(No Model.) 3 Sheets—Sheet 1.

B. YOCH.

MINING MACHINE.

No. 263,645. Patented Aug. 29, 1882.

Fig. 1.

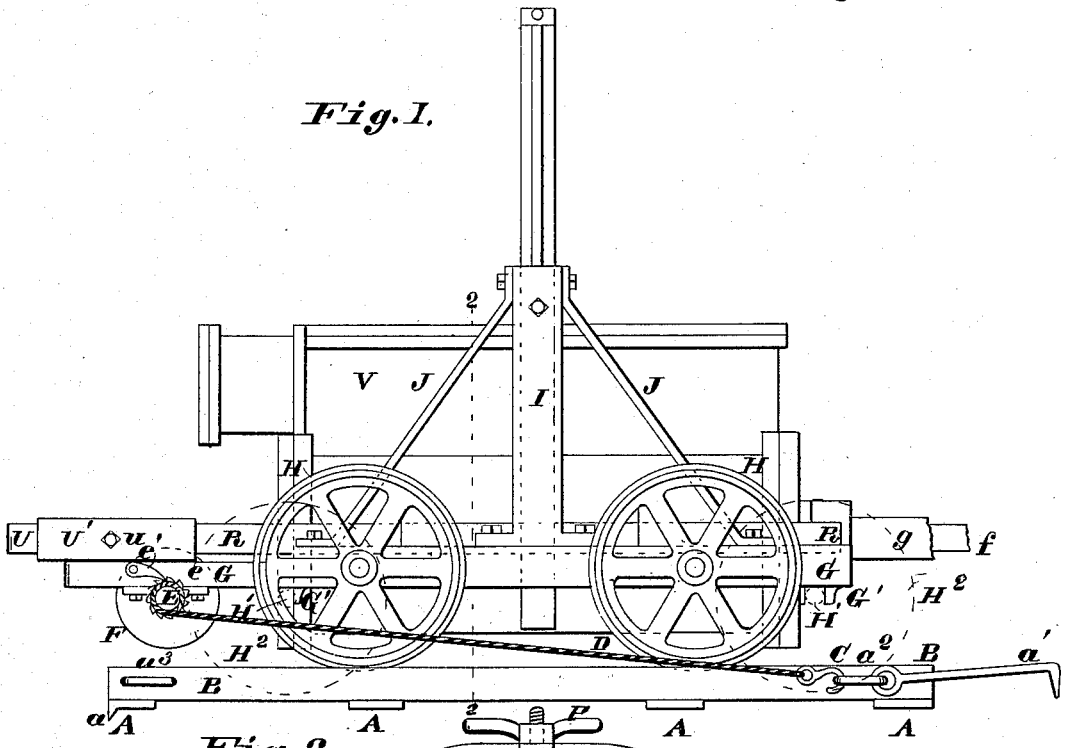


Fig. 2.

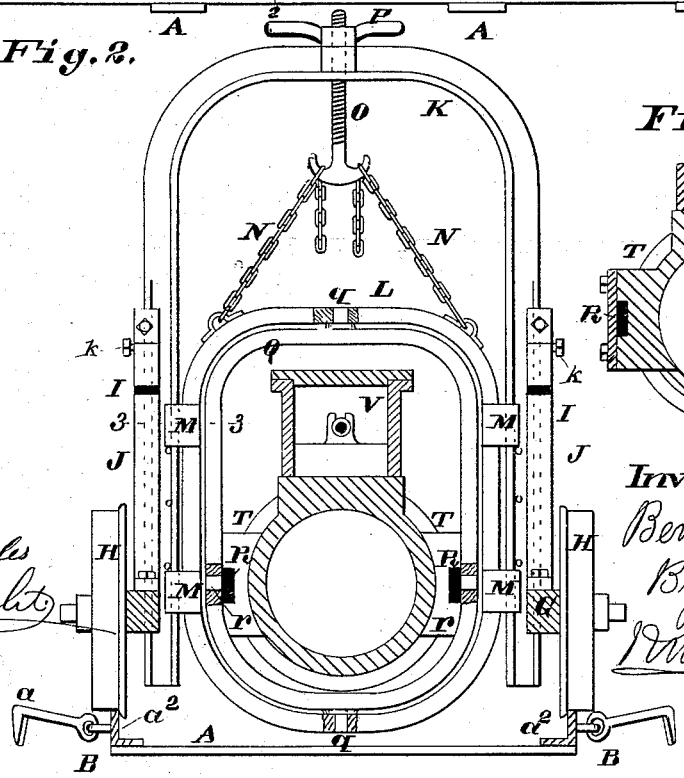


Fig. 3.

