C. A. Chamberlin,

Mining Coal.

No. 19,543. Patented Mar. 9, 1858.

Fig. 1.

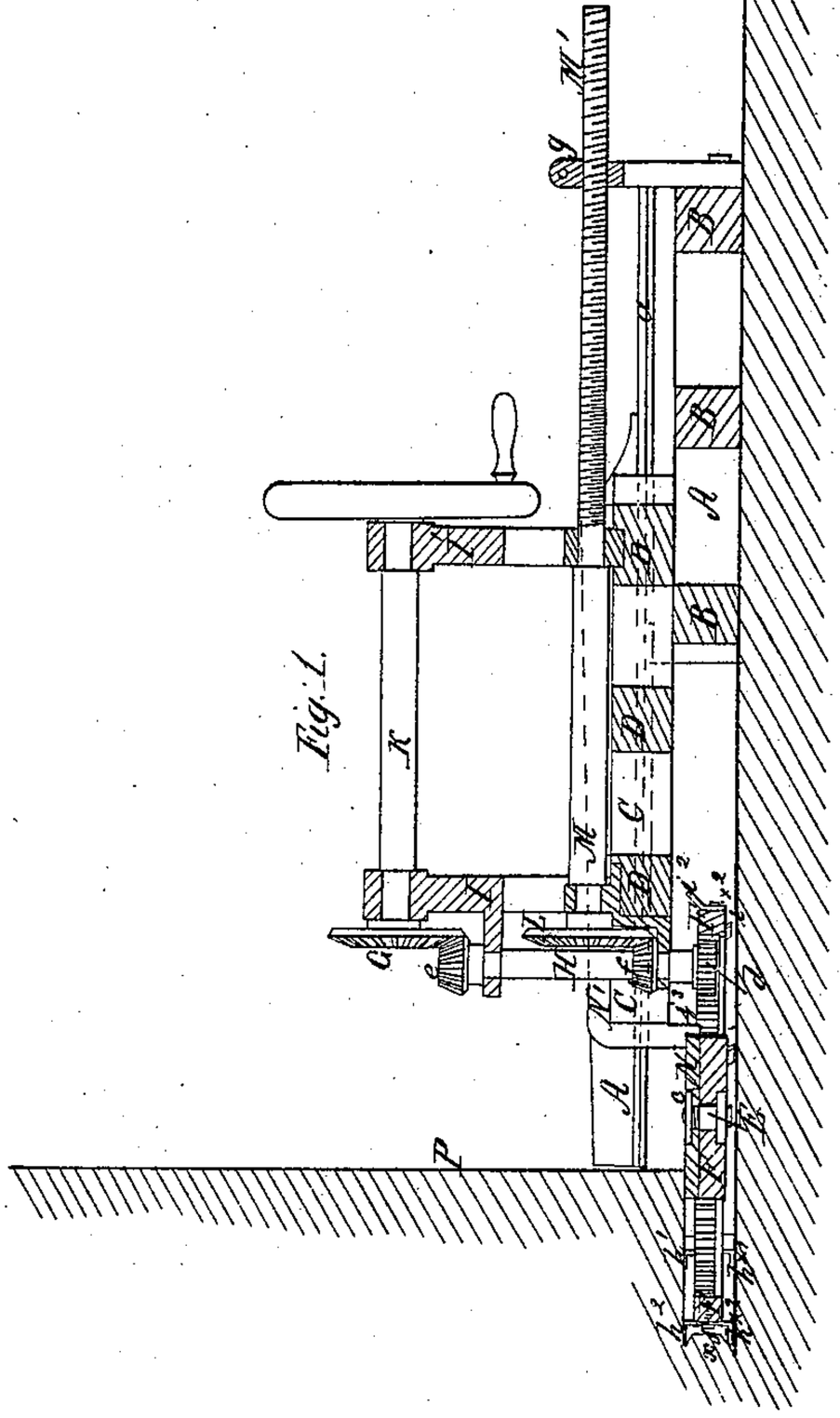

Fig. 2.

