3 Sheets--Sheet 1.

S. FIRTH.

Machines for Cutting Coal.

No. 137,669. Patented April 8, 1873.

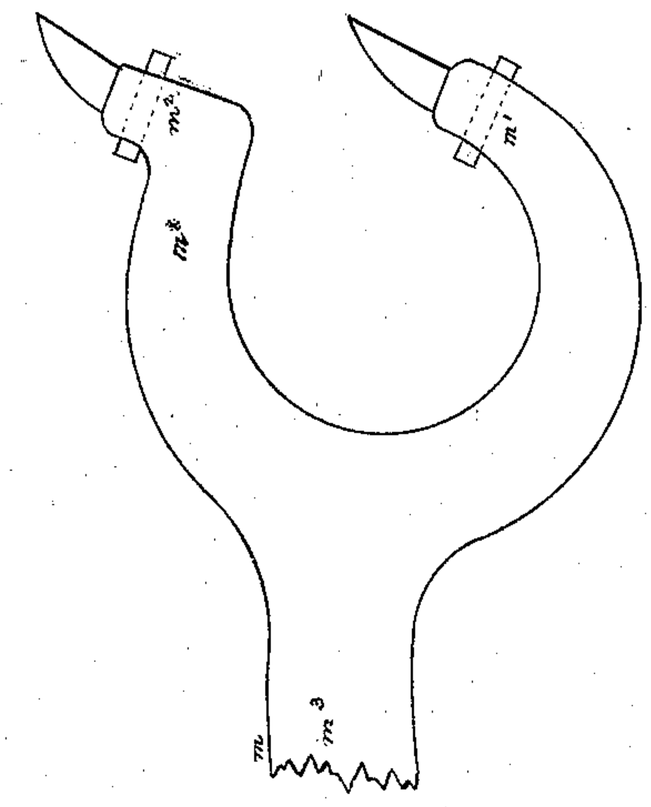


FIG. 7.

