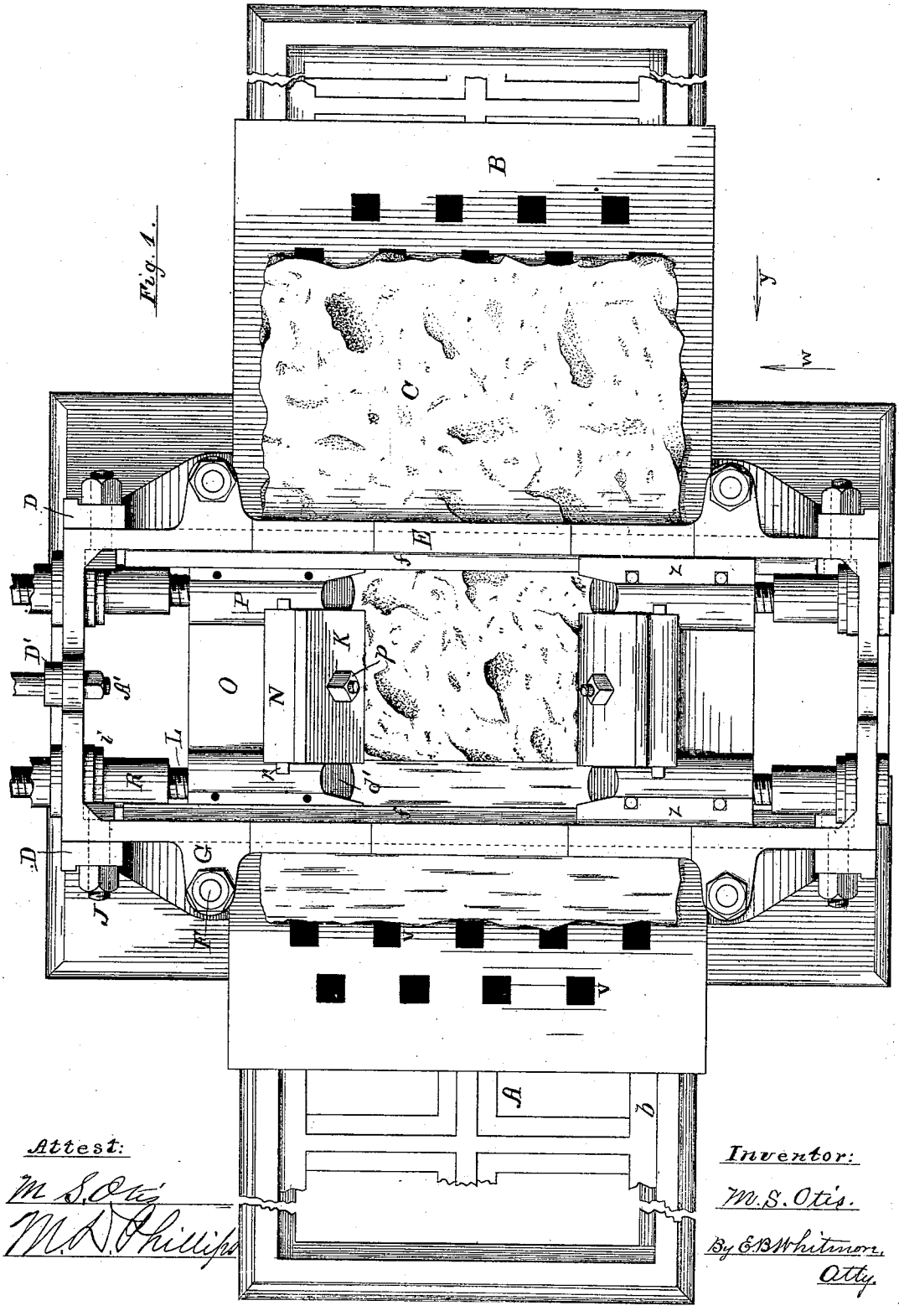
(No Model.) M. S. OTIS. 4 Sheets—Sheet 1

STONE CUTTING MACHINE.

No. 269,451. Patented Dec. 19, 1882.

Fig. 1.



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M. D. Phillips

Inventor:

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By E. B. Whitmore,

Atty.

(No Model.) 4 Sheets—Sheet 2.

M. S. OTIS.

STONE CUTTING MACHINE.