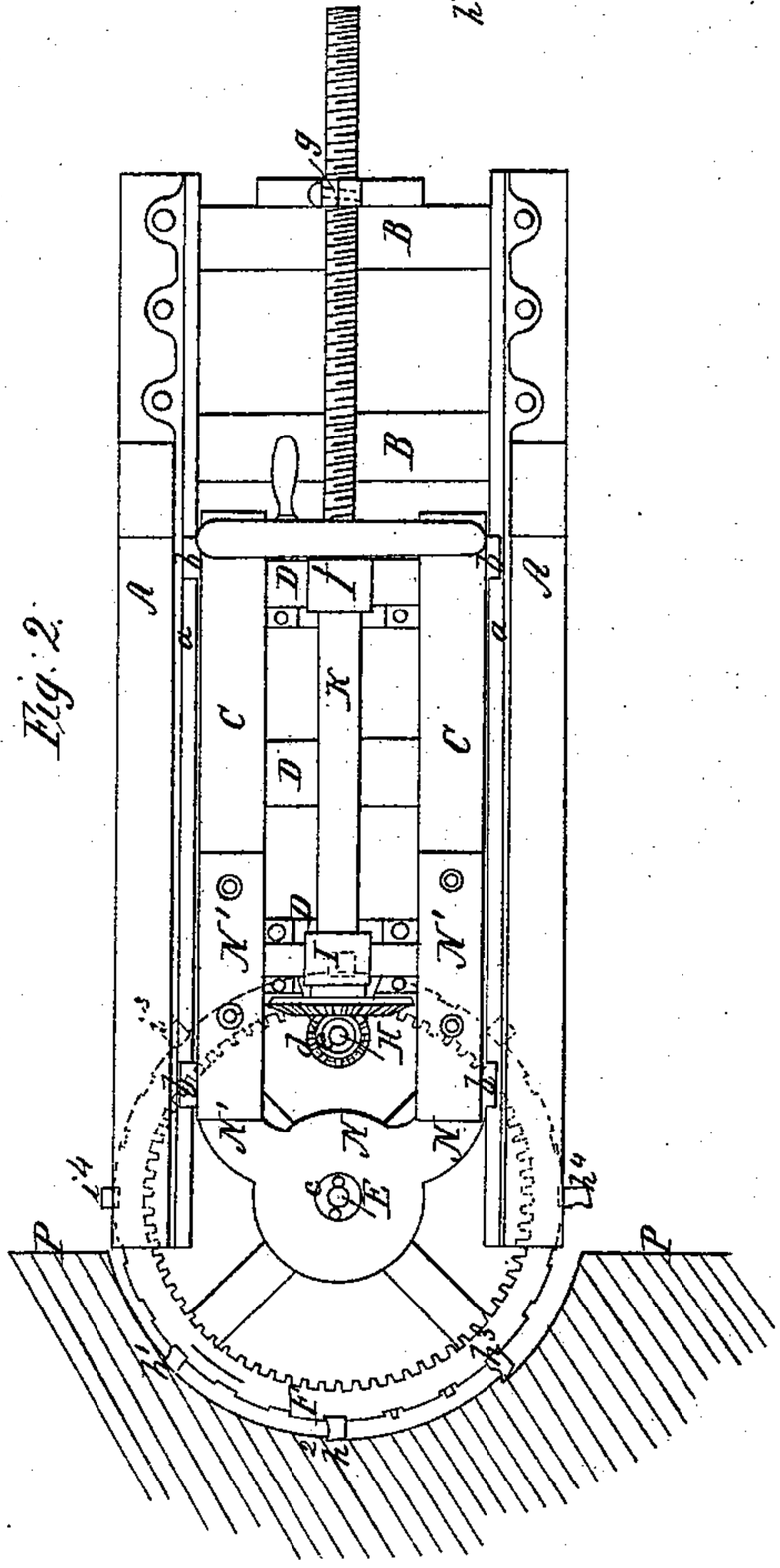

Fig. 3.