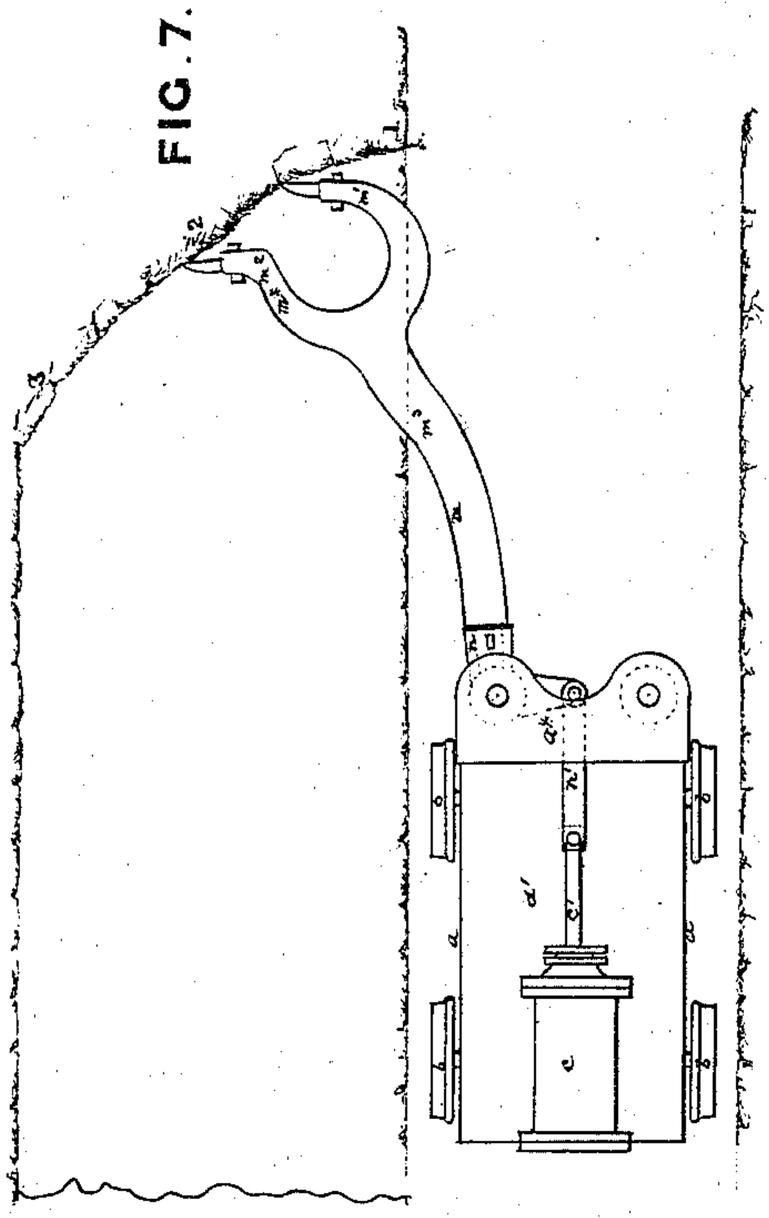
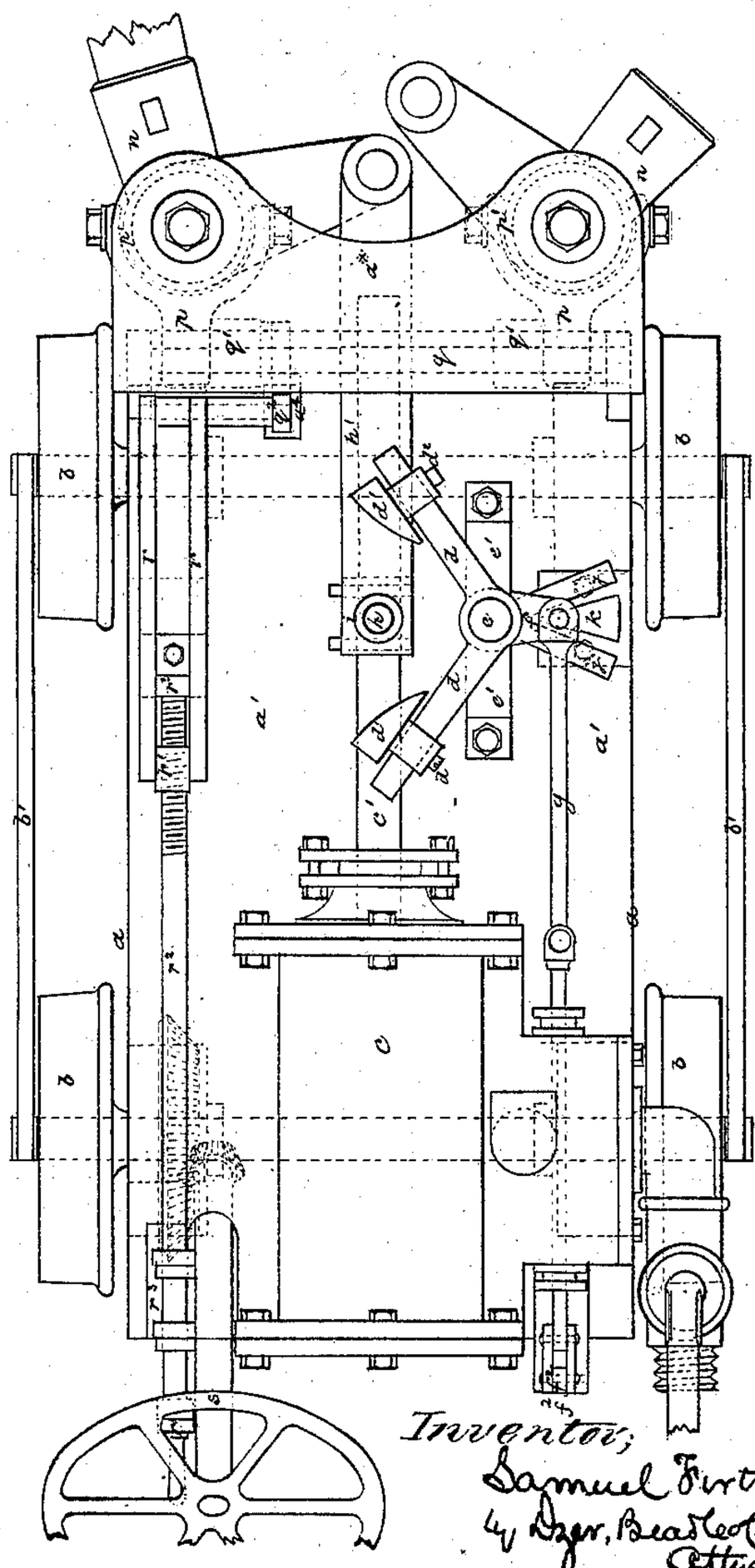


FIG. 1.



