United States Patent

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[45] Patented **Dec. 15, 1970**
[73] Assignee **S.p.A. Secoblitz Industria Meccanica Levico, Trento, Italy**
[32] Priority **Nov. 9, 1964, Oct. 28, 1965**
[33] **Italy**
[31] **Nos. 24,123 and 23,869**

[54] MARBLE BLOCKS SAW WITH MULTIPLE CUTTERS

1 Claim, 16 Drawing Figs.

[52] U.S. Cl. 125/13
[51] Int. Cl. B28d 1/04
[50] Field of Search 125/12, 13, 14; 143/38

[56] **References Cited**

UNITED STATES PATENTS

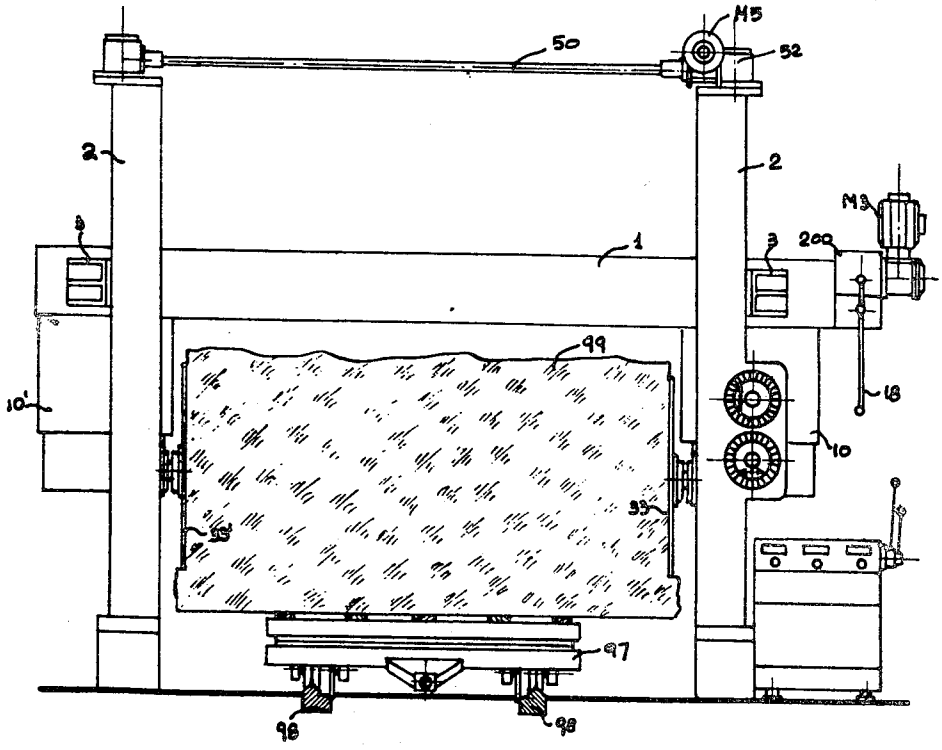
1,016,440	2/1912	Pollard	125/14
1,909,001	5/1933	Nelson	125/13
2,187,299	1/1940	Burkhard	125/13
2,079,864	5/1937	Lansing	125/14
2,609,848	9/1952	Schneider	143/38
2,800,932	7/1957	Scott	143/38
3,289,662	12/1966	Garrison	125/14

FOREIGN PATENTS

16,254	7/1906	Great Britain	125/14
484,555	9/1953	Italy	125/14
618,154	2/1961	Italy	125/13

Primary Examiner—Harold D. Whitehead
Attorney—Clario Ceccon

ABSTRACT: The improved saw for cutting marble blocks has provided therein a plurality of cutters which permit the simultaneous and independent cutting of the block, even in planes normal to each other. These cutters are mounted on a vertically sliding supporting truss which allows them to move together with their actuating means in a horizontal plane even beyond the line of cutting.