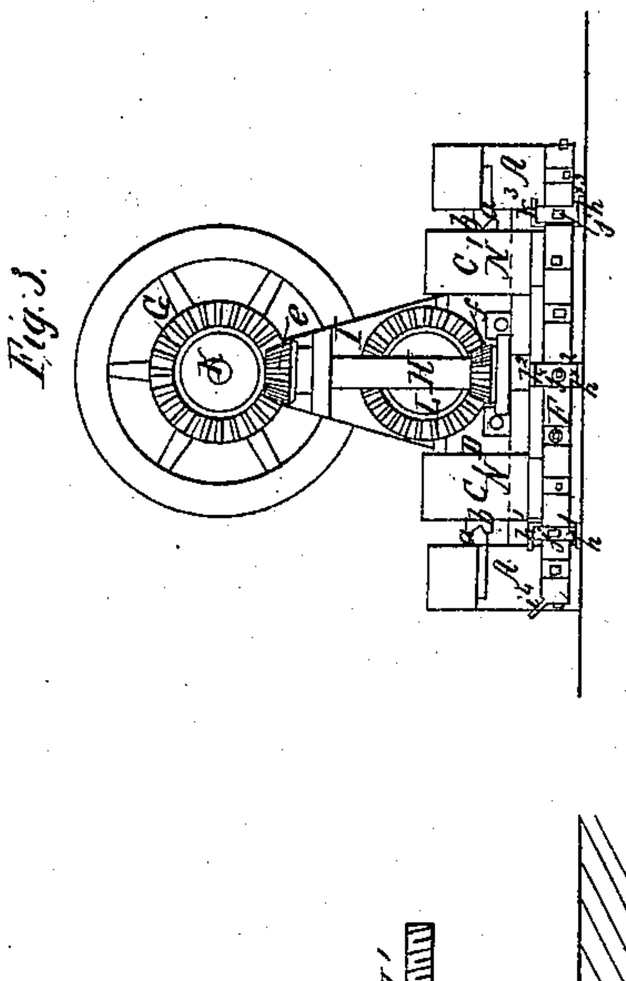

Fig. 4.

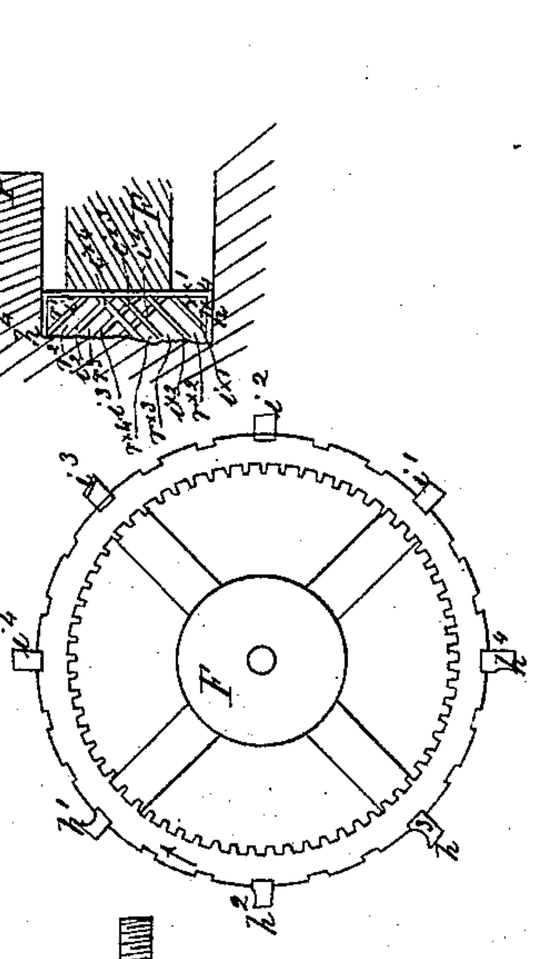

Fig. 5.

UNITED STATES PATENT OFFICE.

C. A. CHAMBERLIN, OF ALLEGHENY CITY, PENNSYLVANIA.

MACHINE FOR MINING COAL, &c.

Specification of Letters Patent No. 19,543, dated March 9, 1858.

To all whom it may concern:

Be it known that I, CHARLES A. CHAMBERLIN, of Allegheny City, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Machine for Mining Coal and other Mineral Substances; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1, is a longitudinal central sectional view of the machine, showing it in operation in what is termed "undermining" coal. Fig. 2, is a plan view of the same. Fig. 3, is a front view of the same. Fig. 4, is a plan view of the cutter-wheel detached from the machine. Fig. 5, is a diagram illustrative of the operation of the cutters.

Similar letters of reference indicate corresponding parts in the several figures.

This machine, which is principally intended for "undermining" and "side-cutting" coal but is also applicable in other mining or tunneling operations, consists principally of a rotary cutter-wheel of proper construction and furnished with a proper arrangement of cutters to cut in a direction perpendicular to its axis, arranged in a carriage which is fitted to travel upon a stationary frame, and a feed screw or some equivalent device for moving the said carriage and cutter-wheel in a direction perpendicular to the axis of the cutter-wheel, for the purpose of moving the said wheel forward as it cuts its way into the coal or other substance to be mined. The machine cuts a groove or narrow cavity directly into the walls of a mine, parallel or as nearly so as desirable either with the floor or walls and as close as desirable thereto, in such a manner as to permit the masses above or at the sides of the said cavities or grooves to be removed by wedging out or blasting.

To enable others to make and use my invention, I will proceed to describe its construction and operation.