Witnesses;

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Charles E. Chinn

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3 Sheets--Sheet 2.

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FIG. 3.

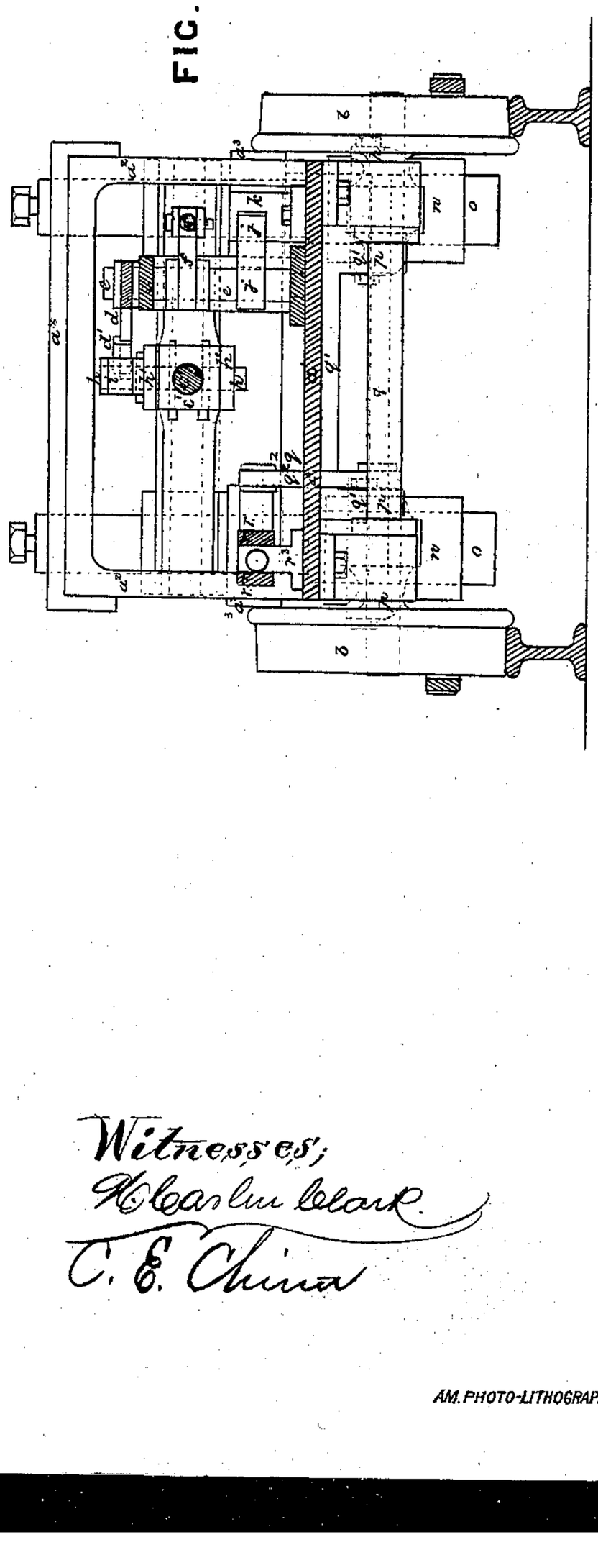
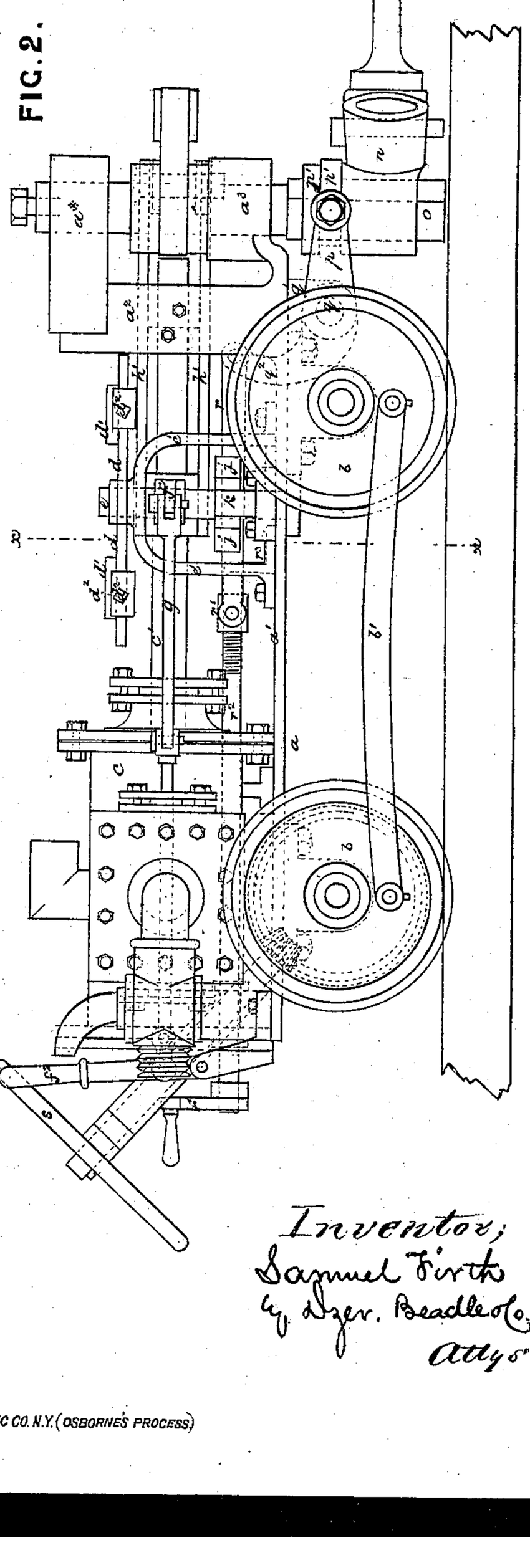