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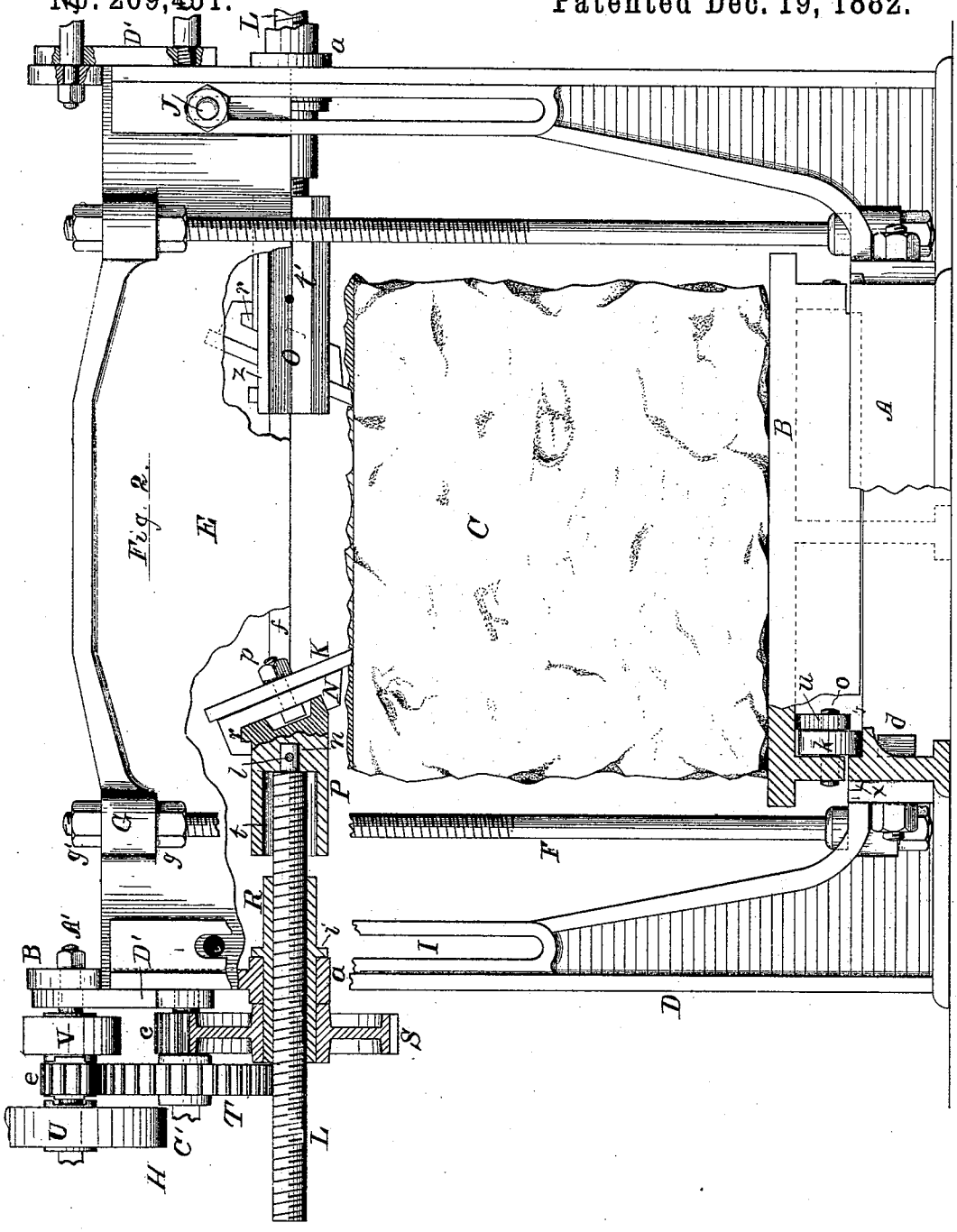

