling-ring at one end and screw-threads at the other, may be connected thereto. The rod 42 may also be made in sections and connected by a common "fish-pole" joint, (see Fig. 11,) so that the length of said tube and rod may be indefinitely increased. A short handle 44 is preferably connected to the rod 42 and extends through a slot in the tube 41 closely adjacent the upper end of the tube 39. A plunger 45 is arranged in said tube 39, and a rod 46 is connected thereto and extends through the upper end of the casing 39, as shown in Fig. 6.

A rack 47 is removably connected by clamps 47^a to one side of the shaft 8′ and extends longitudinally thereof, and a pinion 48 is secured to a shaft 49, which is journaled in a tripod 50, and is provided with a crank 51.

Having now described the construction of my device, the manner of using the same may be described as follows: The frame 32 is firmly secured to the ground about the place where it is desired to sink the hole into the earth, said frame being arranged so that its standards 31 will be in a substantially vertical position. The frame 1 is then placed in the position shown in Fig. 1, so that said standards 31 pass through guide-lugs 1^a of the frame, valve 8^d is closed, (see Fig. 15,) tank 7 is filled with oil or other liquid, and the burner is lighted, so that the oil is heated to a comparatively high temperature. The tool 33 is first connected directly to the lower end of the shaft 8, so that its cutting end rests on the ground, and the platforms 26 will then be nearly horizontal, as shown in Fig. 1. Valve 8^d is then opened, and the two men who are to operate the device then take their places upon the platforms 26 and rotate the shafts 3 by means of the cranks 4, so that the tank 7, shaft 8, and tool 33 will be rotated. As the shafts 3 are rotated the piston 17 will be reciprocated, drawing the heated liquid in the tank into the passage 24 and forcing the same down through the chambers of the tool and back again up the passages 23 into the tank. As the platforms 26 are flexibly connected with the frame 1 and as fully one-half the weight of each man is sustained by said frame, which is in turn sustained by the tool as its end rests on the ground, it will be obvious that the weight of the men will aid materially in forcing the tool into the earth as it is rotated. The arms 11 serve an important function, as they give the men who rotate the driving-shaft something to brace against as they turn the cranks. As the tool is driven into the earth the platforms tip to some extent as they swing downwardly, and the rollers 30 on the ends of the legs 29 at the same time permit the legs to slide away from the shaft 8.

As soon as the liquid is circulated through the tool it becomes heated by the liquid, enabling the tool to melt the frost in the earth and dry and soften it, so that the work of boring the hole in the ground is greatly facilitated. The tool will sink into the earth until the collars 28 rest on the surface thereof and further downward movement is prevented. The valve 8^d is then closed, the tool is uncoupled from the lower end of the shaft 8, and the frame 1 is again lifted. Shaft 8′ is then connected to the upper end of the tool 33 and to the lower end of the shaft 8, as shown in Fig. 1, and the valve 8^d is again opened and the boring operation continued. When the collars 28 again sink to the ground, the valve 8^d is again closed, and another shaft similar to the shaft 8′ is interposed between shaft 8 and the previously-added section, so that the length of shaft 8′ is again increased. Succeeding sections of shaft 8′, tube 42, and rod 41 are thus added until the tool is driven to the desired depth. When the tool is driven below the frost-line, the pump may be dis-

connected and the heating of the liquid in tank 7 discontinued. During the first part of the operation the earth will be readily discharged at the surface; but as soon as the tool is forced below the surface to a considerable depth it will be necessary to employ the earth-removing tube 39, already described. Tube 39 is then placed in the position shown in Figs. 6 and 7, with the plate 40 drawn up so that its end is open. The earth which is cut away by the knife 35 will first fill the recess below the end of the tube and then will be crowded upwardly into the tube, so that said tube will be filled with earth. When the tube 39 is full, the rod 42 is forced downwardly, causing the plate 40 to close the lower end of the tube, as shown in Fig. 6. Then pipe 41 is drawn upward, lifting the tube 39 out of engagement with the tool-body 33. As the ends of pipe 41 and rod 42 would strike the frame as it is drawn up, the sections thereof will be unjointed as they are drawn to the surface, so that the tube 39 may be drawn from the hole without disturbing the boring apparatus When said tube is removed, the plate 40 is drawn upwardly by means of the handle 44, and the end of the tube is opened so that the earth therein may be expelled by means of the plunger 45. After the earth is removed from the tube it is again forced down into engagement with the tool-body 33, the pipe 41 and rod 42 being again coupled as it is lowered. The loose sharp-edged disks 37 serve to loosen the earth in advance of the eagagement of the blade therewith. When it is necessary to remove the tool-body 33, so as to supply a new blade, the valve 8^d is closed, and the shaft 8 is disconnected from the adjacent section 8′, and then the whole frame and its connected parts are lifted above the ends of the guiding-standards 31 and moved to one side. The tripod 50 is then arranged so that its pinion 48 engages the rack 47 on the shaft 8′, and the crank is turned, lifting the tool out of the ground.

