No. 67,323. PATENTED JULY 30, 1867.

R. C. M. LOVELL.

MINING AND TUNNELING MACHINE.

2 SHEETS—SHEET 1.

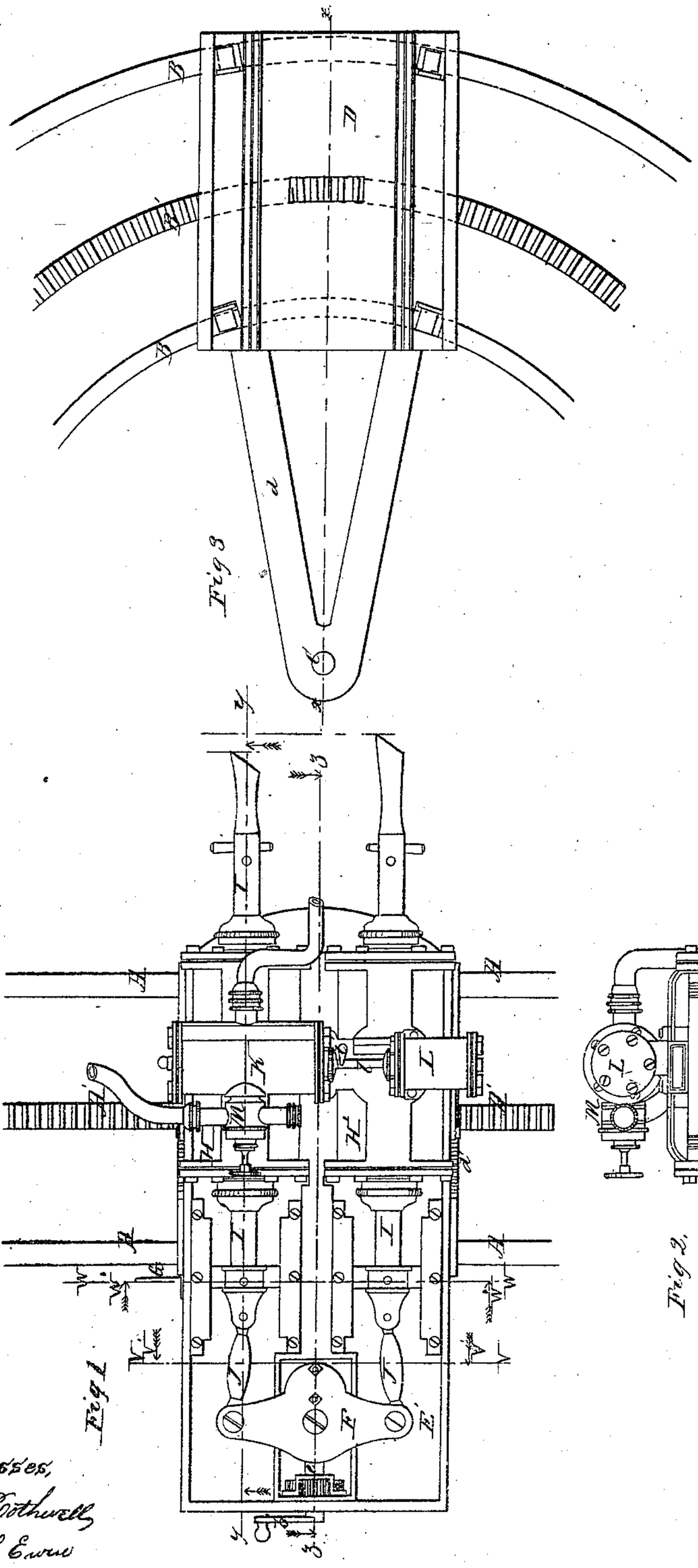

Fig 3

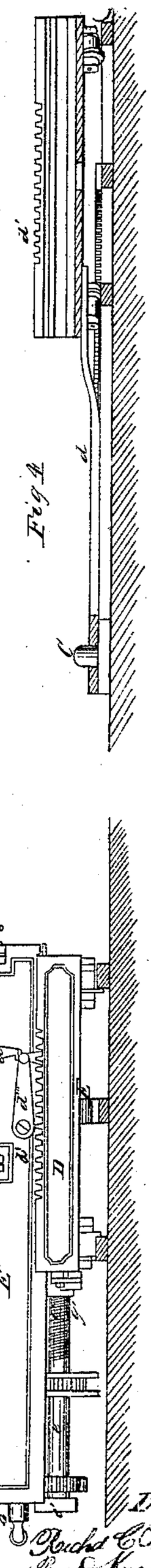

Fig 4

Fig 1

Fig 2.