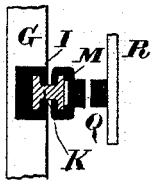
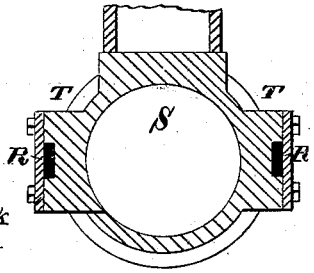


Fig. 4.



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MINING MACHINE.

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Fig. 5

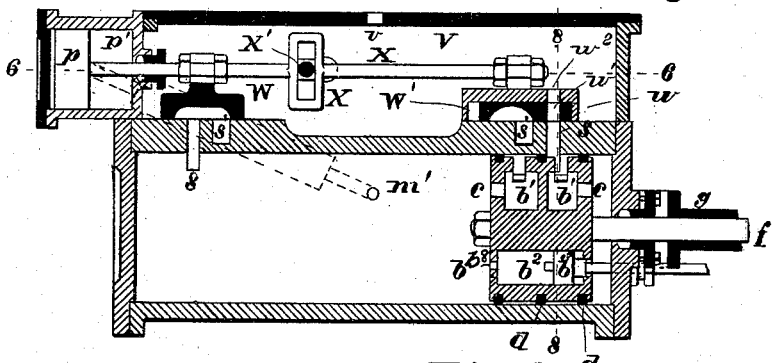


Fig. 6

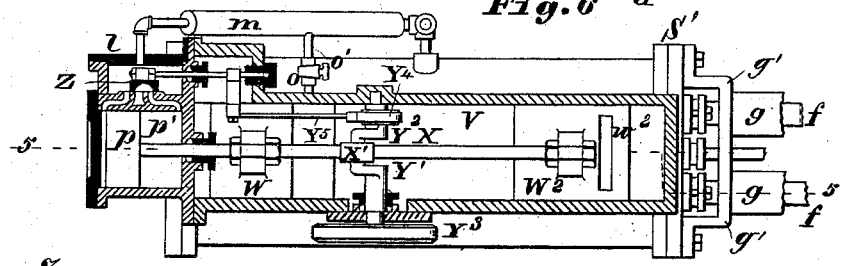


Fig. 7

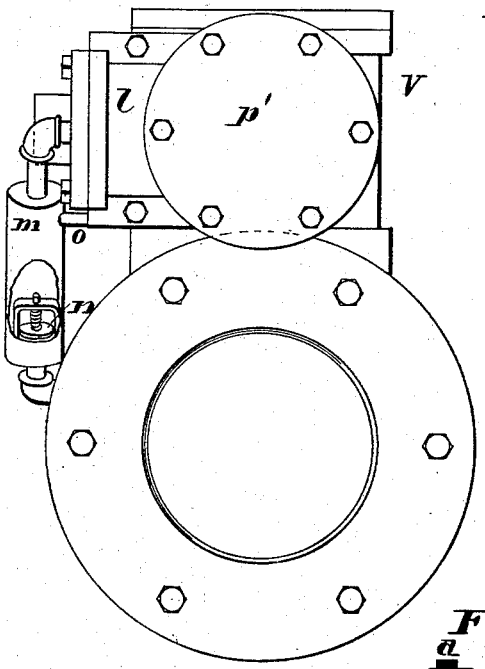


Fig. 8.

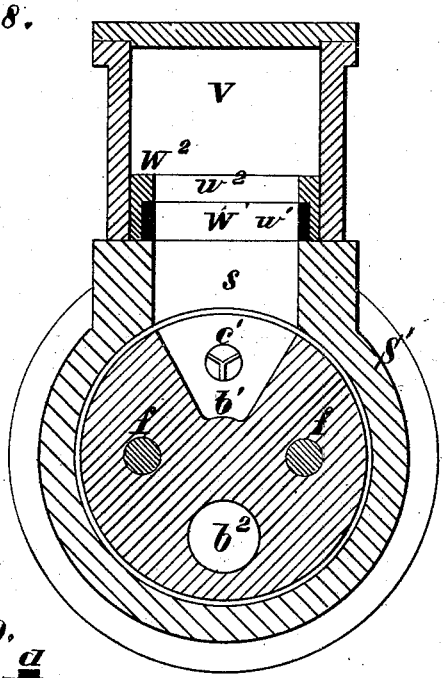
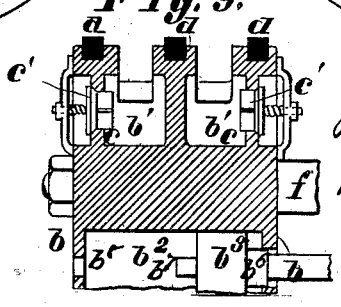


Fig. 9.