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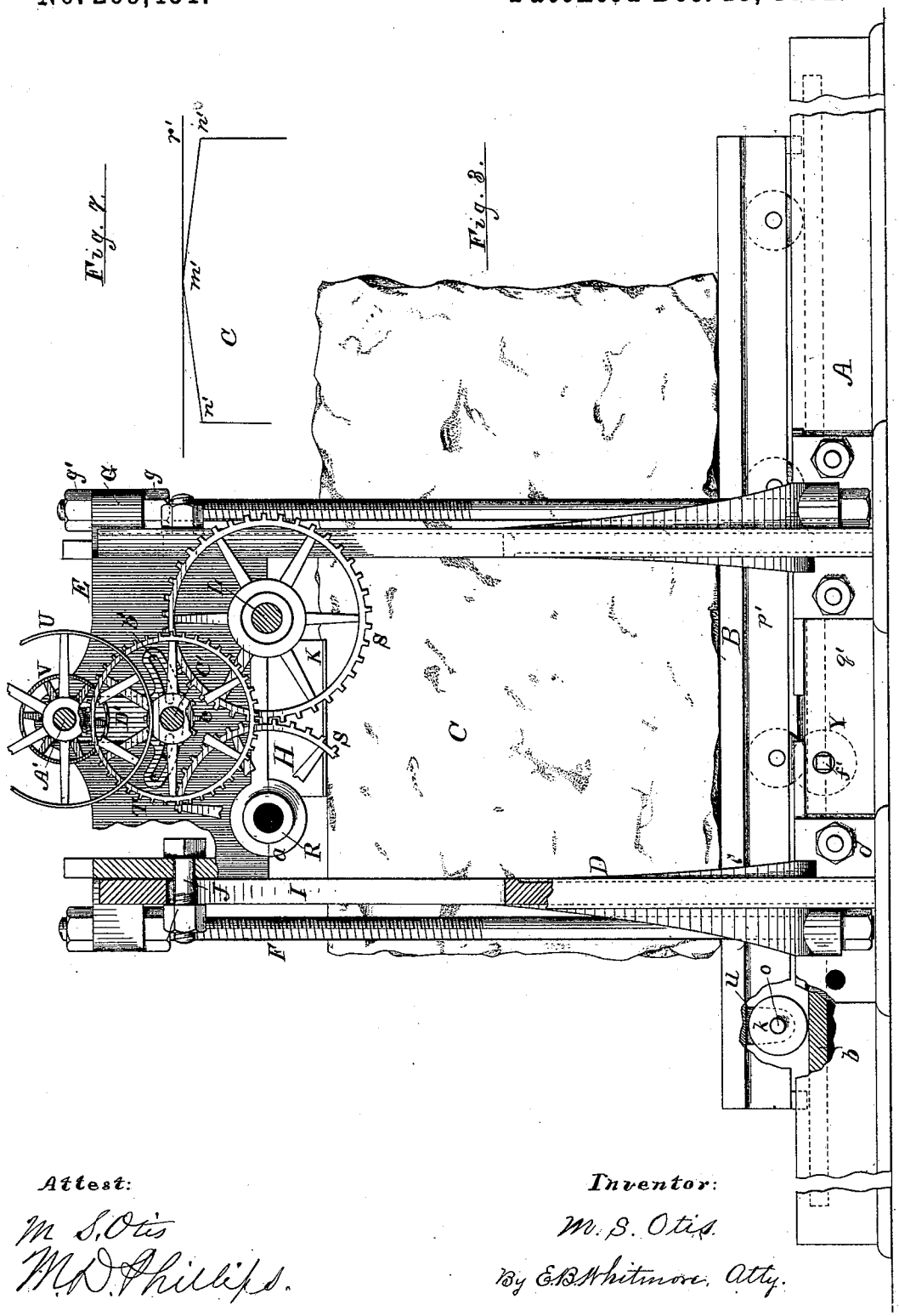
(No Model.) 4 Sheets—Sheet 3.

M. S. OTIS.

STONE CUTTING MACHINE.

No. 269,451. Patented Dec. 19, 1882.



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(No Model.) 4 Sheets—Sheet 4.

M. S. OTIS.

STONE CUTTING MACHINE.

No. 269,451. Patented Dec. 19, 1882.

Fig. 5.

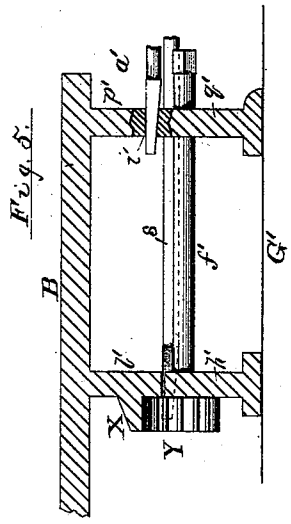


Fig. 6.

