(No Model.) 2 Sheets—Sheet 1.

H. K. GOODRICH.

COMPRESSED AIR AND STEAM APPARATUS FOR SINKING WELLS.

No. 406,898. Patented July 16, 1889.

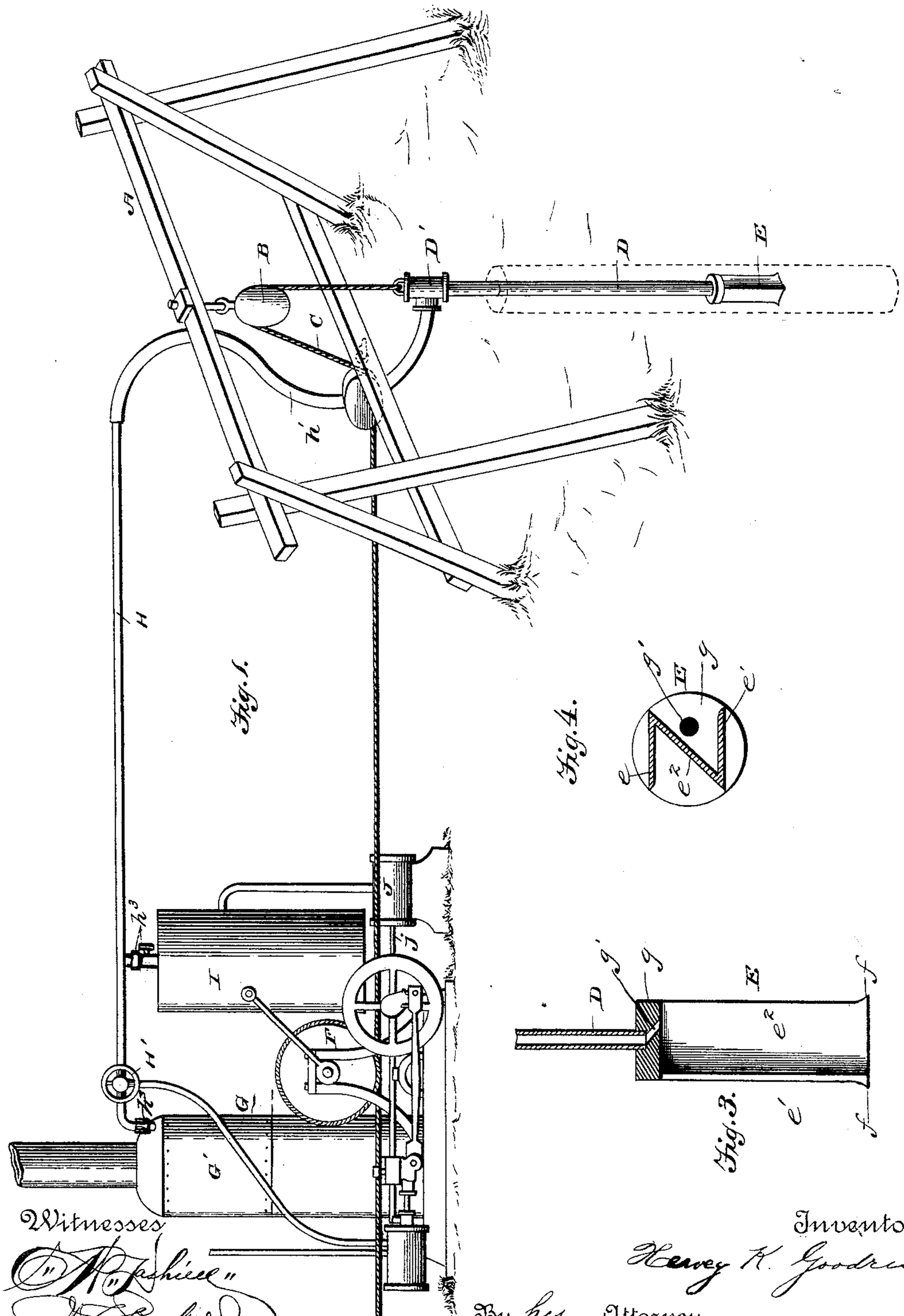

Fig. 1.