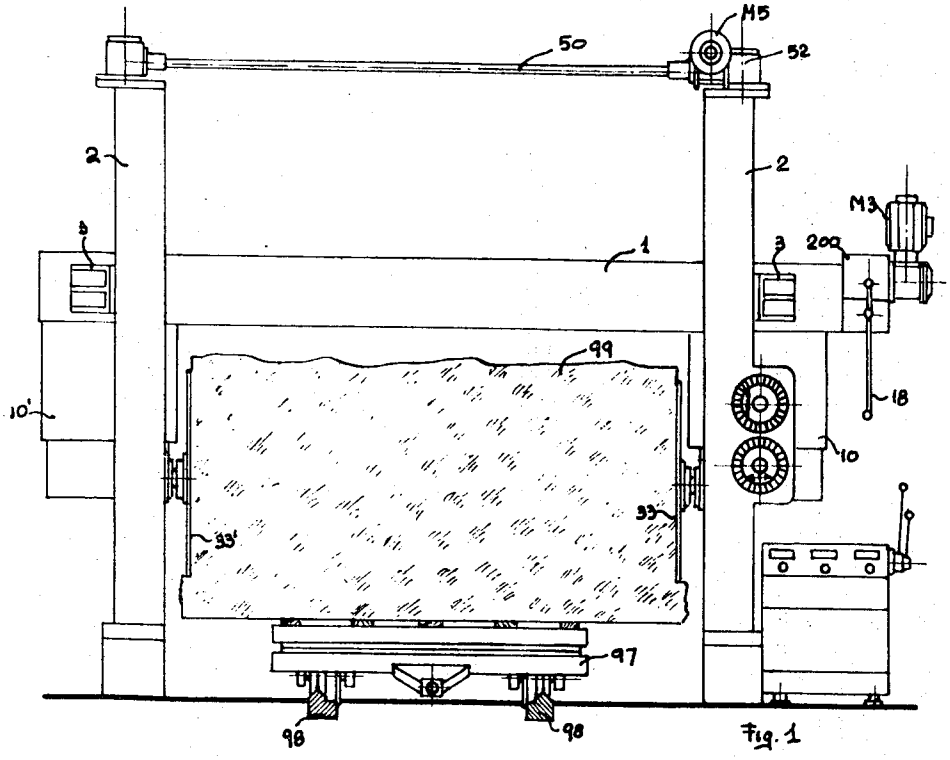

M5
50
52
2
2
M3
1
3
200
3
99
18
10'
10
33
33'
97
98
98

Fig. 1

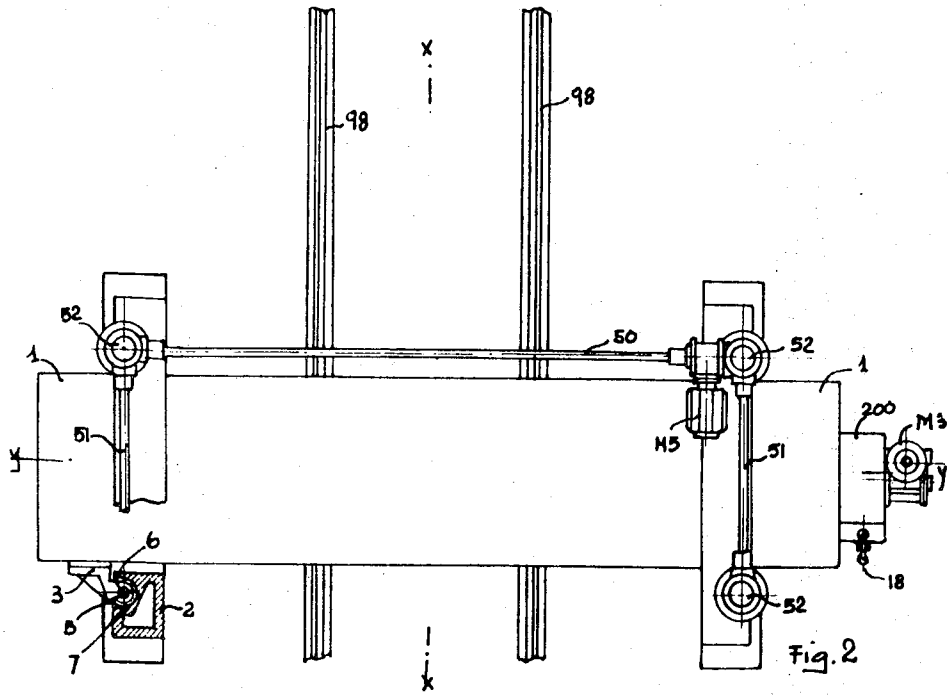

X
98
98
52
50
52
1
1
200
M3
51
M5
51
Y
Y
6
3
5
7
2
18
52
X

Fig. 2

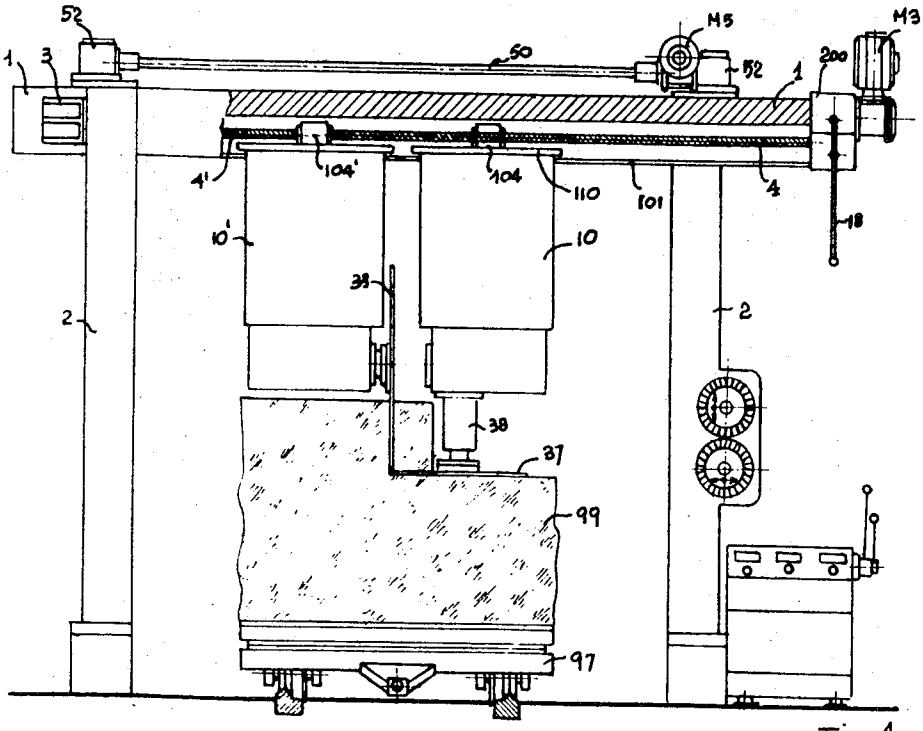