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(No Model.) 3 Sheets—Sheet 3.

B. YOCH.

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Fig. 10.

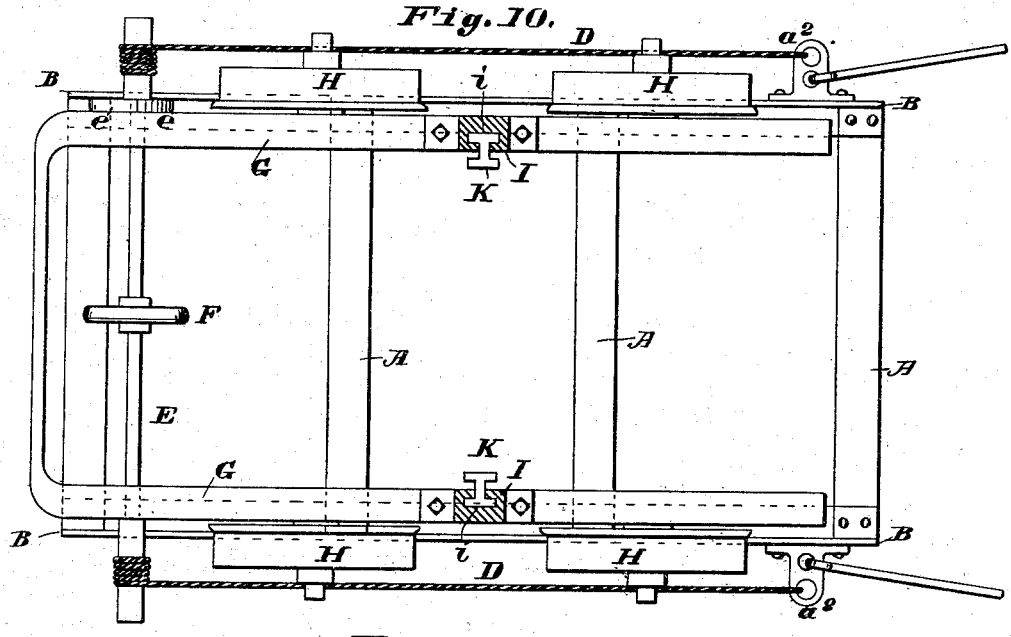

Fig. 11

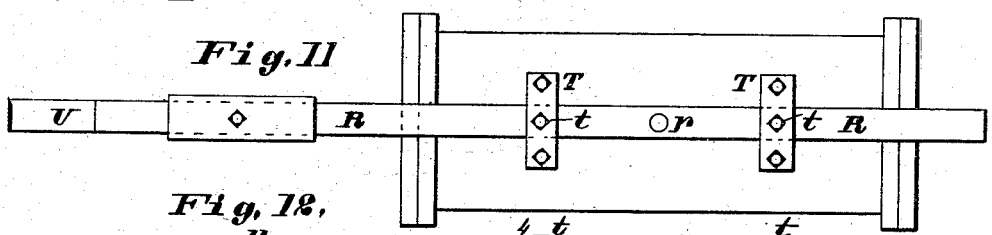

Fig. 12.

