(No Model.) 2 Sheets—Sheet 1.

RUDOLPH RITTER VON WALCHER-UYSDAL

APPARATUS FOR SPLITTING COAL, &c.

No. 370,749. Patented Sept. 27, 1887.

Fig. 1.

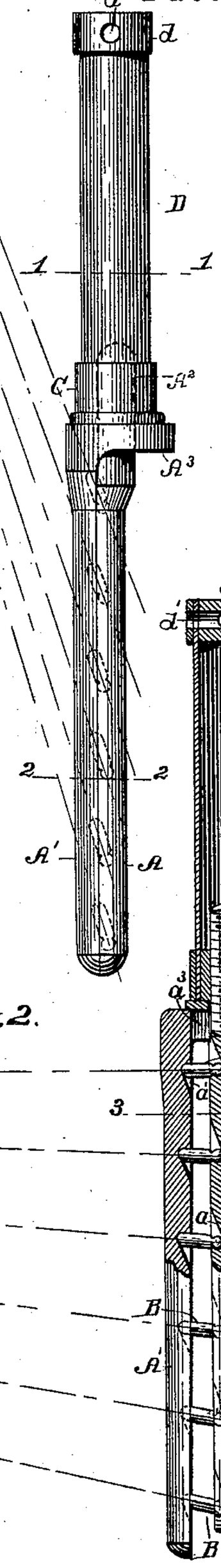


Fig. 2.

Fig. 3.

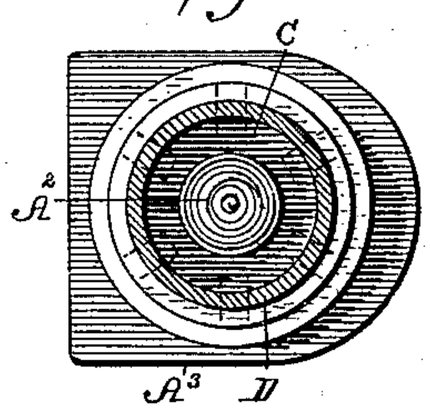


Fig. 4.

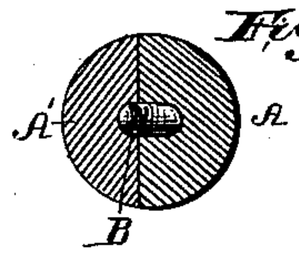


Fig. 6.

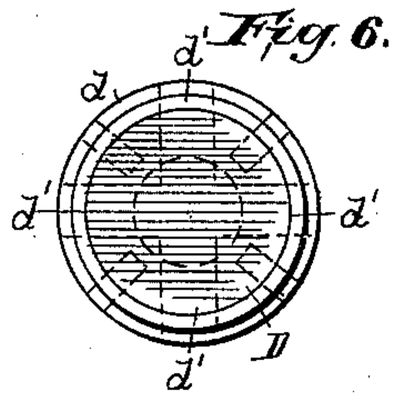
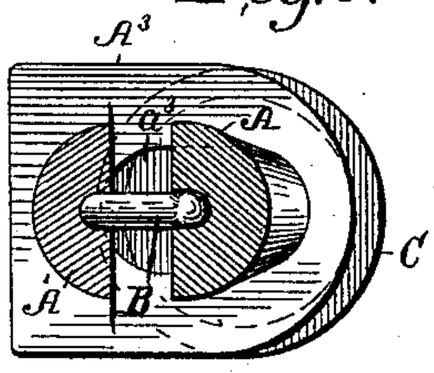


Fig. 5.



Witnesses.
Wm R. Davis.
W. E. Poulter

Inventor:
Rudolf Ritter von Walcher-Uysdal,
per Henry Orth
his Attorney.

(No Model.) 2 Sheets—Sheet 2.

RUDOLPH RITTER VON WALCHER-UYSDAL

APPARATUS FOR SPLITTING COAL, &c.

No. 370,749. Patented Sept. 27, 1887.

Fig. 8.