52
M5
M3
1
3
50
52
1
200
4'
104'
104
110
101
4
18
10'
10
38
2
2
38
37
99
97

Fig. 4

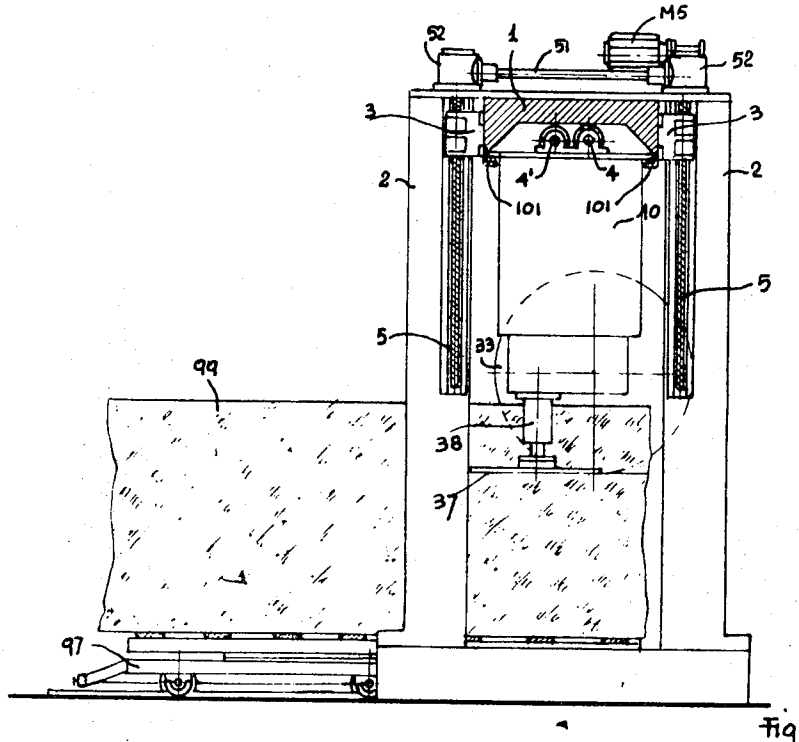

M5
52
1
51
52
3
3
2
2
4'
4
101
101
10
5
5
33
99
38
37
97

Fig. 3

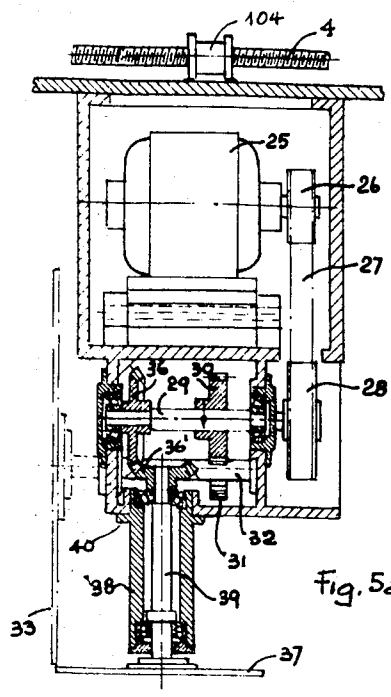


Fig. 5a)