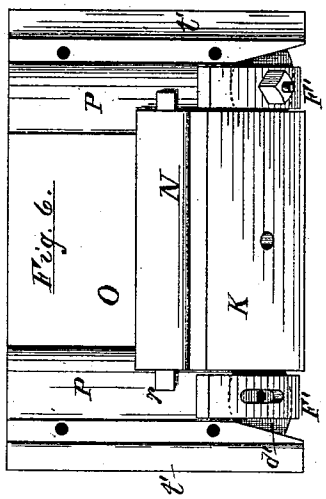
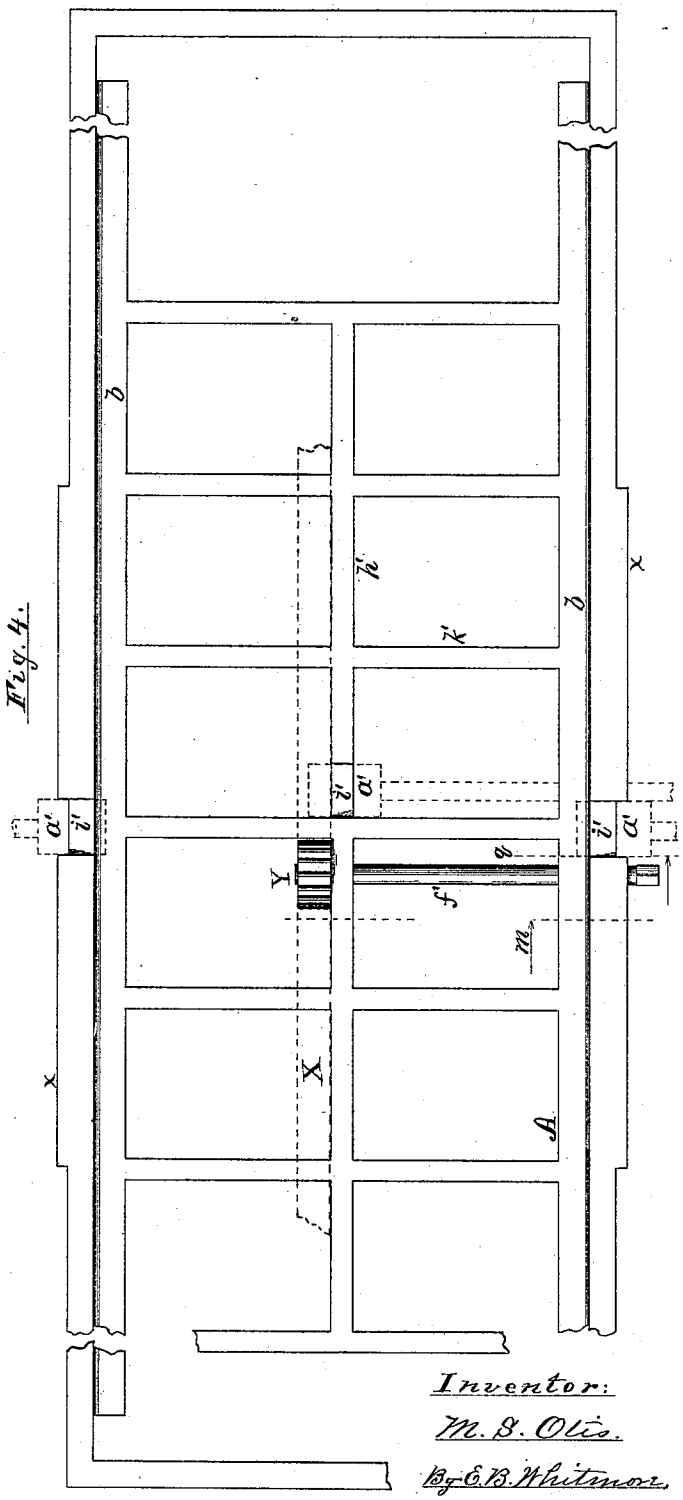


Fig. 4.



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UNITED STATES PATENT OFFICE.

MARVIN S. OTIS, OF ROCHESTER, NEW YORK.

STONE-CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 269,451, dated December 19, 1882.

Application filed January 30, 1882. (No model.)

To all whom it may concern:

Be it known that I, MARVIN S. OTIS, of Rochester, in the county of Monroe and State of New York, have invented a new and useful Improvement in Stone-Cutting Machines, which improvement is fully set forth in the following specification and accompanying drawings.