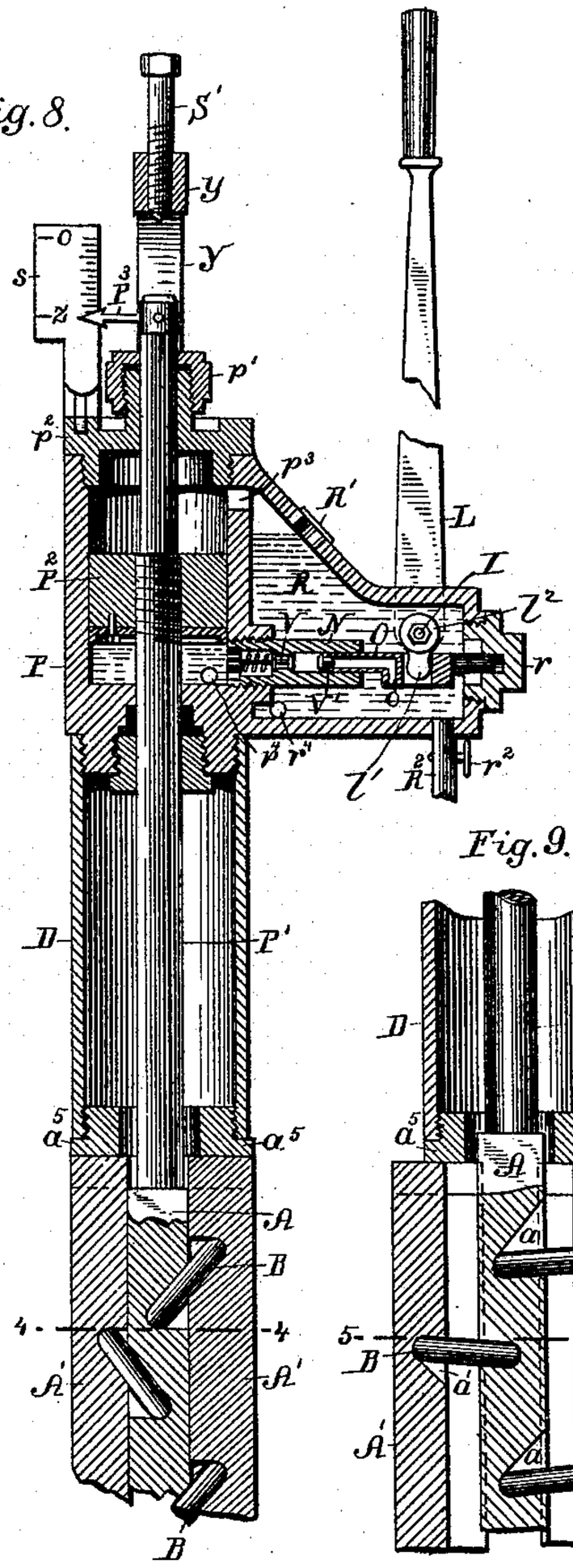


Fig. 9.

Fig. 7.

