M. GOLDSMITH.

MINING APPARATUS.

APPLICATION FILED JAN. 25, 1909.

931,057.

Patented Aug. 17, 1909.

2 SHEETS—SHEET 1.

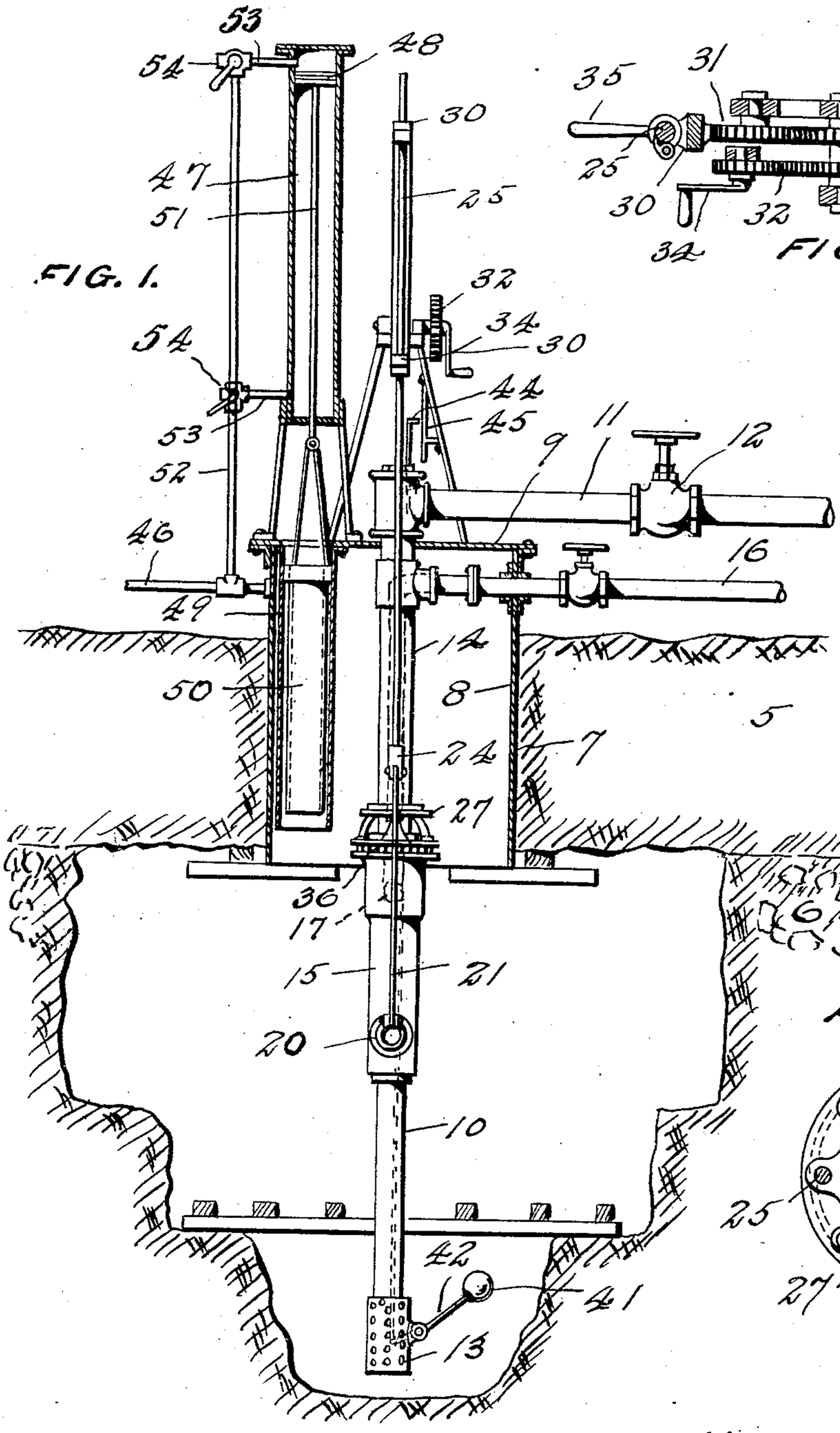
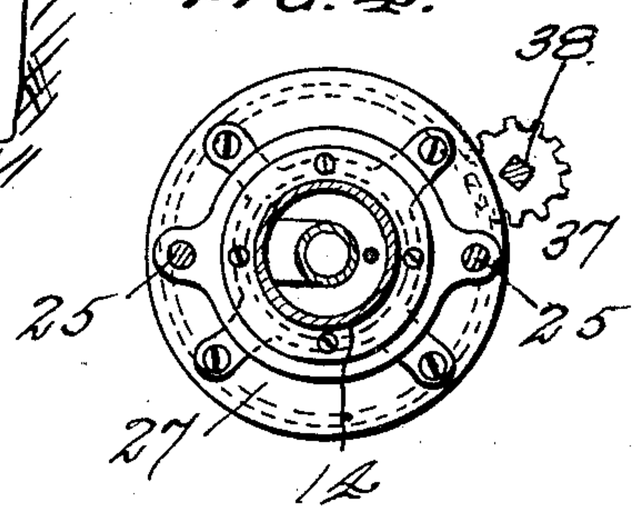