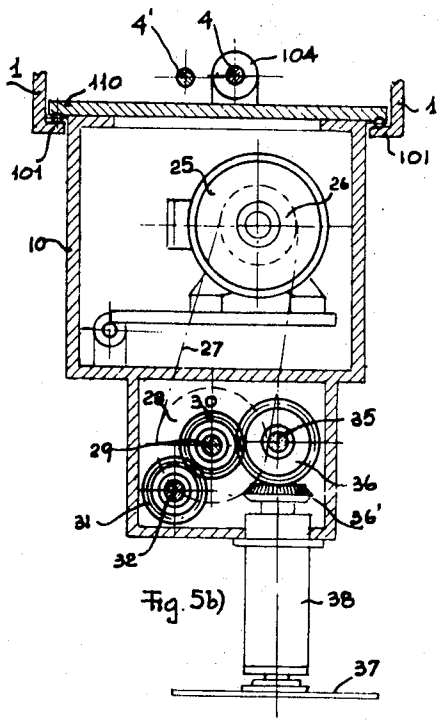


Fig. 5b)

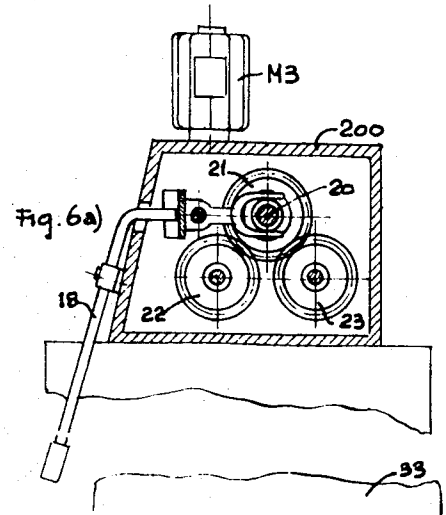


Fig. 6a)

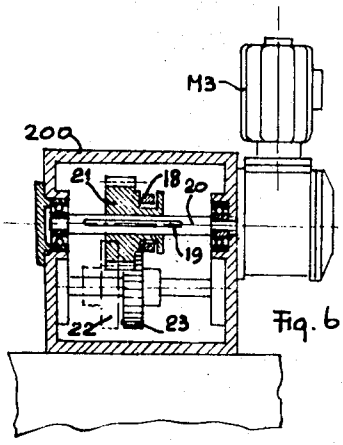


Fig. 6b)

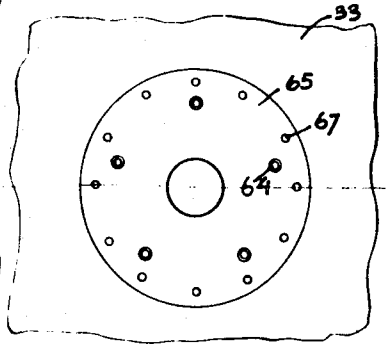


Fig. 7a)

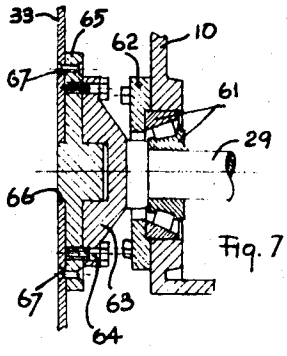


Fig. 7b)