My invention relates to those machines for cutting or dressing the surfaces of blocks of stone in which cutting-tools are forced steadily across the surfaces of said blocks of stone by powerful machinery; and it has for its object the construction and arrangement of the parts holding and driving the cutters in such a manner that said parts and cutters may be conveniently moved to any position of vertical adjustment within limits to dress the surfaces of blocks of stone of different thicknesses; to operate and move the opposing cutters independently of each other; to provide means by which, when the stone is being operated upon by the cutters, the parts of the machine supporting the stone may be more effectually braced or supported from beneath to resist the downward pressure of the cutters than has heretofore been done, and to provide other improved parts and devices combined in the machine, all of which are described in this specification, and more particularly pointed out in the claims.

Figure 1, Sheet 1, of the accompanying drawings is a plan of my improved stone-cutter with parts broken away and omitted; Fig. 2, Sheet 2, an end elevation of the same view indicated by the arrow *y* in Fig. 1, with parts sectioned and other parts broken away; Fig. 3, Sheet 3, a side elevation of the same view indicated by the arrow *w* in Fig. 1, with parts sectioned and broken away; Fig. 4, Sheet 4, a plan of the bed, showing also some of the attached parts with portions broken away; Fig. 5, Sheet 4, a transverse vertical section of a portion of the bed and superincumbent table, taken upon the dotted line *m* in Fig. 4, with a small portion at the right side of the figure, more closely section-lined, sectioned along the line *q* in Fig. 4; Fig. 6, Sheet 4, a plan of a cross-head with some of the combined parts drawn to a larger scale; and Fig. 7, Sheet 3, a detail drawing, all of the parts and devices of the machine being fully specified below.

Referring to the figures, A is a strong bed-piece designed to be laid horizontally upon a foundation of masonry to hold the other parts of the machine and the stone to be dressed.

B is a table upon which the block of stone C to be dressed is placed, said table resting upon the bed A by means of intervening rollers *k*, which are arranged to roll along tracks *b* within the sides of the bed for the purpose of allowing the table to be moved longitudinally upon the bed.

D are four equal corner-posts or standards, two of which are held to each side of the bed A by strong bolts *d*.

E is a cross-bar, rectangular or box-shaped in form, having a sufficient vertical depth of sides to give it great strength and stiffness, held between the posts D at the upper ends thereof.

F are four stout bolts secured vertically in the bases of the respective standards D, the upper ends of which pass through respective loops G at the sides of the cross-bar E.

L are four heavy horizontal screws, two of which enter each end of the cross-bar E, each pair of which screws carries a cross-head, O, within the cross-bar, constructed to slide along ways *f* within the sides of said cross-bar.

K are cutting-tools secured to tool-blocks N, which in turn are attached to the respective cross-heads O. The screws L rest respectively within long sleeve-nuts R, which are journaled within boxes in the end plates of the cross-bar.

S S are spur-gears secured to and rotating the respective sleeve-nuts R.

T and *c* are respectively gears and pinions, the latter of which turn the respective gears S, said gears T and pinions turning together loosely upon the respective studs C′, projecting from pendulums D′, suspended from studs A′ at either end of the cross-bar E. By means of the pendulums, which are of common construction, the pinions *c* may be caused to turn either the right or left hand gear S of the pair, as may be required.

U and V are belt-pulleys of different diameters, which, together with intermediate clutched pinions, *e*, turn loosely upon the respective studs A′, the said pinions turning the respective gears T. The pulleys U and V turn in the same direction, but at different rates of speed, and it is designed to have the more rapid pul-

leys V operate the gearing while the cutters are being drawn back after completing a cut.

The table B is provided with an ordinary longitudinal rack, X, Sheet 4, and an ordinary pinion, Y, and shaft f' are used to move the table along the bed. The outer end of the shaft f' is squared to receive a lever or wrench by which to rotate the same and move the table, as stated.

The bed is provided with a strong longitudinal rib, h', and cross-ribs k' for the purpose of giving it strength and to assist in supporting the table. The latter is provided with a longitudinal rib, l', corresponding to and opposing the rib h' of the bed, and separated therefrom only by a narrow space shown in Fig. 5, while the outer ribs or webs, p', of the table correspond to and oppose the like ribs or webs q' of the bed, and are slightly separated therefrom, as shown.

a' are wedges fitted within seats or spaces i', cut in the upper edges of the ribs h' and q' of the bed, which, when in place, have their upper surfaces resting against the under surfaces of the respective ribs l' and p' of the table. By means of these wedges the table, when loaded with a heavy block of stone and moved in place to have a cut taken across the stone, can be wedged up or supported rigidly from the bed to relieve the rollers of much of the strain due to the weight of the stone and the downward pressure of the cutters while acting. In some of the machines that I am manufacturing the cutters are sixteen inches wide, and the vertical pressure exerted upon the stone during a cut of that width is sometimes very great, particularly when the stone under action is of a tough texture and firmly-set grain. To resist this pressure and that of the weight of the stone, I find it necessary to rigidly shove the table from the bed by direct and positive means, so that it will not spring beneath the cut and leave the surface of the stone untrue.