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2 SHEETS—SHEET 2.

Fig 7

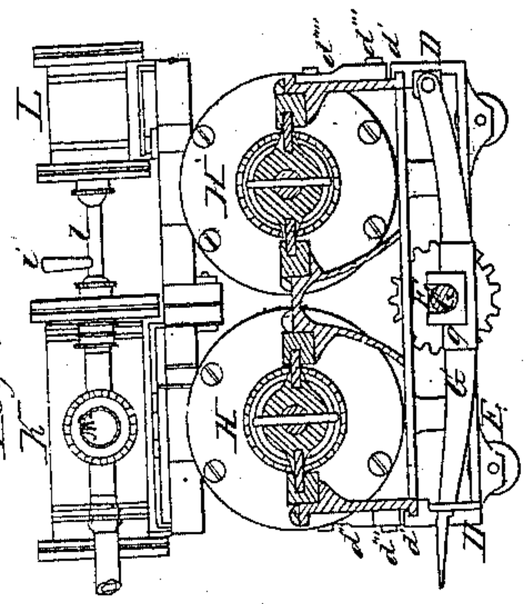


Fig 8.

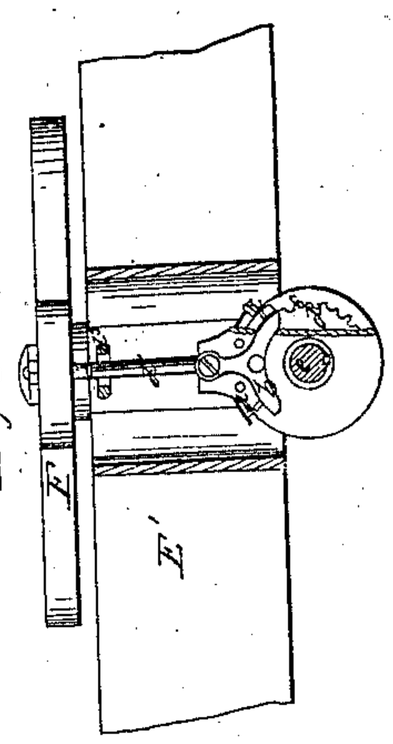


Fig 5.

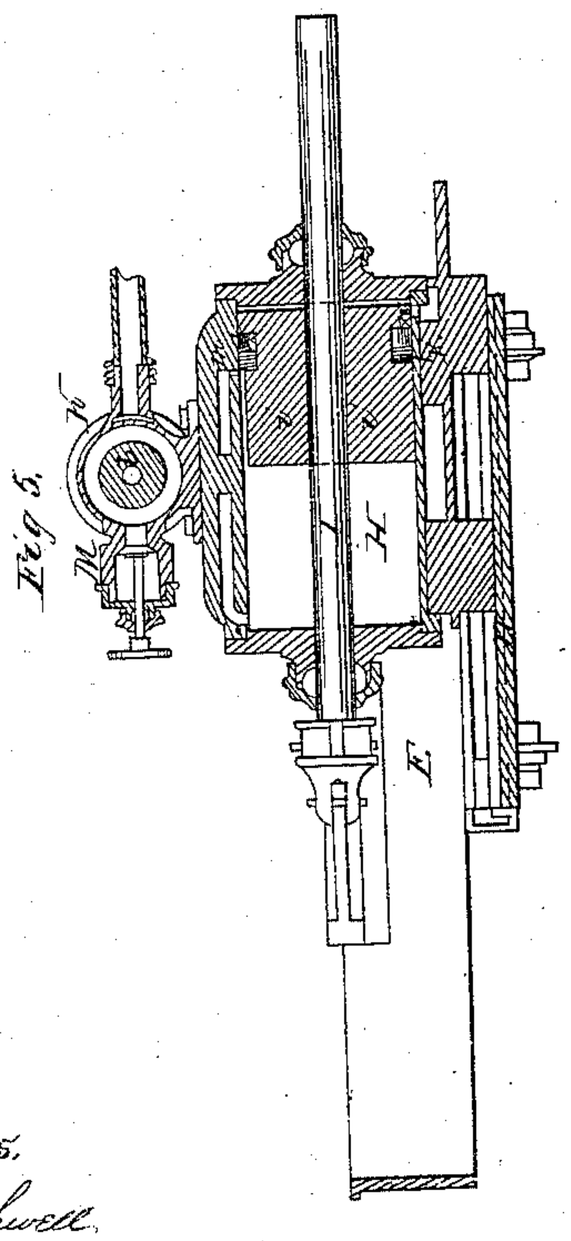
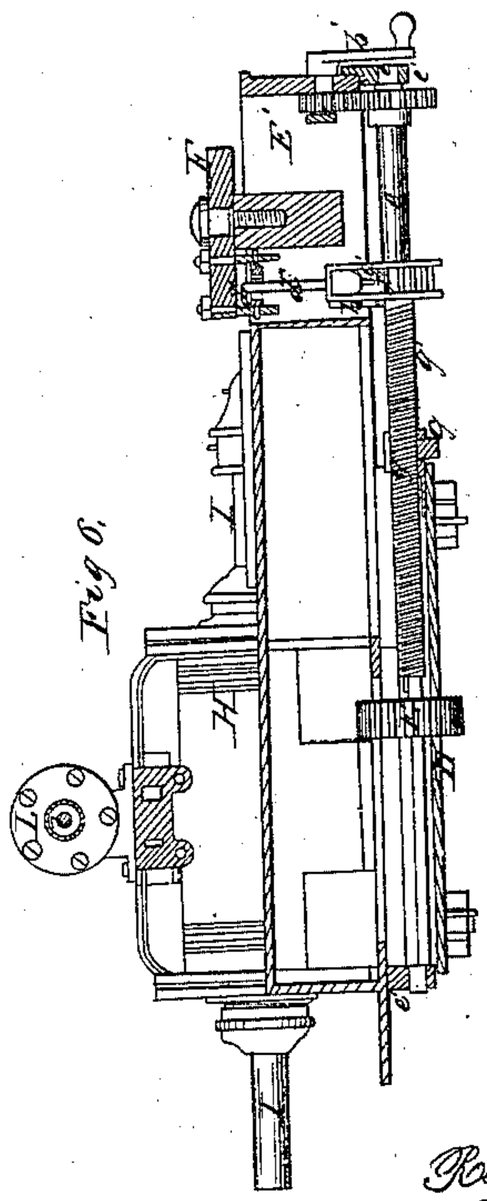