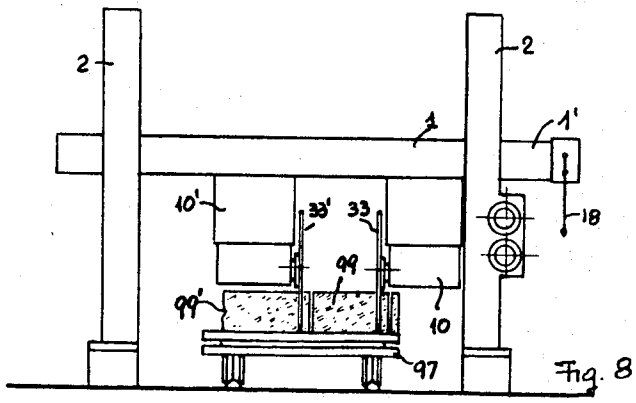


Fig. 8

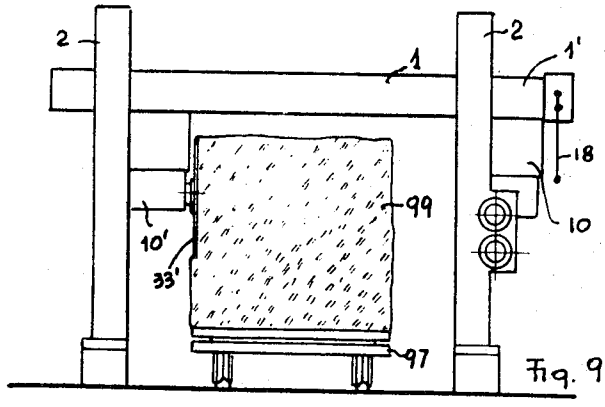


Fig. 9

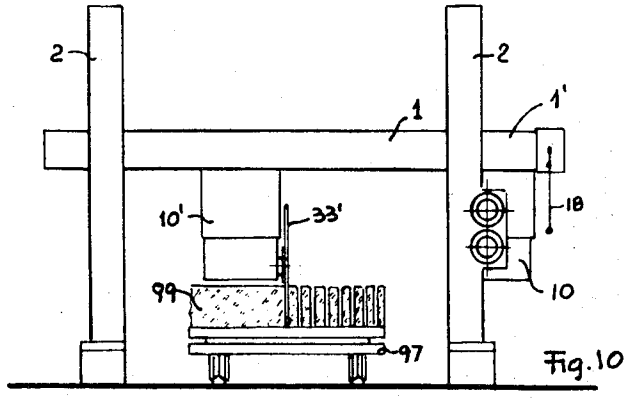


Fig. 10

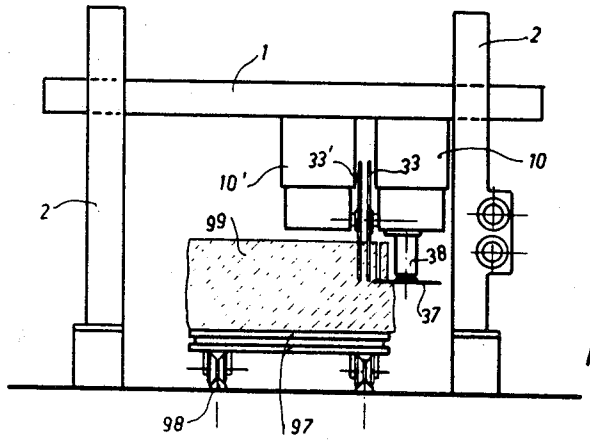


FIG. 11

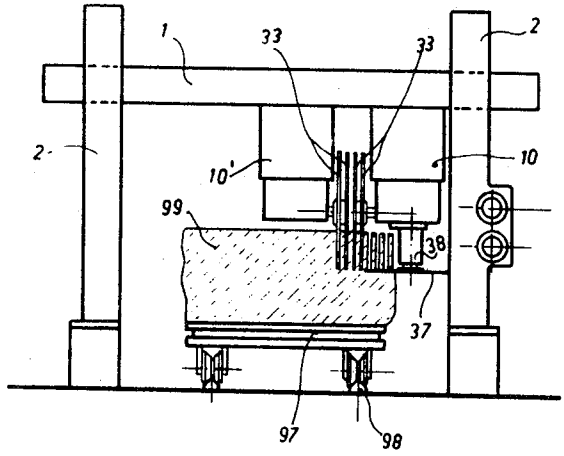


FIG. 12

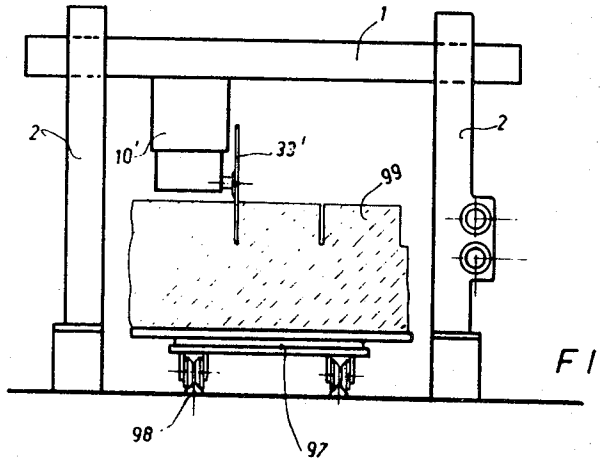


FIG. 13

MARBLE BLOCKS SAW WITH MULTIPLE CUTTERS

This is a continuation of application Ser. No. 506,636, filed Nov. 8, 1965, now abandoned.

Sawing devices for reducing quarry material into well-defined squared blocks or slates and provided with diamond-studded cutting discs are well known. Particularly suitable to this type of operation are those devices which have a fixed carrying structure formed by vertically mounted supports bearing transversal beams on which rests and slides a bridgelike truss. The movements of this truss are orthogonally directed with respect to the movements of the carriage upon which rests the block to be sawed. The horizontal truss carries casing or casings within which are located the motor and all transmission elements actuating the cutting disc or discs. The casings are positioned so that they may also be moved vertically to obtain the best position during the cutting operation.

In these devices, however, the cutting discs operate only along vertical planes and the casings which support them are, consequently, always exposed to the field of cutting, that is, between the two vertical supports of the structure. Furthermore, the supports for the cutters are composed of a pair of flanges protruding with respect to the cutting plane of the disc. As a result, the sawing devices thus constructed do not allow certain working operations capable of expediting the cutting time and reducing the cutting costs.

It is, therefore, the main object of the present invention to obviate these disadvantages by means of novel structural elements and novel arrangements.

It is another object of the invention to provide for a device in which the horizontal truss can move vertically and independently of existing transversal beams forming integral components of the structure carrying the apparatus.

It is still another object of the invention to provide for a device in which the casings for the motor and the transmission elements are so arranged that discs having a horizontally axial characteristic may be substituted with discs having a vertically axial configuration.

It is a further object of the invention to provide for a device in which the casings mentioned above may be moved along the horizontal truss fully, thus clearing the planes of the lateral vertical supports.

It is another object of the invention to provide for discs which are fixed with plates shaved in such a manner that the vertical cutting may be greater than the whole diameter of the disc.

These and other objects and advantages of the present invention will become apparent from a detailed description of the embodiments thereof and from the accompanying drawings, in which:

FIG. 1 shows in frontal elevation and perspective the device of the invention. The device is here shown from the operator's position while a pair of cutters 33 and 33' with horizontal shaft operates on the facing of a block 99;

FIG. 2 is a top view in orthogonal projection in which are visible the rails 98 along which the carriage 97 (of FIG. 1) feeds the block under the cutters;

FIG. 3 is a side elevation view of the device of the invention;

FIG. 4 is a frontal view showing a cutter 33 with horizontal shaft and a cutter 37 with vertical shaft while cutting the mass into smaller prismatic blocks along a longitudinal development;

FIGS. 5*a* and 5*b* show sectionally details of the right casings of the device. In these FIGS. one can see in solid lines the cutter 37 with stem 38 and vertical shaft 39 and in dotted lines the cutter 33. One can also see that, for one individual casings, one cutter or the other may be rendered operative, but never both cutters simultaneously. In these FIGS. are represented the motor 25 and the transmission elements 26, 27 and 28 contained within and supported by the casing 10. FIG. 5*a* is obtained along a section parallel to the vertical plane of transversal motion of the casings (see lines *y–y* of FIG. 2), while FIG. 5*b* is obtained along a sectional line *x–x* of FIG. 2;

FIGS. 6*a* and 6*b* show in cross-sectional detail the casing 200 and the motor-movers assembly therein contained and used to actuate the lateral movements of the disc-supporting casings 10 and 10';

FIGS. 7*a* and 7*b* show in frontal elevation and in axial section, respectively, the application and in axial section, respectively, the application of a cutter with horizontal shaft and with shaved-plate support for large cuttings and for surface planning of exceptionally large blocks;

FIGS. 8, 9 and 10 are schematic representations of the positioning of the various operative elements of the devices, as explained more fully hereafter; and FIGS. 11, 12 and 13 are perspective representations of variances in the application of the device of the invention. Thus, FIG. 11 shows a cutting device for blocks and having two casings 10 and 10', the first casing carrying a diamond-studded disc 33 for vertical cuttings and at the same time carrying stem 38 bearing a diamond-studded disc 37 for horizontal cuttings, both cutters 33 and 37 working simultaneously. FIG. 12 shows a cutting device with two casings 10 and 10', both carrying on their shafts pairs of cutters 33 and 33', casing 10 having again the stem 38 bearing a cutter 37 for horizontal cuttings. The illustration given by FIG. 12 is typical, but the number of vertically cutting discs is theoretically infinite, the only limitation being presented by the power afforded by the motor. FIG. 13 shows a cutting device provided with a single casing 10' carrying exclusively one disc 33 as working tool.