FIG. 1.

FIG. 3.

FIG. 4.



WITNESSES

C. K. Davies

Myron G. Clear.

Manning Goldsmith
INVENTOR

By C. L. Parker.
Attorney

ANDREW. B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C.

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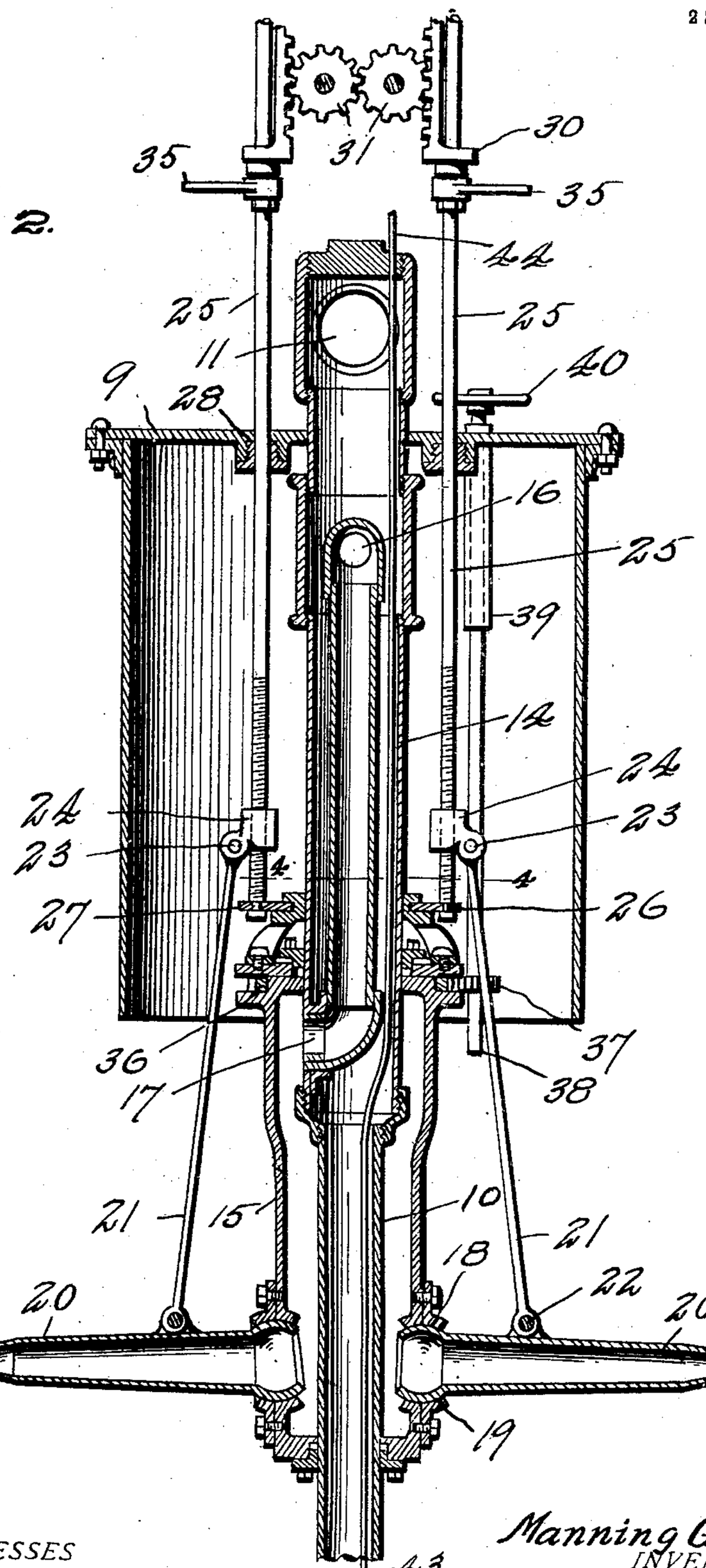
2 SHEETS—SHEET 2.