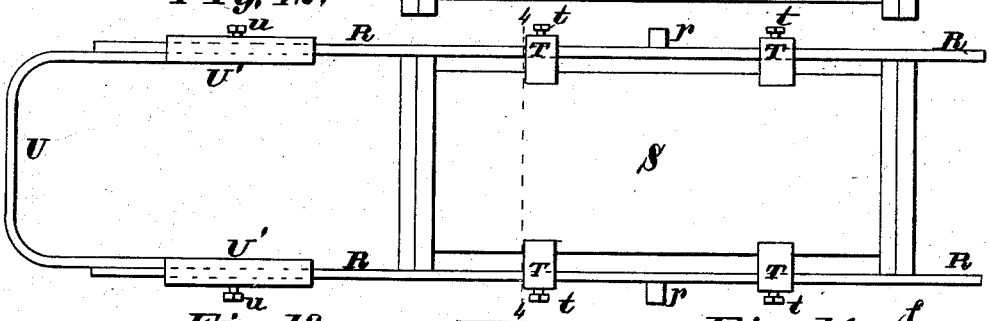

Fig. 13

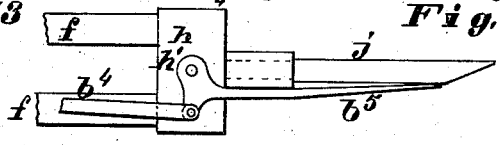

Fig. 14

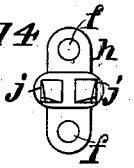

Fig. 15

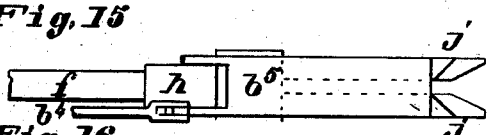

Fig. 16.

Fig. 17

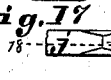

Fig. 18.

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UNITED STATES PATENT OFFICE.

BENHARD YOCH, OF BELLEVILLE, ILLINOIS.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 263,645, dated August 29, 1882.

Application filed December 12, 1881. (No model.)

To all whom it may concern:

Be it known that I, BENHARD YOCH, of Belleville, in the county of St. Clair and State of Illinois, have invented certain new and useful Improvements in Mining-Machines, of which the following is a specification, reference being had to the accompanying drawings, forming part of the same.

My invention relates to that class of mining-machines in which the pick is attached to the piston-rod of an engine driven by compressed air or steam.

My invention consists in the described manner of supporting the cylinder on a truck-frame so as to allow universal motion to the cylinder; also, in a device for driving the valve-engine by partly-exhausted air taken from the cylinder or by steam taken from the same; also, a novel construction of piston; also, a novel construction of slide-valve, with other details of construction, as set forth hereinafter.

The machine is adapted for making horizontal, vertical, and oblique cuts.

In the drawings, Figure 1 is a side view of the machine. In broken lines are shown wheels and axles that are inserted beneath it to allow its removal from place to place on the ordinary rail-track of the mine, (the track or base rails upon which the car stands when at work being on a wider gage.) Fig. 2 is a transverse section at 2 2, Fig. 1, showing the cylinder-supporting frame in elevation. Fig. 3 is a detail horizontal section at 3 3, Fig. 2, showing also part of one of the supporting-rails in top view. Fig. 4 is a transverse section of the engine-cylinder at 4 4, Fig. 12. Fig. 5 is a longitudinal section through the engine and steam or air chest and one of the duplicate stuffing-boxes at 5 5, Fig. 6. Fig. 6 is a horizontal section through the air or steam-chest at 6 6, Fig. 5. Fig. 7 is an enlarged end view of the engine and air or steam chest. Fig. 8 is an enlarged transverse section of the engine and air or steam chest at 8 8, Fig. 5. Fig. 9 is an enlarged detail section of the piston at 5 5, Fig. 6. Fig. 10 is a top view of the carriage-frame. Fig. 11 is a side view of the cylinder and part of a side rail supporting same. Fig. 12 is a top view of the cylinder with parts of the two side rails. Figs. 13 and 15 are side views of the picks and automatic hoe or scraper for drawing out the chippings. Fig. 14 is an end view of two picks in working position. Fig. 16 is a side view of a pick-point, and Fig. 17 is a view of another side of same. Fig. 18 is a section at 18 18, Fig. 17.

The machine, when at work, stands upon the rails B, connected together by ties A.

a are dogs upon one or more of the ties, to engage the floor of the room, and thus prevent the retrograde movement of the base-track A B. The frame has also hinged dogs *a'*, for driving into the floor of the room for a like purpose.

a^2 are staples for the engagement of ropes D by means of hooks C or otherwise. The office of the ropes D is to prevent the backward movement of the carriage on the track-frame and to furnish means for the advancement of the carriage. For this latter purpose the cords are coiled on a windlass, E, turned by a hand-wheel, F, or by other means. The windlass has a ratchet-wheel, *e*, engaged by a pawl, *e'*, to prevent the windlass from turning backward. The carriage has side bars, G, suitably connected by transverse bars and supported upon wheels H upon the rails B.