Referring now to FIGS. 1—4, the horizontal truss 1 is provided with lugs 3 having spiral seats. Within these seats are mounted the threaded rods 5. Lugs 3, with slider 6, run within the vertical cavities 7 with which each of the pilasterlike supports 2 is provided. All four threaded rods 5, vertically positioned and each being in relationship with a lug 3, are kinematically connected (by means of conical cogs contained within boxes 52) with other threaded rods 50 and 51 which are interchangeably rotatable in clockwise or counterclockwise direction upon actuation by a motor M_5 suitably provided on the structural castle of the device.

The above discussed assembly allows the horizontal truss 1 to perform vertical excursions upwardly or downwardly so as to enable the operator to preset the cutters at the most convenient height relative to the working plane of the block-carrying carriage 97 underneath.

The mechanisms which, upon automatic command, provide for either large movements or for minute (lateral) displacements of the casings 10 and 10' along the truss 1 are substantially composed of (see FIGS. 2 and 4) the motor assembly M_3 and the transmission means contained within box or casing 200 positioned at the head of the castle of the device. This assembly, particularly illustrated in FIGS. 6*a* and 6*b*, comprises, besides motor M_3, the transmission means, that is: a pair of conical gears actuating shaft 20, on which it may run, guided by belt 19 by means of a toggle lever 18; the gear 21 which may mesh, depending on the position taken, with either gear 22 or with gear 23 or with both 22 and 23. The gears 22 and 23 are fixed rigidly to the two countershafts connected to the threaded rods 4 and 4', one of which works clockwise and the other counterclockwise. These rods are positioned parallel to the movement of the longitudinal axis *y–y* of the truss 1.

On the threaded rods 4 and 4' are mounted the sleeves 104 and 104' (see FIGS. 5*a* and 5*b*), respectively, integrally connected with the corresponding casings 10 and 10' (see FIG. 4). The lateral displacements of the casings may, therefore, be either simultaneous or independent of each other, but always performed freely of the block to be cut and, if need be, may be carried out while maintaining within the working area a single casing. This is shown in FIGS. 9 and 10, wherein the right casing 10 is displaced on the right lateral extension 1' externally to the truss.

For this purpose, the truss is provided along the entire central section of its lower surface, (see FIG. 3) with a cavity positioned within two protruding wings, each respectively terminating with the presettable guides 101. On the two guides

101 rest the extremities of plate 110 (see FIG. 5*b*), which extremities form the ceiling of the casing 10. On the casing, in turn, the sleeve 104 is rigidly fixed. This is a spiral-screw type sleeve within which is connected the threaded rod 4 controlling the lateral displacements.

It should be kept in mind that an analogous setup exists with respect to casing 10'. Within the casings there is a motor 25 for actuating the transmission means which move the shafts of the cutters 33 or 37. The transmission means are composed of the coupling, by means of belts 27, between the pulley 26 of the motor and the pulley 28 of the shaft 29 on which is keyed the cylindrical gear 30 distributing motive force to two distinct gears 31 and 36.

The first gear 31 moves the counter-shaft 32 which carries the disc with horizontal axis 33. Conversely, the gear 34, mounted on the second countershaft 35, moves the conical gear 36'. Gear 36, only if the assembly 63—64—65 is disassembled, is meshed with the conical gear 36', keyed on the shaft 39 (of the vertical axis type). The shaft 39, supported by stem 38 (in this case, fixed to the lower part of the casing 10) is provided with cutter 37. It should be noted that casing 10' contains equipment similar to that described in connection with cutter 33' and, if so desired, a cutter 37', cutters 33' and 37' being twins with respect to discs 33 and 37.