Fig 6.



Witnesses.
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RICHARD C. M. LOVELL, OF COVINGTON, KENTUCKY.

Letters Patent No. 67,323, *dated July* 30, 1867.

IMPROVED MINING AND TUNNELLING MACHINE.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, RICHARD C. M. LOVELL, of Covington, in the county Kenton, and State of Kentucky, have invented a new and improved Mining, Tunnelling, and Stone-Dressing Machine; and I do hereby declare the following to be a full, clear, and exact description of the nature, construction, and operation of the same, sufficient to enable one skilled in the art to which the invention appertains to make use of it, reference being had to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a top view or plan.

Figure 2 is a side elevation.

Figure 3 is a plan of the traverse track and platform.

Figure 4 is a vertical longitudinal section of the same on the line *x x*, fig. 3.

Figure 5 is a vertical longitudinal section on the line *y y*, fig. 1.

Figure 6 is a vertical longitudinal section on the line *z z*, fig. 1.

Figure 7 is a vertical transverse section on the line *w w*, fig. 1, looking in the direction of the arrow *w'*.

Figure 8 is a vertical longitudinal section on the line *v v*, fig. 1, looking in the direction of the arrow *v'*.

A track for the traversing platform is laid down parallel with the upright face of the coal, &c. The forward adjustment of the machine on its platform is made after each traversing cut. The chisels are operated alternately by their respective engines, the leading chisel cutting half the depth and the following one completing the cut, being reversed, and changed in cutting back. The motor is either steam or compressed air conducted to the engine by pipes from the exterior of the shaft or drift. Momentum is given to the stroke of the chisels by loading the pistons, and the return motion is given to the piston by the effective stroke of the other piston, to which it is connected by a working-beam. The steam is changed, as the piston passes a certain point in the cylinder, by the admission of the live steam to an auxiliary cylinder, whose piston works the valve. The motion of the working-beam which connects the ends of the pitman actuates a rock-shaft, ratchet, and shaft whose pinion gears into the rack on the traverse track. The same shaft has a thread, with which a clutch-nut of the traverse platform is made to engage for the forward and backward motions of the machine, a pawl on the latter engaging with a rack on the platform to keep the machine in position.