I find the wedges above described to be cheap and effectual, though other devices may be employed for the purpose—as, for instance, screws projecting up through lugs cast upon the sides of the bed, having their points or ends caused to bear against the under surface of the table.

The surfaces of a block of stone cut by machines of this class heretofore used are found to be higher at the middle lines thereof, where the successive cuts are finished, than at the edges where the cuts begin. A glance at Fig. 7, Sheet 3, will make this plain. The upper or cut surface of the stone C is higher at the point m' than at the points n' where the cutters begin, as is shown by the right line r'. This fault in the surface of the stone (much exaggerated in the figure) is caused in part by the yielding downward of the table under the pressure of the cut as the cutters advance toward the middle of the surface of the stone. To obviate this I introduce into the bed and table, respectively, the center ribs, h' and l', Fig. 5, Sheet 4, and between them the wedge or prop a', above described. The rib h' of the bed reaches downward to the foundation or masonry G', and by means of the prop a' the table B is firmly supported at the middle or has a center bearing.

The wedge a', between the ribs l' and h', is provided with a rod, s, which reaches out through the side of the bed, by means of which the wedge may be operated by the attendant.

The wedges may all be inserted in their places between the ribs or withdrawn therefrom by any suitable mechanical means that might suggest itself to a skilled operator.

The tracks b, along which the rollers k move, are simple horizontal ledges projecting from the inner faces of the respective outside webs, q', of the bed, a little below the upper edges of said webs, as shown in Fig. 2, Sheet 2. The rack X of the table, Sheet 4, is a projection cast along the side of the center rib, l', of the table, and the shaft f', carrying the pinion, is journaled in the ribs q' and h', through which it passes. The shafts o, holding the respective rollers k, pass through the side ribs, p', of the table and through lugs u, Sheet 2, projecting from the under surface of the table. The table has openings v through it to assist in keying or clamping the block of stone in place while being operated upon.

The upper surface of the bed is provided for a distance near the middle with outwardly-projecting bars or cleats x at each side, and the lower or base portions of the posts or standards D have corresponding depressions at their respective parts contiguous to the bed, and when bolted to the sides of the bed by the bolts d they are locked, as it were, under the bars x, which effectually prevents the said standards being drawn upward or away from their bearings upon the sides of the bed by the upward strain upon the bolts F.

The standards are slotted for some distance at I to permit vertical adjustments of the cross-bar E, and four bolts, J, passing through the sides of the latter, enter the respective slots I to rigidly secure the cross-bar to the standards when brought to any desired position of adjustment by means of the bolts F. The said bolts F are provided with screw-threads throughout half their lengths to permit a liberal vertical adjustment of the cross-bar, and each bolt is provided with two pinch-nuts, g and g', respectively below and above the loop G, as shown. To lower the cross-bar the clamping-bolts J are loosened and the screw-nuts g turned downward along the respective bolts F, the weight of the cross-bar causing it to follow, and when at the desired position of adjustment the nuts g' are brought down upon the respective loops G and the bolts J tightened. The cross-bar is raised in a similar manner. The cross-heads O reach across the interior of the cross-bar and slide along ways f, Sheets 1 and 2, cast upon the interior opposing surfaces of the cross-bar, and at the bottom thereof. These ways or bars f are made

very strong, and the under gibs, t', of the cross-heads, which bear against the under surfaces of the bars, are massive, so as to be able to resist the upward pressure exerted by the cutters while acting upon the stone. Light gibs z, Sheet 1, are bolted to the bodies of the respective cross-heads to rest upon the upper surfaces of the bars f and complete the inclosure of the latter. By means of these rigid bars f the cross-heads, with their attached cutters, are guided horizontally over the block of stone when driven by the screws L, the cutters reducing the rough, uneven surface of the stone to a horizontal plane, as shown.