Fig. 4.

Fig. 3.

Inventor
Henry K. Goodrich
By his Attorney
W. N. Moore

(No Model.) 2 Sheets—Sheet 2.

H. K. GOODRICH.

COMPRESSED AIR AND STEAM APPARATUS FOR SINKING WELLS.

No. 406,898. Patented July 16, 1889.

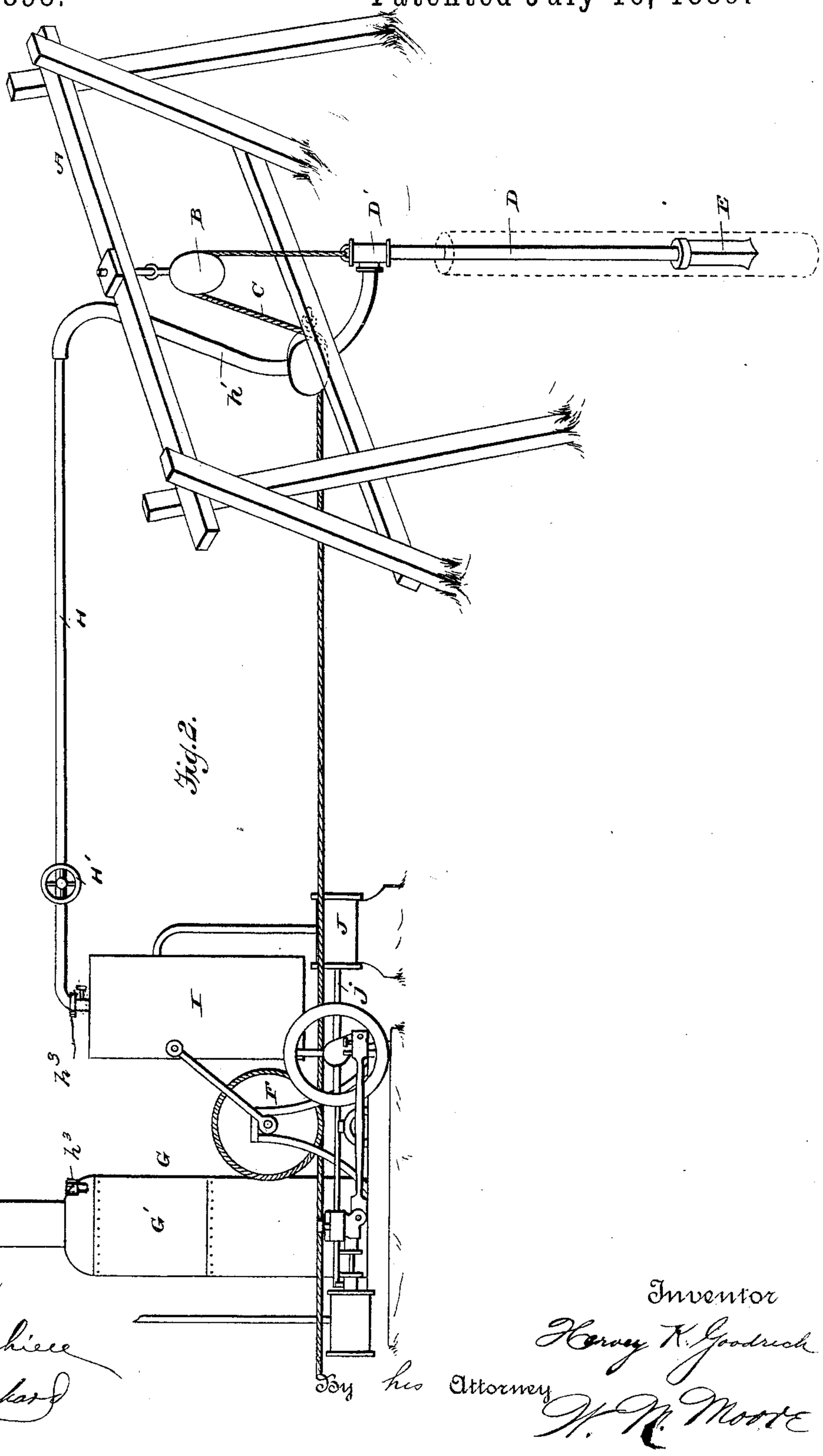

Fig. 2.

Witnesses
D. H. Jackson
W. L. Bernhard

Inventor
Harvey K. Goodrich
By his Attorney
W. N. Moore

UNITED STATES PATENT OFFICE.

HERVEY K. GOODRICH, OF SHERMAN, TEXAS.

COMPRESSED-AIR AND STEAM APPARATUS FOR SINKING WELLS.

SPECIFICATION forming part of Letters Patent No. 406,898, dated July 16, 1889.

Application filed May 26, 1888. Serial No. 275,177. (No model.)

To all whom it may concern:

Be it known that I, HERVEY K. GOODRICH, a citizen of the United States, residing at Sherman, in the county of Grayson and State of Texas, have invented certain new and useful Improvements in Compressed-Air and Steam Apparatus for Sinking Wells; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to a compressed-air or steam drilling and excavating apparatus; and it consists of the peculiar combination of devices and novel construction and arrangement of parts, as will be hereinafter fully described, and particularly pointed out in the claims.

The object of my invention is to provide a simple and inexpensive apparatus for drilling the rock and earth until sufficient loose material has accumulated in the shaft, and then remove such material by the pressure of an aeriform fluid—such as steam or compressed air—which is conducted from a suitable source of supply through the drill-rod and the drill itself to the bottom of the shaft to exert an upward pressure against said loose material and expel the same from the shaft solely by the pressure of such steam or air.