I are uprights upon the side bars, and made in one piece or firmly attached to the same, and braced to the bars by braces J. The inner sides of the uprights have T-grooves *i*, which receive the flanged edges of an arch, K, I-formed in section at the sides. The arch K is vertically adjustable in the uprights I, and is secured in position by set-screws *k* or by other means.

L is an annular frame or hoop, having brackets M working upon the sides of the arch K. The frame L is supported by means of chains N, engaging on hooks of a jack-rod, O, extending up through the crown of arch K, and having a hand-nut, P, screwing upon it and bearing upon the arch. By turning the hand-nut the frame L is raised or lowered. The frame L has at bottom and top sockets in which turn the trunnions *q* of the annular frame or hoop Q, thus allowing the hoop Q to oscillate freely in a vertical plane. The annular frame Q has sockets receiving trunnions *r* upon the sides of the side rails, R, upon which the engine-cylinder S is supported. These rails extend through brackets T on the sides of the cylinder, the brackets being constructed to slide on the rails to enable the balancing of

the cylinder on the frame Q. The brackets are held in position by set-screws *t*. The relative positions of the trunnions *q r* and their sockets may be reversed without affecting the result—namely, to give capacity for universal motion to the cylinder.

U is the handle, adjustable on the side rails by means of sleeves U′, and secured by set-screws *u*.

V is the chest receiving compressed air or steam through the opening *v* or otherwise.

The slide-valves are shown at W W′. The valve W is shown of the common D form, working over induction-port *s* and exhaust-port *s*′. On the other slide-valve, W′, there is an end extension, *w*, with a port, *w*′, extending through it. The valve W′ is not attached to the valve-rod X, but is actuated by a cover, W², that is attached to the valve-rod, and which has a certain amount of lost motion on the valve. The cover W² has a port, *w*², which in a certain position of the cover is brought in conjunction with the port *w*′, so that the compressed air or steam (as the case may be) at such time enters the port *w*′ from the chest, but at other times the cover acts as a cut-off, the lower face of the cover fitting the top of the valve W′. The position of the valves, as shown in Fig. 5, is such that the compressed air is entering the cylinder at the ports *w*² *w*′ *s* of valve W′ and exhausting at valve W. When the valves commence to move toward the cylinder-head S′ the ports *w*′ *w*² are first closed, cutting off communication between the air-chest and the front end of the cylinder; next the compressed air will be admitted at valve W, and exhaust will take place at valve W′. The early cutting off of the compressed air at valve W′ will moderate the force of the back movement of the drills or picks, while it will be seen that the full head of compressed air or steam is upon the piston-head at the commencement of its stroke, so as to draw the picks forcibly backward and overcome any hold they may have in the object being drilled.

The piston *b* has two cavities, *b*′, into which the compressed air or steam enters through the steam-ports *s*, and from which it escapes through ports *c* in the ends of the piston. Each port *c* has a spring check-valve, *c*′, opening outwardly from the chambers *b*′, and closing to prevent air from the cylinder entering the cavity, so that the piston may cushion on the compressed air or steam at the ends of the strokes. Thus the compressed air or steam will first enter the cavity *b*′ while it is in connection with the port *s*, and when the packing ring or collar at that end of the piston has passed said port the piston will be driven by pressure from the air entering the cylinder directly through the port *s*. The packing rings or collars are marked *d*. They are three in number—namely, one at each end of the piston outside the cavities *b*′ and one between said cavities. The piston does not fit the cylinder closely between the packing-rings. The piston contains a cylinder, *b*², with a piston, *b*³, playing therein, and having connection with a scraper, *b*⁵, by means of a piston-rod and connecting-rod, *b*⁴. This is substantially like my scraper shown and described in my application filed 24th of September, 1881, except as to the construction of the cylinder and piston and the cross-head. The head of the cylinder is made with a bore for the passage of the piston-rod, larger in diameter than the said rod, to allow exhaustion from that end of the cylinder, (or, more properly, cylindrical cavity.) Thus it will be seen that the piston-rod does not fill said bore, except that in immediate contact with the piston is an enlargement, *b*⁶, which is of the equal diameter with the bore, and which enters and closes the same in advance of the piston, so that the air or steam is closely confined and forms a cushion, preventing the piston from striking against the head or end of its cylinder. There is a substantially similar arrangement at the other end of the piston, where a plug, *b*⁷, fits the exhaust-port *b*⁸ and closes the same to form an air or steam cushion, as the case may.