In Figs. 16 to 22 I show a modified form of boring-tool which I preferably employ in boring holes in certain earth formations. The tool 60 shown in said figures resembles an ordinary form of twist-drill, except that the cutting end thereof is provided with a pair of oppositely-arranged blades 61, which are fitted into tapering dovetailed grooves in the ends of the spirals of the drill, as previously described with respect to blade 35 of tool 33. The spirally-extending grooves 60^a of the tool lead down to the cutting edges of the blades, so that as the material is cut away by the blades it will be lifted into the grooves and gradually forced upwardly as the tool rotates. These grooves are preferably made relatively narrow at their lower ends and gradually increase in width as they ascend, so that the danger of clogging arising from the material becoming wedged into the grooves is practically obviated. The tool is preferably made up of a series of sections which are firmly connected together. The upper end of each section is provided with an obliquely-disposed seat 60^b, as shown in Fig. 17, having shoulders 60^c at its ends, which extend obliquely to the surface of the seat and provide a V-shaped socket. The lower end of the next section above is made to fit said seat and socket, and when the upper and lower ends of two sections are fitted together, as shown in Figs. 16 and 18, they are secured together by screws 62, which extend across the joint. The meeting surfaces are so arranged that the body of the tool will be continuous at the joint. When the tool is rotated, the strain of this joint will not be taken up to a material extent by said screws 62, but the force will be exerted against the shoulders 60^c and the seat 60^b. Said screws are necessary, however, to keep the parts in their proper positions. The drill 60 is made of cast-steel, and when it is cast each spiral of the drill is cored so that passages 23^d and 24^d are formed therein, said passages extending throughout the entire length of each section except the lower section, which bears the knives 61. An elongated slot (see Fig. 22) is formed in the middle portion of the lower section, which connects the lower ends of said passages and affords free circulation of liquid closely adjacent the blades of the tool. The upper section 60^d is contracted at its upper end, and passages 23^d 24^d therethrough lead into said contracted portion, the latter being provided with tongues and being threaded, so that it may be connected to the lower end of shaft 8 or one of the sections 8′, as previously described. The sections of the drill between the lower section, which carries the blades, and the upper section, to which the shaft 8 is connected, are substantially identical and may be increased in number to any extent required within certain limits. Each of these intermediate stations are practically identical, and they are so formed that the ends of the passages through one section will register with the ends of the passages in the adjacent sections. The manner of operating this tool is identical with that previously described, the tool being heated by the circulated liquid and the frost being extracted from the earth as it is cut away by the tool. The material which is cut away by the knives is carried up by the spirals as the tool is rotated, or the tool may be drawn out of the earth after the spirals have been filled and the earth removed therefrom. In practice it will be necessary to remove the tool at comparatively short intervals on account of the necessity of changing the blades 61, which will become dulled after a certain length of time, dependent largely on the character of the earth through which the passage is being made.

From the foregoing description it will be

seen that I have produced an apparatus which may be advantageously employed in ascertaining the character of the earth at a considerable distance below its surface without its being necessary to sink a shaft.

The feature of heating the tool while it is being driven through the frozen earth may be advantageously employed on a larger scale than that shown, and other changes may be made without departing from the spirit of my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A prospecting instrument comprising a boring-tool having a pair of liquid-tight passages connected at the lower end of the tool, and extending longitudinally thereof, means for operating said tool, a reservoir and means for circulating heated liquid through said reservoir and passages, substantially as described.

2. A prospecting instrument comprising a boring-tool having a cutting edge at its lower end, two liquid-tight passages which extend longitudinally of said tool and are connected at their lower ends closely adjacent said cutting edge, a reservoir into which both said passages lead, means for operating said tool, and means for circulating heated liquid through said reservoir and passages, substantially as described.