Another embodiment of the present invention is the assembly identified in FIGS. 7*a* and 7*b* with the numerals 62 to 67 and employed in the application of the cutters to the countershafts 32 and 35. The assembly is composed, in general, of a means for mounting the cutters having shaved plates. This assembly allows the operation of the cutters under conditions of abnormal strain. Observing the two FIGS. (7*a* and 7*b*), a conical roller bearing 61 is fixed to the wall of casing 10 by means of a center-plate 62 bolted thereto and supports shaft 29. Shaft 29 carries a flange 63 provided peripherically thereto and star-shapedly with filetted openings, within which are seated bolts 64 with terminal embedded in a plate 65. On the circular central sash 66 of the plate 65 is mounted disc 33 which is fixedly connected to the plate 65 by rivets 67 positioned along the periphery of the plate.

Hereabove and with respect to the description of FIGS. 1 to 10 it has been stated that it is not possible to operate simultaneously both disc cutters 33 and 37 for one single casing 10 and 10'. The power of the motors actually installed within the individual casings 10 and 10' permit the simultaneous employment of the vertical discs 33 and/or 33' together with the horizontal discs of the type 37.

Necessarily, by the simple displacement of the shafts actuating the horizontal discs from those actuating the vertical discs, and by utilization of a novel method of motive transmission, it has been possible to apply to the casing the assembly 37—38—39—40 and, consequently, the shaft 39 (mover of the horizontal disc 37) while retaining the application of the vertically cutting disc 33 to the work block.

FIGS. 11 and 12 of the drawings illustrate this setup, in which the vertically cutting discs 33 are employed simultaneously to the horizontally cutting disc 37. The device illustrated in FIGS. 1 to 10 as well as all the variants thereof (FIGS. 11, 12 and 13) should be considered to operate in conjunction with the stone-carrying carriage, described and illustrated in copending Pat. application Ser. No. 392,561 filed on Aug. 27, 1964 and entitled "Mechanical Saws." The purpose for using this type of carriage has been clearly described and illustrated in the above-mentioned document.

It should be noted that by means of known arrangements such as, for example, by means of the use of electrically actuated sleeves coupled with the use of friction brakes, the lateral displacement of a casing, or of the casings, may be obtained by employing one single threaded rod 4 or 4', which action results in the sleeves 104 and 104' being coaxial therebetween.

By means of these variances which alter substantially the arrangement of the heretofore known operational elements, it is possible to achieve particular working patterns of the device. For example, it is possible to effect the simultaneous squaring of two lateral surfaces of a block (see FIG. 1). The block may be of considerably dimensions, such as a height greater than five feet. As another example, a cutting may be independent of and simultaneous with tabular elements which may be either of the same thickness or of different thickness (see FIG. 8). The cutting may be performed on the two lateral surfaces of the same block or of two adjacent blocks, besides the operations indicated, by means of the coupling of vertical-shaft disc with a horizontal-shaft disc, even without presquaring of the block.

As a third example, from the block one may obtain squared rectangular prisms (see FIG. 4) of length equal to the length of the block. This is done by simultaneously cutting vertically and horizontally. As a fourth example, one may work with a single casing, let us say that on the left-hand side, when exclusively vertical cuttings are desired or required for either a resquaring of the blocks (see FIG. 9) or for tabular operations with a single cutting disc. Finally, as another example, packs of slates may be obtained (see FIG. 10) on blocks of limited height and considerable transversal dimension. In this case, the right casing is eliminated from the working area, as it can be seen from the FIG. wherein it is shown as partially covered by the right upright column.

I claim:

1. A quarry block cutting machine comprising the combination of:

a. a horizontal crossmember;

b. means for limiting said crossmember to movement only in the vertical direction;

c. first motor means for moving said crossmember in said vertical direction;

d. first and second casings mounted on said crossmember for horizontal movement relative thereto;

e. second motor means for moving said first and second casings in said horizontal direction;

f. first and second threaded shafts for coupling said second motor means to said first and second casings, respectively;

g. first gear train means intermediate said second motor means and said first and second threaded shafts;

h. transmission means for coupling selected portions of said first gear trains means and said first and second threaded shafts whereby either one or both of said first and second casings move in a linear direction depending upon the portion of said first gear train that is selected by said transmission means;

i. third motor means contained within and enclosed by each said casing;

j. second gear train means contained within and enclosed by each said casing, said second gear train means being responsive to the output of said third motor means; and

k. first and second saw mounting means rotatably supported on each said casing and positioned such that the axes of rotation thereof are in intersecting planes, said first and second saw mounting means being coupled to said second saw mounting means being coupled to said second gear train of each said casing and responsive to said third motor means.