In the matter of the cross-head *h*, I make it of the form shown, the drills being set transversely between the points of attachment of the piston-rods. In this case the scraper-fulcrum *h*′ is in line with the picks. I use two piston-rods, *f*, (as in my former application,) working in a frame, *g*. The guide-tubes of the frame are attached to an open bracket, *g*′, leaving abundant space for the manipulation of the stuffing-boxes. The piston-rods carry at their ends the cross-head *h*, to which the picks *j* are secured. (See Figs. 13, 14, and 15.)

The valve-rod X of the pick-engine has a yoke, in which works a crank, Y′, upon a transverse shaft, Y². The shaft Y² carries a fly-wheel, Y³, and an eccentric, Y⁴. The eccentric is connected by an eccentric-rod, Y⁵, with the slide-valve Z of the engine, by which the slide-valves W and W′ W² of the pick-engine are moved.

l is the valve-chest of the valve-operating engine, said chest receiving compressed air from the valve-chest V of the main or pick engine or from the cylinder S.

m is a reservoir in communication with the valve-chest *l*, and also with the interior of the cylinder S at *m*′.

n is a check-valve, (see Fig. 7,) which opens freely to allow the compressed air or steam to enter the reservoir *m* from the cylinder when the pressure in the cylinder is greater than in the reservoir, but prevents any return current.

o is a pipe communicating directly from the valve-chest V to the reservoir *m*, and having a stop-cock, *o*′, by which it may be closed. This direct communication may be used when the machine is first started or in cases where the full pressure of air or steam is required to work the valve-driving engine; but where less power is needed economy will be had in supplying the valve-chest *l* from the partly-ex-

hausted contents of the cylinder S. The passage m' being at or about at half-stroke, and not being open to the "pressure" side of the piston, the force of the air is not lessened by the passage m' in the first half of the stroke.

It is found advantageous to relieve the piston from a part or all of the air-pressure in the last half of the stroke forward, so as to prevent the reactive force upon the picks, when they strike the object, being transmitted to the rear end of the cylinder S, and thus driving or tending to drive the engine backward from its work, so that it is quite useful to provide a means for exhaust when the piston reaches half-stroke, whether the escaping air or steam can be used for any purpose or not. For this reason I propose to provide the cylinder S with an exhaust-opening, m', at or near half-stroke, even in the absence of the reservoir m and connection with the valve-chest l.

The picks in Figs. 13, 14, and 15 are shown of the shape known as "diamond-point" in cold-chisels, which shape I believe to be new for any tool used for drilling. This shape may be described as having one salient corner and the end beveled, as shown in the drawings. In Figs. 16, 17, and 18 the picks are shown with two points, j', with a transverse cutting-edge, j^2, between the points.

To return to the carriage, the side bars, G, have jaws or axle bearings G′ at bottom to receive the axle H′ of the wheels H^2. (See broken lines in Fig. 1.) The object is to provide means for moving the machine from place to place, the rails B being usually set at a much wider gage than the ordinary track in a mine, (the wheels being arranged to run on the ordinary rail-track.)

I claim as my invention—

1. In a mining-machine, a drill-cylinder supported by and vertically adjustable in a vertical gimbal-frame, substantially as shown, and for the purposes set forth.

2. The combination of hoop L, inner hoop, Q, trunnions $q\,r$, and drill-cylinder, adjustable in said hoops, as set forth.

3. The combination of chains N N, jack-rod O, hand-nut P, arch K, the gimbal-frame L Q, and drill-cylinder adjustably connected to the gimbal-frame, as set forth.

4. The combination of sliding cylinder S, having brackets T, and side rails, R R, as set forth.

5. The combination of vertically-adjustable arch K, side bars, G, uprights I I, and a suitable securing device, as set forth.

6. The combination of supporting-rails R, extensible handle U, and cylinder S, adapted to slide on said rails, as set forth.

7. The scraper-operating piston b^3, having projection or plug b^7, and enlargement or collar b^6, closing the central exhaust-ports, substantially as and for the purpose set forth.

8. The two picks forming a compound pick-tool, as shown, in combination with the cross-head, as set forth.

9. The combination of duplicate piston-rods f, working in guide-frame g, and bracket or bridge g', standing out from the cylinder-head, as set forth.

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Witnesses:
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GEO. H. KNIGHT.