A A B B, is a strong frame, which may be of timber or iron but is represented as being of timber. This frame is fitted up with V-shaped iron ways *a*, *a*, upon and between which slides a carriage C C D D, which, like the frame A A B B, may be of wood or iron but is represented of wood fitted with iron V-pieces *b*, *b*, which are fitted to the ways *a*, *a*. To the sliding carriage C C D D, is bolted an iron head N, in which is firmly secured by a nut *c*, an axle E, to which is fitted the cutter wheel F, the said axle standing perpendicular to the ways *a*, *a*, and consequently perpendicular to the bottom of the frame A A B B, which is parallel with the said ways. The cutter-wheel F has its rim furnished internally with spur teeth to gear with a spur pinion *d*, on a shaft H, which is fitted to bearings in a standard I, that is bolted or otherwise secured to the carriage C C D D, the said shaft being parallel with the axle E, and carrying besides the spur pinion *d*, two bevel pinions *e*, and *f*, the former of which gears with a bevel gear G, on the shaft K, which constitutes the driving shaft of the machine; said shaft working in a bearing in the standard I, and another bearing in a standard I^1, secured to the carriage, and being driven by one or more hand cranks or by other suitable means. The pinion *f*, gears with a bevel gear L, on a shaft M, which works in bearings in the standards I, and I^1, and which, like the shaft K, is parallel with the ways *a*, *a*.

The shaft M, carries a long screw M′, which fits into a stationary nut *g*, that is attached to the rear end of the main frame A A B B. When the driving shaft of the machine is set in motion, the shaft H, derives rotary motion through the gear G, and pinion *e;* and while the cutter wheel F, derives rotary motion through the pinion *d*, and the teeth inside its own rim, the pinion *f*, communicates through the bevel wheel L, a rotary motion to the shaft M, and screw M′, which latter working in the nut *g*, is caused to receive a longitudinal motion by which it is caused to impart to the carriage a movement along the ways *a*, *a*, and thus to give to the cutter wheel a movement parallel with the planes of its own revolution. The nut *g*, is constructed in two pieces, so that it can be opened to allow the carriage to slide back quickly.

The cutter wheel represented in the drawing is furnished with cutters of two kinds, each kind being arranged in two series. The two series of the first kind, h^1, h^2, h^3, h^4, and h^{*1}, h^{*2}, h^{*3}, h^{*4}, are very narrow and chisel-edged, and are arranged to cut two narrow grooves parallel with each other

and perpendicular to the axis of the cutter wheel; those of each series being set at regular intervals apart half way around the cutter wheel, and each one standing out a little farther from the axis of the wheel than the one immediately in front of it or that which immediately precedes it in its revolution, as is shown in Fig. 4, where the series of cutters h^1, h^2, h^3, h^4, is fully shown and the direction of the revolution indicated by an arrow. The two series are set at such a distance apart that the distance between the farthest sides of the two grooves which they cut will be greater than the extreme breadth of the rim of the cutter wheel F. As a matter of convenience the above-mentioned cutters are made in pairs, as is shown in Figs. 1 and 3, each pair comprising one of each series being made of a single piece of steel bent to the required form. By this mode of construction of the cutters in pairs, each pair may be bolted to the periphery of the wheel by a single bolt j, if the straight part which forms the connection between the pair be snugly recessed into the periphery of the wheel. The extreme thickness or breadth of the cutter wheel must be less than the distance between the outer or farthest sides of the two grooves cut by the above-described chisel-edged cutters. The other two series of cutters i^1, i^2, i^3, i^4, and i^{*1}, i^{*2}, i^{*3}, i^{*4}, are formed with broad cutting edges, and set with said edges oblique to the axis of the cutter wheel; those of each series being set at equal intervals apart on that half of the periphery of the wheel not occupied by the first described two series of cutters, for the purpose of paring away the tongue of coal or other material that is left between the two grooves cut by the first described cutters, as indicated at x, in Fig. 1. Each of the oblique-edged cutters is set nearer to the middle of the rim of the wheel F, than that which precedes it in its revolution, so that the first cutters of these two series which follow the chisel-edged cutters h^1, h^2, &c., h^{*1}, h^{*2}, &c., will merely pare the corners off the tongue x, and the next will pare a little nearer to the middle of the slice, and so on, till the last two finish the cutting away of the slice. The operation of these oblique-edged cutters is illustrated by the diagram Fig. 5, where the relative positions of these cutters and of the last pair of the chisel cutters i^4, i^{*4}, as they severally arrive at a given point in their revolution, is illustrated. The parts of the tongue x, cut away by the several oblique-edged cutters are indicated in Fig. 5, by r^1, r^2, r^3, r^4, r^{*1}, r^{*2}, r^{*3}, r^{*4}, the part r^1, being cut by the cutter i^1, the part r^{*1}, by the cutter i^{*1}, the part r^2, by the cutter i^2, the part r^{*2} by the cutter i^{*2}, and so on. The cutter-wheel and its cutters are so arranged that the lower or outermost side of the groove cut by the series of cutters h^{*1}, h^{*2}, &c., will be in the same plane as the bottom of the frame A A B B, and by that means the undermining may be performed in such a manner as to preserve a level or plane floor in the mine, and side-cutting may be performed in such a way as to run the sides of an entry or gallery perfectly straight.