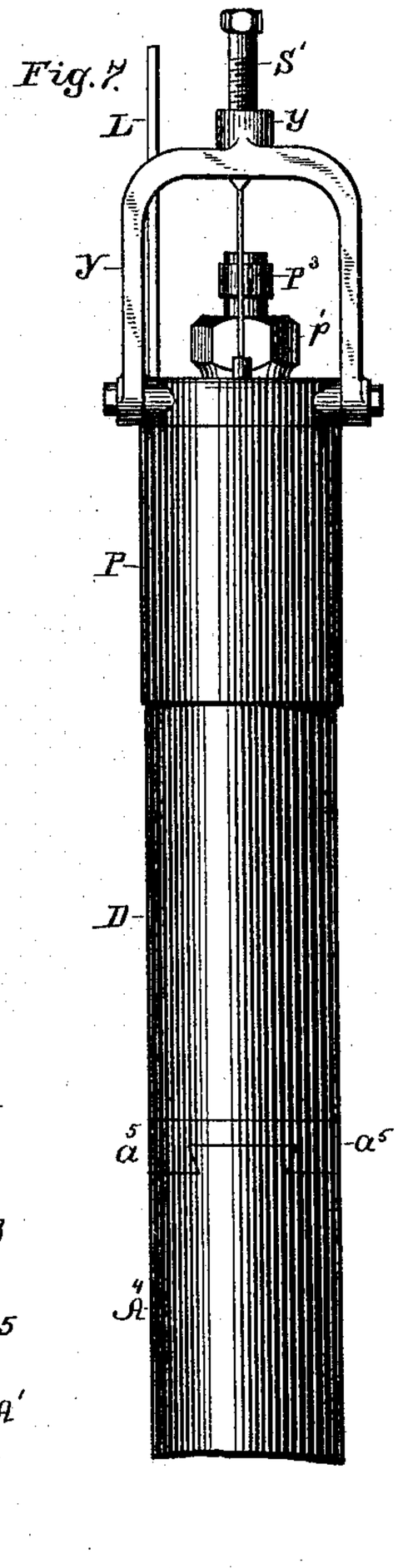


Fig. 10.

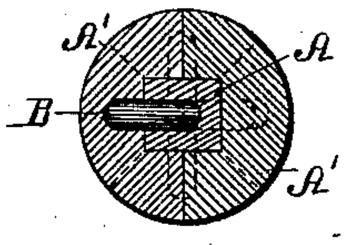
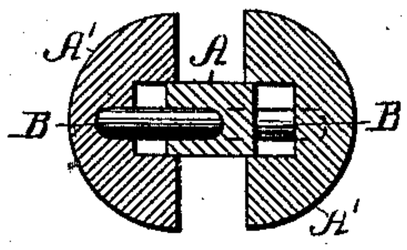


Fig. 11.



Witnesses
F. G. Fischer
W. E. Boulter.

Inventor
Rudolf R. von Walcher-Uysdal,
per Henry Orth
his attys

UNITED STATES PATENT OFFICE.

RUDOLF RITTER VON WALCHER-UYSDAL, OF TESCHEN, SILESIA, AUSTRIA-HUNGARY.

APPARATUS FOR SPLITTING COAL, &c.

SPECIFICATION forming part of Letters Patent No. 370,749, dated September 27, 1887.

Application filed March 12, 1886. Serial No. 195,003. (No model.) Patented in Germany January 8, 1886, No. 37,715; in France January 18, 1886, No. 173,606; in Belgium January 18, 1886, No. 71,672; in England January 18, 1886, No. 785, and in Austria-Hungary June 6, 1886, No. 1,834 and No. 23,741.

To all whom it may concern:

Be it known that I, RUDOLF RITTER VON WALCHER UYSDAL, a subject of the Emperor of Austria, residing at Teschen, in the Province of Silesia, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Apparatus for Splitting Coal or other Minerals, (for which Letters Patent have been issued in Austria-Hungary, No. 1,834 and No. 23,741, dated June 6, 1886; in Germany, No. 37,715, dated January 8, 1886; in France, No. 173,606, dated January 18, 1886; in Belgium, No. 71,672, dated January 18, 1886, and in England, No. 785, dated January 18, 1886;) and I do hereby 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 letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to tools more especially designed for mining or quarrying purposes, and has for its object to provide a simple device capable of being expanded, either by hand or through the medium of other power, to loosen the coal or rock in a drift.

In mining and quarrying, as is well known, channels are first cut into the drift or ledge of coal or stone. Then, by means of boring-tools, a series of holes are drilled for the reception of gads or miners' wedges, which are driven in to wedge or break off the material lying between the channels or trenches and the bore-holes when blasting is not resorted to, or said wedges or gads are driven into channels cut for their reception, as the case may be. The driving of the gads is performed either by manual labor or by power derived from any suitable source, such as steam, air, or other motors.