FIG. 2.



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3 Sheets--Sheet 3.

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FIG. 4.

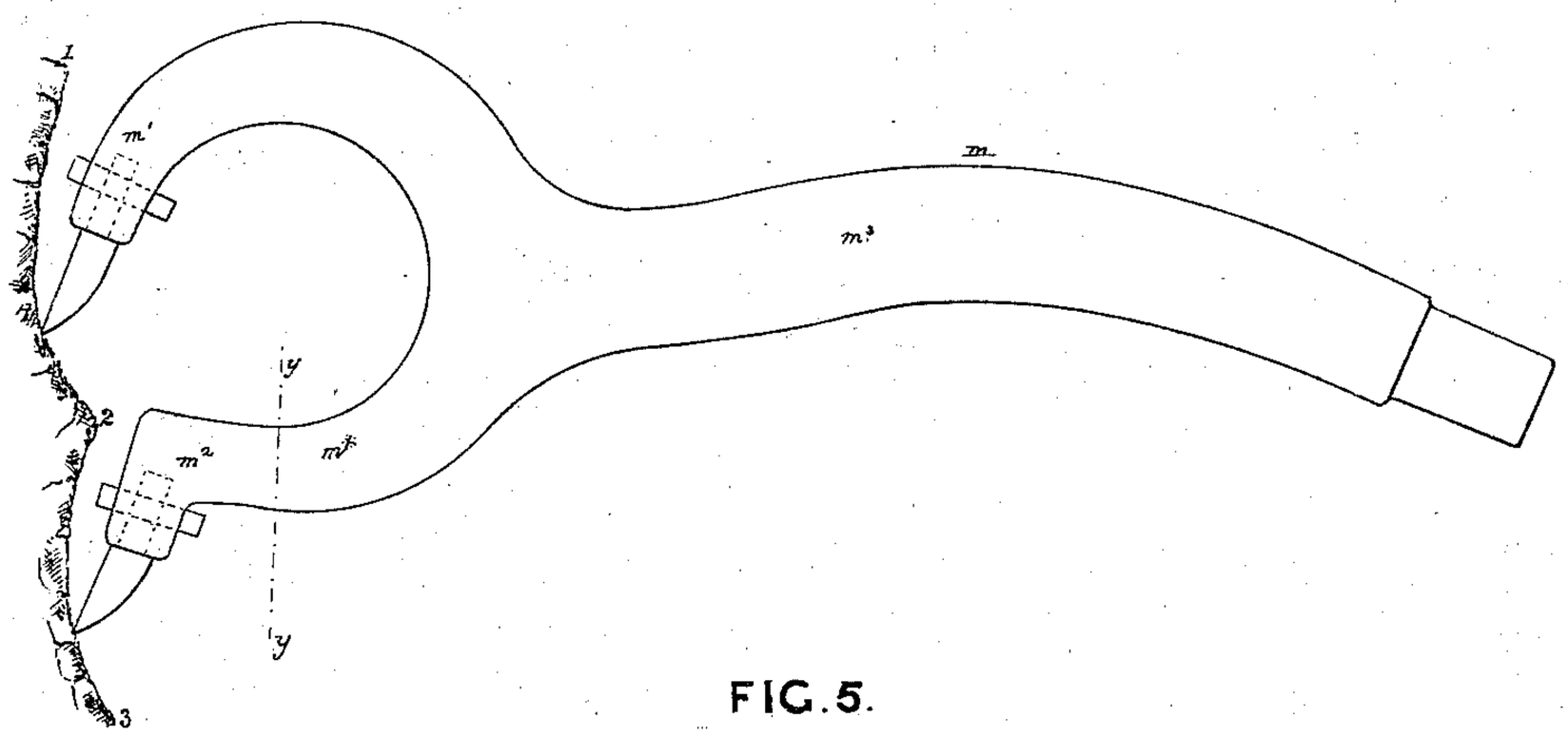


FIG. 5.

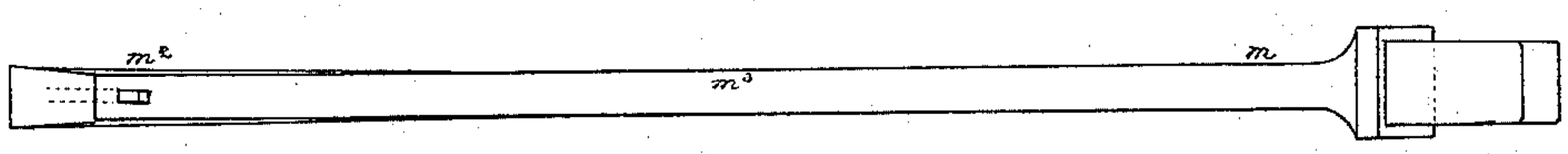
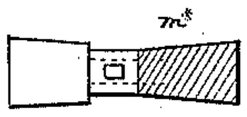


FIG. 6.



Witnesses;
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C. E. Chinn

Inventor;
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Attys

UNITED STATES PATENT OFFICE.

SAMUEL FIRTH, OF LEEDS, ENGLAND.

IMPROVEMENT IN MACHINES FOR CUTTING COAL.

Specification forming part of Letters Patent No. **137,669,** dated April 8, 1873; application filed June 5, 1872.

To all whom it may concern:

Be it known that I, SAMUEL FIRTH, of Leeds, Yorkshire, England, gentleman, have invented certain Improvements in Machines for Cutting Coal, of which the following is a specification:

My said invention relates to machines which are mounted on wheels and move on rails, and have picks or cutters connected to an engine operated by compressed air, the said engine and picks and other parts of the machine being carried by a strong metal frame.

Description of the Drawing.

Figure 1 is a plan of a coal-cutting machine constructed according to my said invention. Fig. 2 is a side elevation of the same. Fig. 3 is a transverse section on the line *x x*, Fig. 2. Figs. 4, 5, 6, show the pick or cutting implement detached. Fig. 7 is a plan, drawn to a reduced scale, illustrating the action of the said pick.

Like letters indicate the same parts throughout the drawing.

a is the frame, which is mounted on the wheels *b*, and carries the whole of the operative and adjusting mechanism of the machine. The cylinder, the distributing-valve and its casing, the arrangement of the admission and exhaust pipes, the connection of the piston-rod to the picks, and the manner in which the machine operates to cut the coal or other materials, are well known, and, therefore, need not be herein particularly described.

The first part of my said invention relates to the construction of the frame *a* of the said machine. Heretofore frames for coal-cutting machines have been made in a number of pieces bolted or riveted together, and great inconvenience has been experienced from their becoming loose under the severe vibration to which the machine is exposed in working. As the machine is frequently used in very deep mines, it is a matter of great importance to obviate as much as possible the necessity of bringing it up for repairs. I, therefore, make my improved frame of one piece of wrought-iron forged into the shape shown in the drawing—that is to say, I make the base or bottom a^1 solid and forge thereon the uprights a^2 and the brackets a^3. By this method of construction I obtain a frame which is not only much stronger and more durable than the ordinary frames of coal-cutting machines, but is also more compact than it has heretofore been practicable to make such frames. The cap a^* is bolted or riveted upon the uprights a^2.