In the drawings, A A are the tracks, and A' a central rack-bar, which are laid down parallel with the upright face of the coal, stone, or other material, which is being quarried, or the stone which is being dressed. This is intended to be laid in sections, collectively as long as the length of the breast of coal which is being mined, and the machine works automatically from one end to the other of this track, being reversed by hand, and returning after reaching the indicated distance. Fig. 3 represents another arrangement of the track, which is curved. In this case the track B B and rack-bar B' are arcs of circles, whose centre is the pivotal point C of the traverse platform D. This form is specially intended for driving into the bank, making a drift or gallery. Fig. 4 shows this latter arrangement in section, the traverse platform D being connected by the bars *d* to the pintle C, and having on its upper edge the rack-bar *d'*, by which the machine is held in position by the pawl *d'''* and latch *d''''*, as shown in the elevation, fig. 2. These portions are lifted out of engagement when the engine is to be moved forward or back, that is, to or from the face of the work on its platform, which motion is effected by means to be described. I have spoken of the traverse track A A A' or B B B', which differ in respect of the curve of the latter, and I have also referred to the traverse platform D, which follows the track on which it is placed. In the former the motion of the platform is rectilinear, and in the latter it is in a curve. In each it is reciprocating by the engagement of the spur-wheel E on the shaft *e* underneath the carriage E' of the machine with the rack-bar A' or B', as the case may be. The construction and arrangement of the shaft *e* is perhaps better shown in fig. 6 than elsewhere, from which it will be seen that it has bearings at *e' e'* at the respective ends of the carriage E'. The cog-wheel E revolves with the shaft *e*, but slips thereon, being secured by a spline to the shaft. I propose to describe the motions of the engines presently, but as the traverse motion of the machine is automatic, and depends upon the motions of the pistons, I shall assume the latter for the present, and state that the working-beam F receives a rotary, reciprocating, or vibratory motion therefrom. The edge of the working beam F toward the engine has an extension beneath, to which is secured a yoke, d^5, which rocks the arm *d''*, (see figs. 7 and 8,) and rotates the cog-wheel d^6, which is fastened to the

shaft *e*. The rotation is performed by the intervention of one or the other of the pawls *a a'*. Throwing one pawl into gear with the cog-wheel *d*" rotates the shaft *e* in one direction, and the other pawl contrariwise, and this control of the pawls is obtained by the pendulous latch *b*, whose motions in one or the other direction raise the respective pawls, or, as in fig. 8, by occupying a vertical position, hold them both out of engagement with the wheel and permit the shaft *e* to be turned by the hand-crank *b'* to shift the machine on the traverse independently of the motions of the engine. It is intended that the traverse motion of the machine shall be automatic, driving the chisels into the breast of coal, for instance, to a given depth, making a horizontal continuous fissure. As soon as it reaches the end of the track, or sooner, if required, the action of the machine is stopped. The chisels are now changed and reversed ready for the return traverse, the necessity for and mode of doing which will be presently explained. For the purpose of taking another chip a forward motion of the machine toward the bank is required, and this is effected by raising the lever G and half nut *g*, so as to engage with the thread *g'* on the shaft *e*. The revolution of the shaft *e* by the hand-crank *b'* will now give the required longitudinal motion to the machine out or in, the latter being toward the coal, and to the right extent, say, for instance, two inches. The pawls *a a'* are reversed so as to change the direction of traverse of the platform, and the machine commences its return motion, the pawl and latch *d'''' d''''* keeping it in place, and the nut *g* being lowered so that the revolution of the shaft *e*, which is necessary to rotate the traversing pinion E, shall not affect the longitudinal position of the machine as the screw *g'* revolves. An oblique approach of the chisel to its work or recession from it may be attained by allowing the wheel E to rotate simultaneously with the engagement of the thread *g'* with the clutch-nut *g*, the longitudinal and traverse motions being concurrent, and the motion being compound, the resultant of the combined forces. The cylinders H H' are single-acting, and are operated by the pressure of compressed air or of steam conducted into the mine by pipes and immediately connected to the induction of the valve-chamber of the engine by a flexible pipe. In each cylinder is a piston-rod, I, loaded or weighted by a piston-block, *i*, and passing through a stuffing-box at each end of the cylinder. Each piston is provided at one end with a chisel, and at the other end with a cross-head which moves in or on slides, the pitmen J connecting the respective pistons to the working-beam F, which has been already referred to as moving the arm *d*". The motions of the valve in the chamber K are made by means of the steam from the working cylinders acting upon a piston in the smaller cylinder L. *k* is a packing-ring of the piston-block, and on the upper edge of the latter is a groove which communicates with the space in the cylinder at the rear of the piston. As soon as the piston passes the port *m* the live steam in the cylinder passes through the groove in the piston, through port *m*, and by the steam-passage to the smaller cylinder L, where it acts upon one side of the small piston and actuates the valve in chamber K. The valve in chamber K and the piston in cylinder L are connected by a rod, *l*, the handle *l'* of which affords means for manipulation to change or reverse the steam. M is the throttle-valve, which controls the admission of steam or compressed air to the engine. At the lower side of each cylinder H H', and near the front end, is an opening, *n*, which admits air to and from the cylinder in front of the piston. The latter are single-acting, and the air is permitted free exit to and from in front until the front end of the piston has passed the part *n*, when the remaining air is compressed between the piston and the front of the cylinder, cushioning the piston to some extent, though this latter effect is principally obtained by the admission of live steam behind the other piston, the two being connected by the working-beam F, as has been stated.