My invention is designed to provide a tool that is intended to take the place of the gads or wedges usually employed, and is more especially designed for use in drilled holes or cylindrical openings formed in the ledge or drift of material. It is so constructed as to be capable of expansion after being inserted in the bore-hole to force or break off the material between it and the channels cut in the drift or ledge, and to be operated by hand or by a suitable power, preferably hydraulic power. Tools constructed upon this principle are not broadly new, and various constructions of such tools have been proposed for mining purposes. In some constructions an expanding rod or mandrel of rapidly-increasing diameter and operating upon laterally-movable sections has been proposed. In others the expanding-rod of increasing diameter was provided with converging bearing-faces, and the laterally-movable sections were provided with like faces, a ball or rolling bearing being interposed between the two to reduce friction. In still other constructions the expansion was effected by means of toggle-levers connected to the expanding-rod and to the laterally-movable sections. I am also aware that hydraulic power—such as a hydraulic piston—has heretofore been proposed to operate the expanding or longitudinally or endwise movable rod. I therefore do not desire to claim, broadly, a mining-tool constructed for insertion and expansion in a bore-hole of a drift; nor do I desire to claim, specifically, any of the constructions above referred to. I am not aware, however, that a tool of this class has heretofore been constructed in which spreader bars or bolts are loosely inserted between the expanding-rod and the laterally-movable sections; nor am I aware that these spreader-bars have been arranged at gradually-varying angles from the power end of the tool to its opposite end, whereby a gradually-increasing expansion of the tool is obtained; nor am I aware that in the combination, with such a tool, of a hydraulic power the expanding-rod has been made use of as a piston-rod; and these points of difference constitute my invention, whereby a more efficient and more readily and economically operated tool is obtained.

To these ends the invention consists, therefore, in a mining-tool embodying the features of difference referred to, and constructed substantially as hereinafter described, and as set forth in the claims.

In the accompanying drawings, in which like

letters indicate like parts, Figures 1 and 2 show in elevation and partial longitudinal axial section a hand-power mining-tool illustrating one arrangement of and means for expanding the jaws of the tool, which jaws are shown in their expanded position in said Fig. 2. Figs. 3 and 4 are sections taken, respectively, on lines 1 1 and 2 2 of Fig. 1. Fig. 5 is a section taken on line 3 3 of Fig. 2, looking toward the handle. Fig. 6 is an end view taken from the power end of the tool. Figs. 7 and 8 show in elevation and longitudinal axial section, respectively, a portion of a power mining-tool illustrating a modification in the arrangement and means of expanding the tool. Fig. 9 is an axial section of a portion of the tool shown in Figs. 8 and 9, illustrating the same in its expanded state; and Figs. 10 and 11 are sections taken, respectively, on lines 4 4 and 5 5 of Figs. 8 and 9.

As stated hereinbefore, the essential elements of the tool comprise one or more laterally movable or expansible bars or jaws, a longitudinally movable or expanding bar, means controlled by the latter to impart lateral motion to the expansible bars or jaws, and means for imparting the necessary longitudinal motion to the expanding-bar. The arrangement of the expansible jaw or jaws relatively to the expanding-bar, as well as the means that control the movement of said expansible jaws and those of the expanding-bar, may be varied according to the uses made of the tool.

I will first describe the construction of a tool adapted to be operated by hand, referring more particularly to Figs. 1 to 6, inclusive, of the accompanying drawings.

A indicates the longitudinally movable or expanding bar or jaw, and A′ the laterally movable or expansible bar or jaw, both semicylindrical in cross-sections, the proximate plane faces of which, when the jaws are not expanded, lie in contact with each other, as shown in Figs. 1 and 4.

It will be observed that the degree of expansion or separation of the jaws A A′ from each other will depend upon the amplitude of lateral movement imparted to jaw A′ by the expanding devices, as will be readily understood.

The means for imparting lateral motion to the jaw A′, through the longitudinal movement of the jaw A, consist of spreader bolts or bars B, loosely seated in vertically-inclined recesses formed in the proximate flat faces of the jaws A A′, respectively, one end of which bars, B, has a spherical head, *b*, to form with the recess in one of the jaws a ball-and-socket joint. These bars B operate on the vertically-inclined faces *a* and *a′* of the recesses to spread the jaws A and A′ when one of them is moved longitudinally or endwise along the other, and, as shown, the said surfaces *a* and *a′* are inclined in reverse directions, those, *a*, in the jaw A inclining from the inner face thereof downwardly and outwardly, while the corresponding surfaces, *a′*, in the inner face of jaw A′ extend upwardly and outwardly, so that when the jaws are closed, as in Fig. 1, the bolts or bars B will lie within the recesses in contact with the inclines *a* and *a′*, the forms of which are such as to snugly inclose the bars.

It is obvious that if the jaw A is moved along the jaw A′ in one direction the bars B will move in a direction at right angles to the movement of the jaw A, and thereby impart a lateral motion to the jaw A′. The degree of separation or expansion of the jaws, as hereinbefore stated, depends upon the amplitude of the lateral movement of jaw A′, and this will of course depend upon the length of the spreader-bars B.