The front sides of the cross-heads are beveled, as shown in Sheet 2, so that the cutters may incline away from each other at an angle with the vertical best adapted for cutting. The cutters K are fastened to cutter-blocks N, which are hooked over transverse ribs r on the upper surfaces of the cross-heads, and caused by gravity to lie solidly against the front beveled faces of said cross-heads.

The sleeve-nuts R are made long for the purpose of obtaining a bearing upon a large number of the turns of the threads of the screws L to avoid the danger of stripping. These sleeve-nuts are respectively journaled in thickened parts a of the end plates of the cross-bar, and extend some distance within the cross-bar and far enough without to receive the respective gears S, as shown in Fig. 1. The screws L do not rotate, but pass through the sleeve-nuts, and have their respective reduced ends n entering and pinned fast within the cross-heads by pins l, the sleeve-nuts being rotated about the screws by means of the gears S, which drive the screws endwise and with them the cross-heads. The sleeve-nuts have respectively collars i, which bear against the inner surfaces of the cross-bar to resist the reaction of the stone while the cutters are being forced against the same, while the hubs of the gears S form collars at the outer ends of the bearings, on account of which hubs and the collars i the sleeve-nuts are held to their places within the end plates of the cross-bar.

The cross-heads are chambered at t, where the screws L enter them, so that when they are drawn clear back for the purpose of starting the cutters on a new cut they will pass over or outside of the sleeve-nuts where the latter project within the cross-bar. The screws L enter the respective chambers t concentrically, and have bearings in the cross-heads only at the reduced ends n, which are well fitted to the cross-heads for the purpose of withstanding the great pressure brought to bear upon them by the sleeve-nuts when the cutters are forced against the stone. The two screws L, entering either end of the cross-bar, are parallel with each other, and together form a pair which, with the connected cross-head, move together backward or forward in their several bearings entirely independently of the opposing and in every way similar pair of screws and cross-head connected. The axes of the four screws L, lie in the same horizontal plane, which plane also coincides with the bottom surface of the cross-bar.

The cross-bar E is provided at each end with a system of gearing, H, above described in detail, which systems are in every way alike, only one of which at one end of the cross-bar being shown in Figs. 2 and 3 of the drawings. These independent systems of gearing are each driven by separate belts upon the pulleys U and V, and each system drives the pair of screws L, connected with it, by rotating the sleeve-nuts R, as above described.

The studs A′, holding the pulleys, are secured rigidly within the raised parts B′ at the respective ends of the cross-bar, and the pendulums D′ depend from these studs, respectively, as centers of motion. The pendulums are formed similarly to those commonly employed in machinery, having concentric slotted parts b' extending laterally from opposite edges of the body, through which to receive cap-screws, which enter holes c' in the cross-bar for the purpose of securing the pendulums in any position of lateral adjustment. A pendulum may be swung to the left, causing the pinion e to rotate the left-hand gear S, which will move the cutter in one direction, and, if swung to the right, causing said pinion to rotate the right-hand gear S by actual contact, the motion of the cutter will be reversed. If the gears S of either system mesh together, as represented in Fig. 3, they will rotate in opposite directions, and consequently the thread on one screw of the pair will have to be a right-hand thread and on the other a left-hand thread, in order that said screws shall both move in the same direction simultaneously. By interposing an intermediate between the gears S, causing them to move in the same direction, both screws of a pair may have like threads.

It will be observed that as both systems of gearing H, with the sleeve-nuts R, screws L, cross-heads, and cutters, are attachments of the cross-bar E, and all secured thereto, the whole will move up or down as a unit when the vertical adjustments of the cross-bar E, above described, are made. Some ordinary precaution will have to be taken to maintain a uniform tension upon the driving belts upon the pulleys U and V during the vertical adjustments of the cross-bar just mentioned. Several mechanical devices to effect this successfully are well known to mechanics, either of which may be employed.

The inner ends, d', Figs. 1 and 6, of the enlarged or cylindrical parts P of the cross-heads O at each end of the cutters K are beveled at about the same angle as that of the faces of the cross-heads between said end surfaces, d', and adapted to hold short stout cutters or "routers" F′, which are bolted to said surfaces d', as shown. The use of these routers is to remove any prominent projections or lumps upon the uncut surfaces of the stone as the cross-heads advance that would, if not removed, come in contact with and rub against

the under surfaces of the said enlarged parts P of the cross-heads. The cutting-edges of the routers are not set as low as those of the cutters proper, K, but only sufficiently low to remove any projections of the stone that might touch the cross-heads, as above stated. It will be understood that these routers are necessary to protect only the parts P of the cross-heads that chance in the operation of the machine to pass over the uncut surface of the stone—as, for instance, the right-hand parts P of the respective cross-heads as appearing in Fig. 1. The corresponding left-hand parts P passing over a part of the stone previously reduced by the cutters K need have no routers attached.