3. A prospecting instrument comprising a shaft having two liquid-tight passages which extend longitudinally thereof, a boring-tool which is connected to said shaft and is provided with passages which are respectively connected with the passages therein, said passages being connected near the cutting edge of the tool, a fluid-containing reservoir, means for heating the same, connections between said reservoir and the passages of said shaft, means for circulating heated liquid through said reservoir and passages, and means for rotating said shaft, substantially as described.

4. A prospecting instrument comprising a shaft having two passages which extend longitudinally thereof, a tool which is connected to one end of said shaft, said tool having passages which register with the passages of said shaft and are connected at the cutting end of said tool, a liquid-containing tank which is borne by said shaft and is connected to the passages therein, a pump for forcing the liquid into one of said passages and for causing the same to be discharged back into the tank through the other passage, means for rotating said shaft and for simultaneously operating said pump, substantially as described.

5. A device of the character described comprising a frame, a pair of driving-shafts journaled thereon, a tubular shaft which is journaled in said frame and is operatively connected with said driving-shafts and has a pair of liquid-passages therein, a tool which is connected to said shaft and is provided with a pair of liquid-passages which are respectively connected with the passages of said shaft, a liquid-containing tank which is carried by said shaft and is connected to the passages thereof, a pump which is operated by one of said driving-shafts and circulates the liquid in said tank through said passages, and means for heating said liquid, substantially as described.

6. A device of the character described comprising a frame, a pair of platforms which are flexibly connected to said frame at their adjacent ends, a supporting-leg for the opposite ends of each platform, a pair of driving-shafts which are journaled in said frame having cranks, an upright shaft which is journaled in said frame and is provided with a boring-tool at its lower end, and suitable connections between said upright shaft and said driving-shafts whereby the upright shaft may be rotated, substantially as described.

7. A device for the purpose described, comprising a frame, a pair of oppositely-arranged platforms which are flexibly connected to said frame at adjacent ends, supporting-legs which are connected to the opposite ends of said platforms, a pair of horizontal driving-shafts which are journaled in said frame having suitably-arranged cranks, an upright shaft which is journaled in said frame and is operatively connected with said driving-shaft, a boring-tool which is connected to said upright shaft, and arms which are rigidly connected with said frame and extend to one side of said platforms between the platforms and the cranks, substantially as described.

8. A device of the character described comprising a frame, a tubular shaft which is journaled in said frame and is provided with a pair of longitudinally-extending passages, means for closing both of said passages, a liquid-containing tank which is connected to said passages, means for heating the liquid in said tank, a boring-tool connected to said shaft beyond said closing means and provided with a pair of circulating-passages which extend to the upper end thereof, said passages registering with the passages of said shaft, means carried by said frame for rotating said tubular shaft, and means for conducting the liquid in said tank through said passages and returning the same thereto, substantially as described.

9. A device for the purpose described comprising a boring-tool having an earth-receiving recess, means for rotating the same, means for removing the borings of said tool comprising a tube open at its lower end and arranged in said recess, a flexible plate arranged to slide within said tube and connected to one side thereof, means for reciprocating said plate which extends upwardly from said tube, means for bending said blade to an oblique position as it is forced downwardly to thereby

close the lower end of said tube, and means for lifting said tube out of said earth-receiving recesses, substantially as described.

10. A device of the character described comprising a frame, an upright tool-carrying shaft which is journaled and held against longitudinal movement therein, a pair of oppositely-arranged platforms which are flexibly connected to said frame at adjacent ends, a supporting-leg for the opposite end of each platform, and means connected to said shaft for operating the same, substantially as described.

11. A device of the character described comprising a frame, an upright tool-carrying shaft which is journaled and held against longitudinal movement therein, a pair of platforms which are flexibly connected at adjacent ends to said frame, means for rotating said upright shaft, and means for guiding said frame in a direction parallel to the axis of said shaft, substantially as described.

12. A device for the purpose described comprising a vertically-movable frame, an upright shaft journaled therein, means for rotating said shaft, a boring-tool connected with the lower end of said shaft, a horizontally-arranged gear which is connected to said shaft, a pair of driving-shafts which are journaled in said frame and are provided with gears which mesh with said horizontal gear, cranks which are connected to the outer ends of said driving-shafts, a pair of platforms which are flexibly connected to said frame at their adjacent ends and are arranged beneath said cranks, a pair of legs which are connected to the opposite ends of said platforms, and curved arms which are connected to each side of said frame and extend to one side of each platform between the platforms and the cranks, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MILTON CHASE.

Witnesses:

LOUIS H. HARRIMAN,

J. L. HUTCHINSON.