In the accompanying drawings, Figure 1 is an elevation of a drilling and excavating apparatus constructed in accordance with my invention. Fig. 2 is a view showing the supply-pipe connected with a compressed-air receiver for introducing a fluid into the shaft of greater pressure and density than steam, and Figs. 3 and 4 are enlarged detail views of the drill.

Referring to the drawings, in which like letters of reference denote corresponding parts in all the figures, A designates a tripod or other suitable supporting-frame, which is adapted to be erected over the spot where the shaft is to be sunk. This tripod or frame has a guide sheave or pulley B suspended therefrom, over which passes a cord, rope, or other pliable connection C, which is secured at one end to a coupling D′ of a hollow tubular drill-rod D, that is adapted to carry a drill E and to enter the shaft or hole excavated by said drill. The drill-rod is lengthened, as the drilling and excavation of the earth, &c., progresses, by the addition of suitable sections or lengths of tubular pipes, which are suitably connected and hermetically united to provide tight joints and prevent the escape of air or other fluid in the hollow drill-rod. The drill-rod is given a vertical reciprocating or "dropping" motion to cause the drill E to properly cut or penetrate the earth, rock, &c., which motion is attained by connecting the unattached end of the rope or cable C to a winding-drum F, carried by a shaft which is driven from an engine or motor G, mounted upon a suitable bed plate or frame that carries the boiler G′, from which steam is taken to drive the engine G in any ordinary or preferred manner.