The outer ends of the studs A′ and C′ are to be supported by some suitable devices not shown. The pinions *e* on the respective studs A′ are designed to be shifted endwise upon the studs for the purpose of causing them to be locked respectively with either the pulleys U or the pulleys V, as may be required. When light cuts are to be taken from the stone, or when the cutters are backed up after a cut has been completed, the more rapid pulleys V are designed to be used, while the slower-rotating pulleys U drive the cutters through heavier cuts of the stone.

In the operation of the machine the cutters move toward each other from opposite sides of the stone, and when they have approached near each other the motion of the gearing driving either one is reversed and the cutter drawn back, while the other cutter is allowed to continue and finish the cut, the independent motion of the cutters above described permitting this. In using the machine shown in Patent No. 145,376, in which the opposing cutters move simultaneously toward or from each other, and not independently, a line of rough, uncut stone is unavoidably left where the cutters cease cutting upon approaching each other, which has to be removed and finished by hand-tools.

I do not claim broadly in a stone-cutting machine opposing cutters approaching or receding from each other, such having before been known and used, and shown in Patent No. 145,376, in which the opposing cutters are operated by horizontal rotating screws.

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

1. In combination, the bed-plate A, standards D, and cross-bar E, the latter provided with cross-heads O O and cutters K K, and systems of gearing H H to drive said respective cross-heads, with supporting-rods F passing through perforations in the cross-bar E, said rods having their lower ends secured in the base of the frame, their upper ends screw-threaded and provided with clamping-nuts *g g′*, formed to clamp said cross-bar E in place, as and for the purpose set forth.

2. A machine for cutting or dressing the surface of stone, having the non-rotating cutters secured in a suitable cross-bar supported on standards, said cross-bar carrying a system of driving-gear adapted to force the cutters across the face of the stone independently of each other, the cross-bar being vertically adjustable by means of rods and standards, as shown and specified.

3. In a stone-cutting machine, the table B, mounted on rollers and formed with apertures or spaces *i′* in the ribs between the bed A and said table B, in which are inserted stiffening-blocks *a′*, substantially as shown and specified.

4. The combination, in a stone-cutting machine, of the cross-bar E, held upon standards D D D D above and away from the stone, said cross-bar being provided with opposing cross-heads O O, carrying cutters and independent sets of parallel non-rotating driving-screws L L L L, connected with the respective cross-heads and sleeve-nuts R R R R for said screws, and means to rotate the sleeve-nuts, by means of which the said cross-heads, with their attached cutters, are moved in the same or in opposite directions over the surface of the stone in the act of cutting the same.

5. The combination, with the cross-bar E, of a cross-head, O, parallel non-rotating screws L L, having their inner ends secured within said cross-head, and means to give said screws endwise motion, substantially as shown and described, and for the purpose set forth.

6. The combination, with the cross-bar E, of a cross-head, O, provided with chambers *t t*, and the screws L L, entering said respective chambers, and the sleeve-nuts R R, substantially as set forth and shown.

7. In combination, the cross-bar E, sleeve-nuts R R, gears S S, gear T, pinion *c*, pendulum D′, studs A′ and C′, and pinion *e*, with means to rotate the latter, by means of which pendulum the pinion *c* may be caused to directly turn either gear S.

8. The cross-head O of a stone-cutting machine, in combination with the cutter-block N, attached to said cross-head for the purpose of holding the cutter K, and roughing-cutters F′ F′, secured directly to the cross head on either side of the cutter K for the purpose of removing the higher lumps or projections of the stone to prevent contact between the same and the cross-head as the latter is carried over the face of the stone, substantially as set forth.

9. In combination, the bed A, standards D D D D, and cross-bar E, the latter being provided with cross heads O O and cutters K K, and systems of gearing H H to operate said respective cross-heads, and non-rotating supporting-bolts F F F F for the cross-bar, passing through projections from the latter, and having their respective lower ends resting respectively in the bases of the standards, and screw-nuts *g g′*, provided for the supporting-bolts, to secure the same rigidly to the cross-bar, substantially as set forth.

MARVIN S. OTIS.

Witnesses:
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