My said invention relates, secondly, to mechanism for operating and controlling the distributing-valve for admitting the air to the cylinder *c*. This mechanism consists of the following parts—viz., a double tappet, *d*, is fixed on the vertical shaft *e*, which carries a lever, *f*, connected to the spindle of the said valve by the rod *g*. The said shaft is supported in the standard *e'*, which is firmly bolted to the base a^1 of the frame. On the pin *h* which connects the piston-rod *c'* to the links *h'*, I place an anti-friction roller or bowl, *i*, which, as the piston comes near the end of its stroke in either direction, strikes one or other of the said tappets, and thereby reverses the distributing-valve and the movement of the piston. The said tappets are provided with adjustable shoes d^1, which are held on the tappets by the screws d^2, and can be set to any position thereon to vary the stroke of the piston and pick, as desired. The shaft *e* also carries a forked piece, *j*, between whose arms I place the stop *k* which is fixed on the base a^1. It will be seen by referring to Fig. 1 that this stop is formed to allow the forked piece a limited reciprocating motion, which motion is shared by the shaft and double tappet, so that the latter, through the medium of the aforesaid lever *f* and rod *g*, moves the distributing-valve the proper distance, and no further, in either direction. The valve-rod is provided at its rear end with a hand-lever, f^2, whereby the valve is adjusted or reversed when the piston does not make a full stroke.

Another part of my said invention relates to apparatus for adjusting and holding the picks *m* in any required position. The said picks are secured in the sockets or holders *n*, which are fitted to slide on the lower end of the shafts *o*, the same being made square or otherwise properly formed to allow the said sockets to slide endwise while preventing their turning upon them. The said shafts are supported in the brackets a^3 and the cap a^*. The sockets *n* have necks *n'*, around which I place

the forks p provided with curved strips p' which enter and fit the said necks. These forks are fixed on the shaft q, which extends across the machine, and is supported in suitable bearings q^1 secured to the base a^1. This shaft also carries a lever, q^2, which extends up through a slot, a^4, formed in the said base, and is connected to a forked rod or link, r. The latter has a nut, r^1, through which is passed the end of the shaft r^2, the same having a screw-thread to fit said nut. This shaft is supported in the brackets r^3 fixed on the base a^1. The shaft r^2 is provided, at the rear end of the machine, with a handle, r^4, whereby the said shaft is turned in its bearings. By means of this handle the attendant can turn the said shaft in either direction and thereby raise or lower the pick.

The machine is provided with a hand-wheel, s, which may be put in or out of gear with the wheels b, as desired. When in gear with the said wheel, the machine may be firmly held in any position on the rails and easily moved thereon, when required. The fore and hind wheels b are coupled together by the connecting-rods b', or the axles may be cranked and coupled together by suitable connecting-rods.

I may use any suitable picks or cutting implements, or series of the same, with my improved machine, but I prefer to use the improved double-pointed picks shown in Figs. 4, 5, and 6. With this pick a groove may be cut in the coal or other substance to the required depth by passing the machine once across the base of the stratum. Therefore it is very advantageous in cases where the coal or other substance will not stand up for a second cut. m^1 is the first or leading point, and m^2 is the second or following point. The point m^1 cuts from face 1 of the stratum to the point 2, and the point m^2 increases the depth of the groove from 2 to 3. The *débris* made by the point m^1 in cutting is brought out of the groove in the return stroke of the pick by the arm $m^\times$, which, at the back or inner edge, is made of a width nearly equal to that of the groove. The stem or shaft m^3 of the pick is curved or bent, as shown, to allow the pick to work in the smallest possible space. I have shown this pick with loose or detachable points, but, if desired, I may make the same with solid points.

Claims.

1. The frame a made of wrought-iron in the form shown, or substantially in the same form, and forged in one piece, as herein set forth.

2. The double tappet d operating in combination with the piston-rod and distributing-valve, substantially as specified, for the purpose set forth.

3. The double tappet d, stop k, and forked piece j, in combination with the distributing-valve, as herein specified, for the purpose set forth.

4. The sockets n fitted to slide on the shafts o, and in combination with the forks p, shaft q, lever q^2, link r, nut r^1, shaft r^2, and handle r^4, for adjusting and holding the said picks, as herein set forth.

5. In a machine for cutting coal or other minerals, the aforesaid wrought-iron frame a mounted on wheels b and carrying the above-described operating and adjusting contrivances arranged upon the said frame in combination together, and with the picks or cutting implement shown, substantially as herein set forth.

6. The double-pointed picks m^1 m^2, constructed as described, and arranged relatively to each other, as and for the purpose set forth.

SAMUEL FIRTH.

Witnesses:

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