The drill E of my invention is provided with two blades or knives *e e′*, respectively arranged at an angle to a central straight knife e^2, and at opposite sides thereof, said blades forming a drill substantially **Z** shape in cross-section. The outer blades *e e′* each have a laterally-extended lip or prong *f* at the free end thereof, and the lower edges of all the blades are properly beveled or sharpened to insure maximum accurate cutting by the drill. At the head of the drill is formed an annular integral part or flange *g*, which is socketed to receive the lower end of the drill-rod, and through this solid head of the drill is formed one or more passages or ducts *g′*, that communicate with the tubular drill-rod and open through the lower side of the head at one side of the vertical blades or knives, so that the compressed air or steam can escape from the drill-rod into the shaft and elevate the loosened earth, rock, &c., to the surface by exerting strong pressure below the loosened mass and maintaining the pressure in the shaft by continuing the supply of compressed steam or air until the material has been forced or expelled entirely from the shaft.

For the initial drilling and excavation of the shaft or well I prefer to use live steam under considerable pressure—say one hundred and fifty pounds—which is supplied to the tubular drill-rod through a pipe H, which is connected at one end with the steam-space of the boiler, and has a pliable or flexible section h' at its opposite end, that couples with one of the elbows of the coupling at the upper extremity of the drill-rod. The said drill-pipe H is coupled to the boiler or compressed-air reservoir by the well-known sleeve or collar coupling h^3, as shown. This supply-pipe has a regulating valve or cock H', by means of which the supply of steam can be readily controlled.

After the shaft or well has been sunk a considerable distance I prefer to use compressed air of great density for expelling the loosened matter from the shaft; and with this end in view I detach the supply-pipe from the boiler and connect it to a compressed-air reservoir or chamber I, into which air is forced and compressed up to the required density by an air pump or compressor J, of any preferred pattern, which has its piston-rod j connected with one of the shafts of the hoisting-engine G, so that the pump or compressor is actuated by the same motor that operates the drum to secure the vertical dropping motion of the rod and its attached drill.

The operation of my invention is obvious from the foregoing description, taken in connection with the drawings. After the apparatus has been properly set up and adjusted for service with the supply-pipe connected to the boiler, as indicated in Fig. 1, the motor is set in motion to reciprocate the drill-rod and cause the drill to cut through rock, earth, &c., and loosen the same. After the proper quantity of matter has been loosened the drill and rod are stopped with the former in the lower extremity of the shaft beneath the mass of loosened matter, and live steam is then fed to the drill-rod from the boiler by merely turning the cock j. The steam passes through the drill-rod and escapes therefrom through the duct in the head of the drill, so that it exerts an upward pressure against the superimposed mass on the drill and expels the same from the shaft. The valve is now closed, the reciprocation of the rod and drill resumed, and the loosened earth alternately expelled in the manner just described until the well or shaft has been sunk a considerable depth, where the pressure of steam carried in the boiler is not sufficient to properly force the loosened earth from the shaft. At this point I attach the supply-pipe to a compressed-air reservoir in which the supply is maintained to the proper density by a compressor and the alternate operations of drilling and excavating resumed until the shaft has reached the desired depth. It will of course be understood that tubing is placed in the shaft at proper times.

Slight changes in details of construction, form, and proportion of parts can be made without departing from the spirit or sacrificing the advantages of my invention.

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

1. The combination of the frame, the tubular drill-rod, the drill formed with outlet-passages through the lower side of the drill-head, the compressed-air reservoir, the steam-boiler, the steam-engine, connections for reciprocating the drill, and a supply-pipe adapted to be connected at will with either the boiler or the air-reservoir, substantially as described, for the purpose set forth.

2. In an apparatus for sinking wells or shafts, the combination of a tripod or frame having a guide-pulley, a tubular drill-rod provided with a coupling, a drill fixed to the lower end of the rod and having one or more ducts communicating therewith, an air-reservoir and a compressor or pump for feeding the same, a steam-boiler, a valved supply-pipe connected at one end to the drill-rod and adapted to be connected with the air-reservoir or steam-boiler, and a cable connected to the drill-rod, and with mechanism for reciprocating the rod vertically, substantially as described.

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

HERVEY K. GOODRICH.

Witnesses:

J. P. GREEN,

S. W. PORTER.