FIG. 2.



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UNITED STATES PATENT OFFICE.

MANNING GOLDSMITH, OF ATLANTA, GEORGIA.

MINING APPARATUS.

No. 931,057. Specification of Letters Patent. Patented Aug. 17, 1909.

Application filed January 25, 1909. Serial No. 474,038.

To all whom it may concern:

Be it known that I, MANNING GOLDSMITH, a citizen of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Mining Apparatuses, of which the following is a specification.

The present invention relates to means for the removal or extraction of small solid and insoluble materials, from beneath the surface of the ground, and while particularly intended for mining pebble phosphate rock, may of course be successfully employed for other purposes. Ordinarily phosphate rock of the above character is overlaid with a stratum of earth, that varies in thickness from six to sixteen feet, and heretofore it has been the custom to remove this stratum entirely from the surface of the phosphate rock. This is slow and costly, often requiring a year to remove the upper stratum from one acre, and costing in the neighborhood of twenty cents a cubic yard.

The object of the present invention is to reduce the expense of mining by eliminating the necessity of removing the surface layer.

The preferred embodiment of the invention is illustrated in the accompanying drawings, and is described in the following specification. It will be observed from an inspection of the claims hereto appended that the invention is not necessarily limited to the exact apparatus disclosed.

In the drawings:—Figure 1 is a vertical sectional view through a mine or cavity, illustrating the apparatus in position. Fig. 2 is a vertical sectional view on an enlarged scale, through a portion of the same. Fig. 3 is a horizontal sectional view through the mechanism for raising and lowering the head. Fig. 4 is a horizontal sectional view on the line 4—4 of Fig. 2.

Similar reference numerals designate corresponding parts in all the figures of the drawings.