The mode of operation has been stated incidentally as to each part in stating their construction and relation, but it may be briefly summed up so as to assist the understanding of the connection. The track A A A' or B B B', as the case may be, is laid down and levelled so as to get it "out of wind," that is, in a true plane. Upon this depends the correct working of the machine, which is then mounted thereon and the steam or compressed-air connection made. The chisels have each a cutting face and a rear slope, and one is shorter than the other, the one working in advance being the shorter of the two, and the straight edge being presented. If the chip to be cut during the single traverse be two inches, the machine will be advanced on the platform to such an extent that the forward chisel will have a cutting depth of one inch, and the rear chisel an additional inch, so that their duty is equal; and I may here state that when the machine has arrived at the end of its traverse, and before it starts back, the chisels are taken out and changed, as well as transposed in position, so that the short chisel is shifted into the advance and the cutting faces properly presented. The position of the machine on its platform being secured by the pawl and latch *d'''' d''''*, the steam or compressed air is admitted and the chisels commence their reciprocating motion, chipping away the coal or other matter to which they are applied, the machine traversing horizontally by the motion of the shaft *e* and wheel E on the rack-bar beneath, as has been already described. The end of the traverse being reached the chisels are stopped, changed, and reversed, and the machine advanced on its platform for another cut. The pawls *a a'* are then adjusted for the reverse motion of the shaft *e*, and the steam or compressed air being admitted the machine returns upon its track. The carriage is represented as mounted on wheels upon the track, but slides may be substituted. In the dressing of stone the machine may work automatically along the face of the stone, or the platform of the machine may be made stationary and the stone be made to move automatically on a carriage mounted on a rail or tram-ways in front of the chisels, or both may be made to move, according to the nature of the work to be performed, chisels of such form being used as are adapted to the nature of the material or the progress of the work. In mining or tunnelling, when the machine has been moved forward on its platform to the extent of its range, and it is desired to give the chisels a further penetration, the machine is backed out and longer chisels inserted in the chisel-socket. The work is then resumed, and thus the required depth attained. The depth attained by a given traverse across the face of the matter under treatment will vary according to its hardness and intractability. With coal, a penetration of two inches divided between the two chisels may be attained, and probably considerably more. With stone it would be less than with coal, but would vary according to the quality

stone. In stone-dressing the character and edge of the tool will be made conformable to its duty. It may be a pointed pick, an edge chisel, or of a gouge-shape, with the required outline of cutting face for cutting flutes in columns, or with faces adapted to pound and dress the surface after the more decided chipping is finished.

While I do not confine myself to any particular scale or proportions, I will indicate what I at present propose to use for a given kind of work, and I do not wish that my data should be taken as conclusive on the subject. The machine represented in the drawings is intended for mining coal, the scale being one inch to the foot, half the cylinder approximately being occupied by the piston-block, whose weight gives effectiveness to the stroke of the chisel. The loaded piston acts as a hammer, and the power of the stroke being greatly due to the weight of the piston the reaction of the blow is received thereon, relieving the machinery of considerable jar and strain.

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

1. The combination of the traverse track, the traverse platform, and the adjustable carriage on which the engine is mounted, substantially as described.

2. A mining or stone-cutting machine adjustable longitudinally and laterally by means substantially as described, and having two cylinders whose piston-rods are connected to a working-beam.

3. I claim, in combination with the carriage E′, upon which the engine is mounted, the shaft *e*, the splined wheel E, cogged rail A′ or B′, and rotating devices *d*″, *a a*′, *d*⁵, or their equivalents, deriving their intermittent motion from the reciprocating motion of the working-beam, or its motors the pistons.

4. I claim the combination of the traverse platform D, the carriage E′, the threaded shaft *g*′ *e*, and clutch-nut *g*, operating substantially as described.

5. I claim the combination of the carriage E′, with its rack-bar *d*′, on the traverse platform, the pawl *d*‴ and latch *d*⁗, constructed and operating substantially as described.

R. C. M. LOVELL.

Witnesses:

EDWARD H. KNIGHT,

S. C. KEMON.