It will be observed that there is no connection between the spreader-bar B and the jaws A and A′, said bars B being loosely seated in the recesses *a a′*, thereby avoiding the usual accidents liable to occur to the connection between the spreader-bars and jaws.

It will be further observed that if the inclination of the various recesses is such that the longitudinal axes (as shown in dotted lines in Figs. 1 and 2) of the spreader-bars B, when projected, will intersect each other at a given point, or, in other words, if the angle of inclination of the recesses is gradually increased from the stock to the end of the tool, or if spreader-bars of gradually-increasing length be employed, a gradually-increasing expansion of the tool is obtained, as shown more clearly in Fig. 2. Under some conditions of use this will be found of advantage, the greater power being exerted by the jaws at a point farthest from that where said power is applied. The tool may be constructed to be operated by hand for use where another power is not available, or when such power cannot readily be applied.

In a hand-tool the jaw A, as shown in Figs. 1 and 2, is provided with a screw-threaded shank, A^2, to which is applied an operating-nut, C, while the jaw A′ has at one end a perforated ear or a collar, A^3, that projects at right angles therefrom and through which the screw-threaded shank A^2 of jaw A passes freely. The transverse slot a^3 in the ear or collar A^3 of jaw A′ is of such length as to permit said jaw to move away from jaw A the full length of the spreader-bars B, and the length of said transverse slot a^3 will therefore depend on the length of said spreader-bars.

It is obvious that if the tool is driven into a hole and held against rotation and power applied by any means—such as a wrench or key—to the nut C, to move the same into the proper direction, the jaw A will be moved longitudinally, thereby causing the spreader-bars B to move in a direction at right angles to the motion of the jaw A, and force the jaw A′ to move in the direction of the spreader-bars, or away from jaw A, thus expanding the tool.

Although the tool when constructed as described is capable of operation, yet for mining or quarrying purposes such a construction would necessitate the workmen coming into

close proximity to the material to be broken away, and such material in falling would be liable to injure the men. To avoid this, I attach to the nut C a suitable handle, D, which is tubular or partially tubular, to allow the proper play to the shank A^2 of jaw A therein, and said handle D terminates in a head, *d*, that may be squared to receive a key or wrench, or provided with holes *d'* for the reception of hand-levers, as shown in Figs. 1 and 2. This handle I make of such length that the operator will be out of reach of the falling mass of material broken or wedged out of a ledge or drift.

The nut C may also be operated by power derived from any suitable prime motor—such as steam, air, or gas—by coupling the nut to such motor; or the said tool may be operated by hydraulic power.

In Figs. 7 to 11, inclusive, I have shown a tool operating on the principle described in conjunction with a hydraulic ram for expanding the sections or jaws of said tool, whereby I obtain not only a compact device, but also a very powerful medium for expanding the tool. In this construction I have shown the tool—namely, a longitudinally-movable expanding bar, A—composed of three sections, and expansible jaws A' inclosing the same, the proximate faces of the bar and jaws being also provided with vertically-inclined recesses for the spreader-bars B, and, if desired, said recesses may be arranged to adapt the tool for varying expansion; or spreader-bars varying in length may be employed to this end, as hereinbefore referred to. The bars B in this case are also laterally disconnected from the expansible jaws and the expanding-bar, and are loosely seated in their respective recesses.

It is evident that when the parts are in the position shown in Fig. 8, and the expanding-bar A is moved longitudinally in the proper direction, the spreader-bars B will force the jaws A' A' to move in opposite directions and at right angles to the direction of motion of the bar A, away from it, as shown in Fig. 9. When, on the other hand, the bar A is moved in a reverse direction, the jaws A' A' will move back into contact with the bar A, as shown in Fig. 8.

To permit the lateral to-and-fro motion of the jaws of the tool, I employ a sleeve, A^4, that has a dovetailed transverse guideway or mortise, each of the jaws A' terminating in a correspondingly dovetailed projection or tenon, a^5, as more plainly shown in Fig. 7.