In Fig. 1, a sectional view through a portion of the earth's surface is shown, illustrating a stratum 5 of earth or soil overlying a lower stratum 6 of phosphate rock. In mining this rock according to my method, an opening 7 is formed through the upper stratum 5, and is closed by a cap comprising a cylindrical side wall 8 and a top wall 9 bolted or otherwise secured thereto. Depending from the top wall of this cap is an eduction pipe 10 connected at its upper end with a suitable delivery pipe 11 having a controlling valve 12 therein. This pipe 10 extends downwardly into the lower portion of the mine or cavity, and is preferably provided with a perforated lower end 13. The upper portion 14 of the eduction pipe, as shown more particularly in Fig. 2, is enlarged, and slidable on said pipe is a hollow head 15, said head being also rotatable. Another pipe 16, leading from a suitable source of supply, conducts fluid under pressure into the head 15, said pipe 16 entering the upper portion of the eduction pipe, and extending downwardly within the enlarged portion 14. It terminates in a lateral delivery end 17 that communicates with the interior of the head 15. The lower portion of said head 15 is provided with two or more sockets 18, in which operate the enlarged ball portions 19 of nozzles 20 that can thus swing so that their angles of inclination with respect to the head 15 can be changed. These nozzles are supported by links 21 pivoted thereto, as shown at 22, and said links have their upper ends pivoted, as illustrated at 23 to nuts 24 that have threaded engagements with vertical rods 25. These rods have their lower ends journaled and interlocked, as shown at 26 with a collar 27 rotatably engaged with the upper end of the head 15, and said rods pass through suitable stuffing boxes 28 in the top wall 9 of the cap. Their upper ends are rotatably engaged with racks 30, which are in mesh with gear wheels 31 and 31ª, said wheels being geared by gears 32 and 32ª, the latter being mounted upon the same shaft with gear 31ª, as shown in Fig. 3 to an operating crank 34 or other device. With this arrangement therefore, it will be evident that if the crank 34 is turned, the gear wheels 31 will be revolved, thus raising or lowering the rods 25, and inasmuch as said rods have connections with the head, said head and the nozzles will be raised and lowered also. The rods furthermore have outstanding handles 35, by which said rods can be rotated, and if rotated, it will be obvious that the nuts 24 will be moved up and down on said rods, so that the nozzles will be swung with respect to the head. By this means therefore the position and arrangement of the nozzle can be altered as desired.

It is also desirable that the nozzles should be rotatable so that they may operate in

different directions, and to this end, the head 15 is provided near its upper end with a gear wheel 36, meshing with a pinion 37 that is slidably mounted on the angular portion of a shaft 38. This shaft is journaled, as shown in a sleeve 39, carried by the cap, and projects above said cap, where it has a hand wheel 40. By turning the wheel, it will be obvious that the pinion 37 will be turned, and this rotary motion will be transmitted to the head 15. The pinion engaging between two flanges formed above and below the gear wheel 36, will move up and down with the head, as will be apparent.

In order to determine the depth of the water at the bottom of the cavity, a float 41 is employed carried upon the end of a swinging arm 42 that projects within the eduction pipe, and the inner end of this arm is connected to a vertically movable rod 43 extending longitudinally within said eduction pipe, and projecting above its upper end. The position of the float can therefore be easily determined by the position of the projecting end of the rod, which, as shown in Fig. 1, has an offset terminal 44 coöperating with a scale located on a suitable plate 45.

For the purpose of supporting the upper stratum of earth, a supply of air under pressure is introduced into the cavity or mine from any suitable source of supply by a pipe 46 connected to the upper end of the cap. It is often desirable to have an inspector enter the mine for the purpose of investigating the condition of the workings. For this purpose therefore, a cylinder 47 is supported upon the cap, and has a reciprocatory piston 48 operating therein. Depending within the cap is a tube 49, within which operates a telescoping tube 50 that acts as a car or carrier for the inspector. The tube 50 has a connection 51 with the piston. A pipe 52 leads from the air supply pipe 46, and has connections 53 with the ends of the cylinder 47, said connections being controlled by three way valves 54. By operating these valves, it will be evident that the carrier 50 can be raised or lowered, as desired.