An important feature of the machine consists in the construction of the cutter-wheel and the head N, which carries its axle, which admits of the cutter wheel running in a cut beyond its center. To effect this, the thickness of depth of the hub is made considerably less than the extreme space between the outsides of the two series of chisel cutters h^1, h^2, &c., and h^{*1}, h^{*2}, &c., and the hub is brought as near as possible toward the lower side of the wheel. The head N, is made of such thickness that said thickness added to the thickness of the hub makes up an aggregate thickness less than the extreme space between the outsides of the chisel-cutters, and the said head being fitted to the upper side of the thin hub is as it were recessed within the cutter wheel, so that it may run into the cavity cut by the revolution of the cutters, as illustrated in Fig. 1, where it is shown in the act of running in. The head N, thus constructed is connected with the carriage C C D D, by strong curved iron straps N^1 N^1, which may be cast with it; and it and its straps may be so formed as to allow the cutter wheel to cut in nearly to its full diameter, as for instance, that the wheel being three feet six inches in diameter outside the cutter, which is a very convenient size for use, may cut in to a distance of about three feet. To insure steadiness of the cutter wheel with so short an axle as must necessarily be used, as I do not wish to cut a cavity more than two and a half or three inches high, I make the hub with a broad face which I fit to the head N, and make the nut c, which should be countersunk in the head N, of a large diameter to serve as a bearing for the pin, and I furnish the axle at its lower end with a broad shoulder for the hub of the wheel to rest on, and countersink the said shoulder into the hub. The wheel will, however, be much steadied in its revolution by the cutters themselves as those which are cutting in will act as guides.

The operation of the machine is conducted in the following manner: Before commencing, the nut g, is opened and the carriage with the cutter-wheel pushed or drawn back so that the cutter-wheel does not project in front of the main frame A A B B, after which the nut g, may be closed again. When the machine is to be used for undermining, it is laid down with the main frame flat on the floor of the mine, and the front

end of the said frame close to or near the wall to be undermined, as is shown in Figs. 1 and 2, where P represents the wall of the mine, which the machine is shown to be in the act of undermining. The main frame having been brought to the required position is secured by placing upright stay timbers between it and the top of the mine and horizontal ones between it and the side walls. The shaft K has then a rotary motion given to it, which causes the cutter-wheel to receive a rotary motion also, and at the same time it is fed forward by the screw M′, by which means it is caused to cut its way into the wall in front of it close to the floor, as illustrated in Fig. 1, the cutters operating as already described. When the wheel has cut in as far as possible or desirable, the rotary motion of the shaft K, is stopped, the nut g, is opened, and the carriage and cutter-wheel are drawn back; after which the stay timbers are removed, and the machine after having been moved sidewise as far as necessary, and again secured by stay timbers and having had the nut g, closed, is again set in motion by turning the shaft K. When the wheel has cut its way into the wall as far as before, the carriage is again run back and the machine again moved sidewise, and the same operation is repeated till the "hole" as it is termed by miners is cut all across the room or gallery. When the machine is used for side-cutting, it is placed with the main frame against the side walls, and the said frame is secured by stay timbers and the operation in that case is the same as before.

It is not absolutely necessary that the chisel-edged and the oblique-edged cutters be arranged in precisely the same manner as represented; as the chisel-edged cutters h^1, h^2, h^3, h^4, and h^{*1}, h^{*2}, h^{*3}, h^{*4}, may be arranged at regular intervals all around the cutter-wheel with their edges all at the same distance from the axis of the wheel, and the oblique-edged cutters i^1, i^2, i^3, i^4, and i^{*1}, i^{*2}, i^{*3}, i^{*4}, at regular intervals between the chisel-edged cutters; but experiment has led me to prefer the arrangement first described and represented in the drawing.

What I claim as my invention, and desire to secure by Letters Patent, is:—

1. The combination of chisel-edged cutters and oblique-edged cutters applied to the cutter-wheel to operate substantially as set forth.

2. The construction and mode of fitting together the cutter wheel and the head N, in which its axle is supported in the manner substantially as described, whereby the cutter wheel is enabled to cut its way beyond its axis, as herein explained.

3. The arrangement of the main frame, the carriage and the cutter-wheel, to operate substantially as set forth.

C. A. CHAMBERLIN.

Witnesses:
W. Tusch,
W. Hauff.