To the sleeve A^4 is secured a tubular handle, D, for the purposes already explained, to the end of which handle is secured the piston-cylinder P of the hydraulic ram. The endwise movable or expanding bar A of the tool, which is square in cross-section throughout that portion thereof that lies within the jaws A' A', has a cylindrical shank or extension, P', that performs the function of a piston-rod and carries a piston, P^2. The said rod passes through suitable stuffing-boxes, *p* and *p'*, in the cylinder-heads, and carries at its rear end, above the stuffing-box *p'*, a pointer, P^3, projecting over a graduated scale, *s*, indicating the degree of motion of the piston-rod and piston and consequently that of the expanding-bar A, the said scale being secured to the cylinder-head p^2. To the latter cylinder-head is also secured a stirrup or yoke, Y, that has a screw-threaded bearing, *y*, on a line with the axis of the cylinder, in which is fitted a screw, S', by means of which and the scale *s* the extent of outward movement of the piston-rod and piston is determined, so that the operator may have a sure index, whereby he may at all times be aware of the degree of expansion of the jaws A and A' within the bore-hole of a drift or ledge of coal or rock.

On one side of the piston-cylinder P is formed or secured a chamber or reservoir, R, in which the water used as a motive power is stored. Said reservoir is in communication with the piston-cylinder P in rear of the piston by a port or ports, p^3, so that the air as it is compressed by the outward movement of the piston will exert its pressure upon the water in the reservoir.

N is the plunger-barrel in communication with the piston-cylinder P in front of the piston, and is provided with the usual check-valve, V, arranged so as to admit the water freely to, but prevent its return from, the cylinder.

O is the plunger, that is also provided with a suitable check-valve, V', arranged to allow the water to pass freely to the check-valve V, but prevent its return through the plunger to the reservoir R. The plunger is tubular and has one or more admission-ports, *o*. It slides in the plunger-barrel N and in the removable head *r* of reservoir R, as shown, and is operated or reciprocated by a hand-lever, L, pivoted on a stud or cross-shaft, I, that carries a sleeve, l^2, provided with a radial arm, *l'*, which latter operates in a slot in the plunger to reciprocate the same when the lever L is operated.

The cylinder P is provided with an exhaust-pipe communicating with the reservoir R at r^4 and with the cylinder at p^4, said pipe being provided with a suitable stop-cock or valve for the purpose of returning the water from the cylinder to the reservoir after each operation of the piston.

R' is a plug in the wall of the reservoir, for the purpose of filling or replenishing the same, and R^2 is an exhaust-pipe provided with a suitable valve or stop-cock, r^2, for exhausting the water from the reservoir and removing sediment therefrom.

By means of the described construction it will be seen that, instead of exhausting the water from the cylinder through a waste pipe or port, said water is returned to the reservoir R after each operation of the piston, and may thus be used for a very long time, thereby

avoiding the labor of frequently filling the reservoir.

It is obvious that when the parts are in the position shown in Fig. 8, and the lever is reciprocated, water from the reservoir R will be forced into the cylinder P in front of the piston and will drive said piston rearwardly toward the screw S′ in yoke Y, carrying with it the expanding-bar A, thereby spreading or expanding the jaws A′, the pointer p^3 indicating on the scale *s* the degree of expansion of said jaws, and when the head of the piston-rod abuts against the point of the screw S′ the operator will know that the jaws are fully expanded.

In this construction of tool jaws A′, adapted to be variably expanded, may be used interchangeably—that is to say, a pair of jaws capable of greater expansion may be readily substituted for a pair of jaws capable of being expanded to a given extent by the use of longer spreader-bars B and correspondingly-extended inclined surfaces *a′* in the jaws, in conjunction with a sleeve, A^4, having a flange of correspondingly greater diameter.

It will be obvious that if such a sleeve is used a pair of jaws having inclines *a′ a′* of greater extension and spreader-bars of greater length may be readily substituted for those shown in said Fig. 8 without necessarily necessitating a change of expanding-bar A, the dovetailed portion a^5, that fits in the guide groove or slot in the flange of said sleeve, being alike in all the jaws or sections A′.

It will also be readily perceived that in this construction of tool, instead of two jaws A′, three or four such jaws may be employed, the latter construction being indicated by dotted lines in Fig. 10, the spreader-bars being arranged in recesses formed in the four faces of the expanding-bar A and in the adjacent faces of the jaws A′.