The operation of the structure is substantially as follows. After the apparatus has been introduced, the closure is made substantially air-tight. Water is then turned on through the supply pipe 16, and will flow into the head 15, being discharged with great force through the nozzles 20, against the adjacent walls of phosphate rock. Said walls will consequently be disintegrated, and the material will flow into the bottom of the cavity from which it can be drawn by means of the eduction pipes 10 and 11. At the same time, in order to preserve the overlying stratum, and force the material through the eduction pipe 10, air is admitted through the pipe 46. It will be obvious that by the mechanism above described, the head and the nozzles can be moved so that the entire bed of material within the range of action of the nozzles can be operated upon, and when the limit of such action has been reached, the apparatus can be withdrawn and introduced at a new point.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art, without further description, and it will be understood that various changes in the size, shape, proportion, and minor details of construction, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

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

1. In mechanism of the character described, the combination with means for closing the mouth of a mine or similar cavity, of means for introducing a liquid under pressure into said mine or cavity, means for again withdrawing the introduced liquid and dislodged material from said mine or cavity, and means for supplying air under pressure to said mine or cavity.

2. In mechanism of the character described, the combination with means for closing the mouth of a mine or similar cavity, of means mounted on said closing means for introducing a liquid under pressure into said mine or cavity and again withdrawing the introduced liquid and the material dislodged thereby, and means also connected to the closing means for supplying air under pressure to the mine or cavity.

3. In mechanism of the character described, the combination with an eduction pipe, of a head mounted thereon and having a delivery nozzle, and means extending downwardly in the eduction pipe and connected to the head for supplying fluid under pressure to said head.

4. In mechanism of the character described, the combination with a closure cap, of an eduction pipe suspended therefrom, a head surrounding the pipe, a plurality of nozzles projecting from the head, and a fluid supply pipe located within the eduction pipe and having a lateral delivery end opening into the head.

5. In mechanism of the character described, the combination with a movable head, of a nozzle carried by and movable on the head, and means for moving the head with the nozzle, and also moving the nozzle with respect to the head.

6. In mechanism of the character described, the combination with a movable head, of a nozzle carried by and movable on the head, and a single device for moving the head with the nozzle and also moving the nozzle with respect to the head.

7. In mechanism of the character described, the combination with a movable head, of a nozzle carried by and movable on the head, and a rotatable and longitudinally movable rod connected to the head and nozzle and respectively moving them on its longitudinal and rotary movements.

8. In mechanism of the character described, the combination with an eduction pipe, of a head slidable thereon, a nozzle pivoted on the head and longitudinally movable, a revoluble rod connected to the head and having screw threads, a nut engaged with the screw threads and moved upon the rotation of the rod, and a link connection between the nut and the nozzle.

9. In mechanism of the character described, the combination with an eduction pipe, of a head rotatable thereon and having nozzles, means for supplying liquid to the nozzles, and means for rotating the head.

10. In mechanism of the character described, the combination with an eduction pipe, of a head longitudinally movable and rotatable on said eduction pipe, means extending within the eduction pipe for supplying liquid to the head, outstanding nozzles carried by the head, means for sliding the head longitudinally upon the pipe, and means for rotating said head.

11. In mechanism of the character described, the combination with a closure cap, of an eduction pipe depending therethrough, a hollow head rotatably and slidably mounted upon the pipe, a liquid supply pipe extending downwardly within the eduction pipe and having a lateral delivery end communicating with the interior of the head, an operating shaft having a gear engaged with the head for rotating said head, longitudinally movable and rotatable rods engaged with said head, means for moving the rods longitudinally, said rods having screw threads, nuts engaged with the screw threads, nozzles having ball and socket joints in the head, and links pivoted to the nozzles and to the nuts.

12. In mechanism of the character described, the combination with a closure for the mouth of a mine or cavity, of hydraulic eduction mechanism mounted on said closure, and elevator mechanism also carried by said closure for raising and lowering the mine inspectors.

13. In mechanism of the character described, the combination with a closure for the mouth of a mine or cavity, of hydraulic eduction mechanism mounted on said closure, a cylinder mounted above the closure, a piston operating in the cylinder, and telescoping pipes suspended within the closure, one of said pipes being connected with the piston and constituting a car for an inspector.

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

MANNING GOLDSMITH.

Witnesses:

JESSE L. MOORE,

R. G. MASON.