I have shown in the drawings a sectional expansible rod or bar of cylindrical form in cross-section. Although this construction is preferred for mining or quarrying purposes, for the reason that the holes bored or drilled in the ledge or drift of material to be mined are usually of cylindrical form, yet it is obvious that this form is not absolutely necessary, and that any other suitable form in cross-section may be given to the expansible portion of the tool.

In this description I have also confined the use of the tool to mining purposes only. It will, however, be apparent that it may be used for other purposes—for instance, in the raising of heavy stones or timbers which cannot conveniently be raised by means of ropes or chains passed around them, for the reason that in positioning the material the ropes cannot be removed without danger to the workmen or liability to deface the stone or wood. In this case the material is usually raised by means of eyebolts or equivalent devices driven or screwed or sealed in holes bored or drilled in the material for the purpose.

It is obvious that by very slight changes, if any, in the structure of the expansible jaws of the tool, so as to cause their outer surface to embed or bite into the material—as, for instance, by forming teeth on the outer faces of the jaws or by forming a screw-thread on the same, so as to adapt the tool to be screwed into the material or into a suitable filling in a hole in said material, and by providing means for attaching the hoisting-tackle thereto, for which purpose the yoke Y may be employed when the tool, Figs. 7 to 11, is employed. The tool may be advantageously and economically used for the purpose described, whether as a hand-operated tool or as a tool operated by hydraulic power, as described.

Other uses where the expansibility of the jaws can be made available will readily suggest themselves.

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

1. A tool of the class described, comprising a longitudinally movable or expanding bar or jaw, one or more expansible or laterally-movable bars or jaws and spreader-bars B, loosely seated in inclined recesses formed in the proximate faces of the longitudinally and laterally movable jaws or bars, substantially as and for the purpose specified.

2. A tool of the class described, comprising a longitudinally movable or expanding bar or jaw, one or more expansible or laterally-movable bars or jaws, and spreader-bars B, interposed between the proximate faces of the longitudinally and laterally movable bars, said spreader-bars being arranged with their axes on inclined planes that, when projected, will intersect each other, substantially as described, and for the purposes specified.

3. A mining-tool comprising a power-cylinder, a longitudinally-movable bar extending through and projecting from said cylinder, a piston secured to the bar and operating within the cylinder to impart motion to the bar, an abutment to limit the movement of the bar in one direction, and one or more expansible or laterally-movable bars operated by the longitudinally-movable bar, substantially as and for the purpose specified.

4. A tool of the class described, comprising a power-cylinder, a longitudinally-movable bar extending through and projecting from said cylinder, a piston mounted on the bar and operating within the cylinder to impart motion to such bar, an adjustable abutment to adjust and limit the stroke of the bar, and one or more expansible or laterally-movable bars operated by the longitudinally-movable bar, substantially as and for the purpose specified.

5. A tool of the class described, comprising a power-cylinder, a longitudinally-movable bar extending through and projecting from the cylinder, a pointer secured to the projecting end of the bar and arranged to travel over the index on the cylinder, a piston mounted on said bar and operating within the cylinder

to impart motion to the bar, and one or more expansible or laterally-movable bars operated by the longitudinally-movable bar, substantially as and for the purpose specified.

6. A tool of the class described, comprising a power-cylinder, a longitudinally-movable bar, a piston mounted thereon and operating within the cylinder to impart motion to the bar, one or more expansible or laterally-movable bars operated by the longitudinally-movable bar, and a tubular connection interposed between the power-cylinder and laterally-movable bars, said connection having a head provided with guide-grooves that connect the laterally-movable bars to said head and guide the same in their movements, substantially as and for the purpose specified.

7. A tool of the class described, comprising a longitudinally-movable bar, one or more expansible or laterally-movable bars, and spreader-bars interposed between the longitudinally and laterally movable bars, the several spreader-bars of the series increasing in length from the power end of the tool to the opposite end thereof, substantially as and for the purpose specified.

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

RUDOLF RITTER VON WALCHER-UYSDAL.

Witnesses:
EDMUND JUSSEN,
OTTO SCHEFFER.