

March 28, 1939.

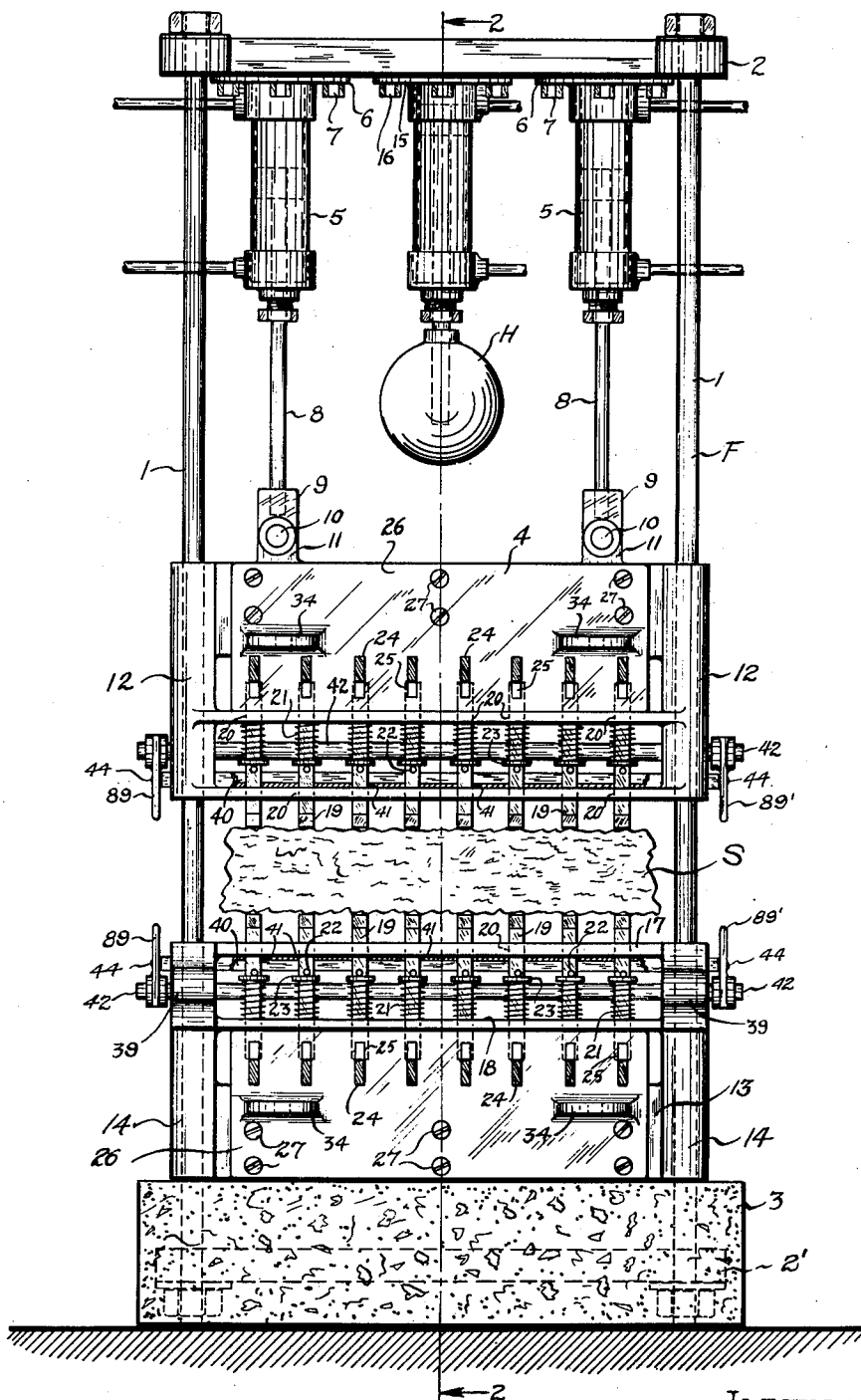
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2,152,193

STONE CUTTING MACHINE

Filed June 17, 1938

3 Sheets-Sheet 1



INVENTOR:

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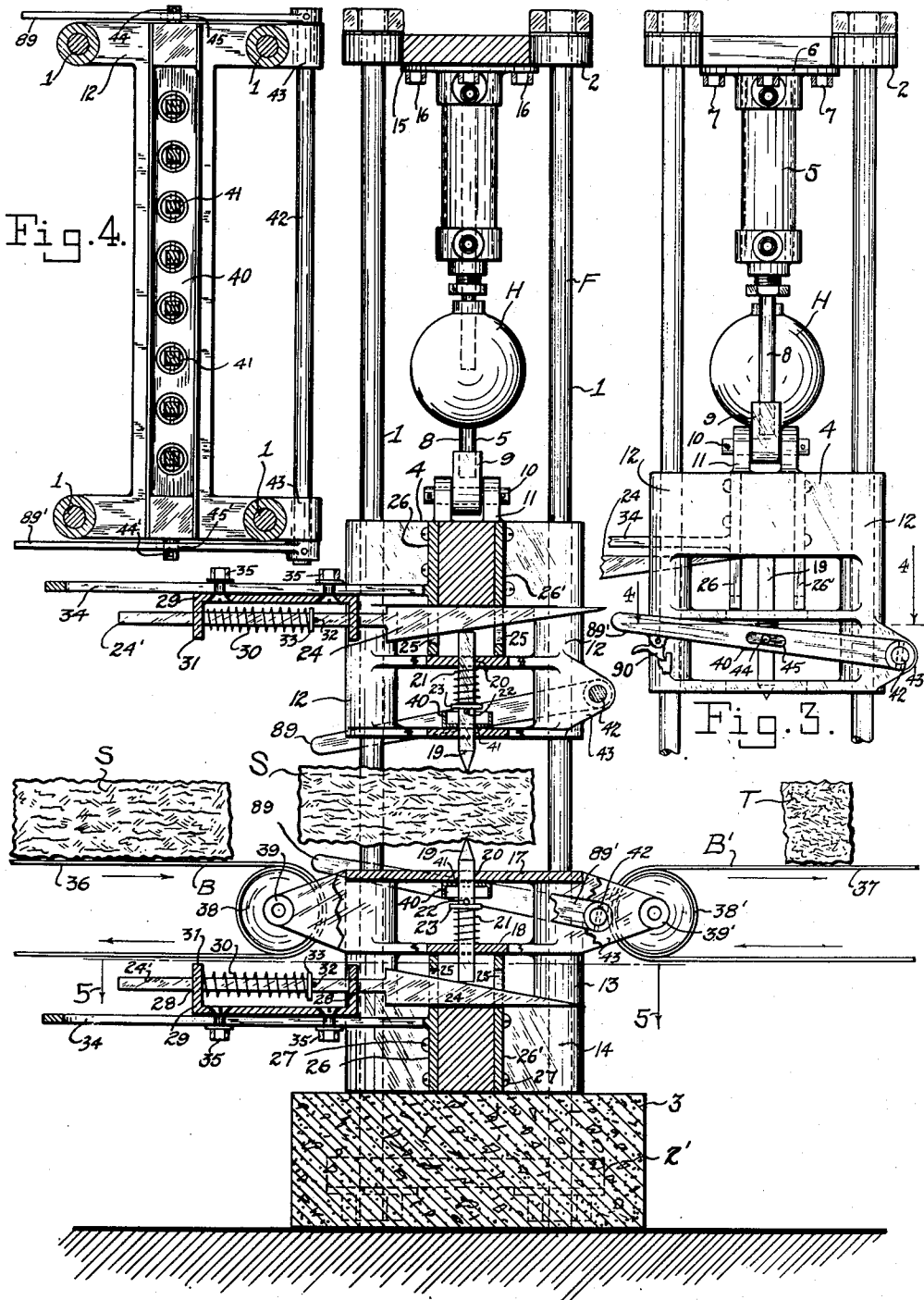


Fig. 2.

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Fig. 6.

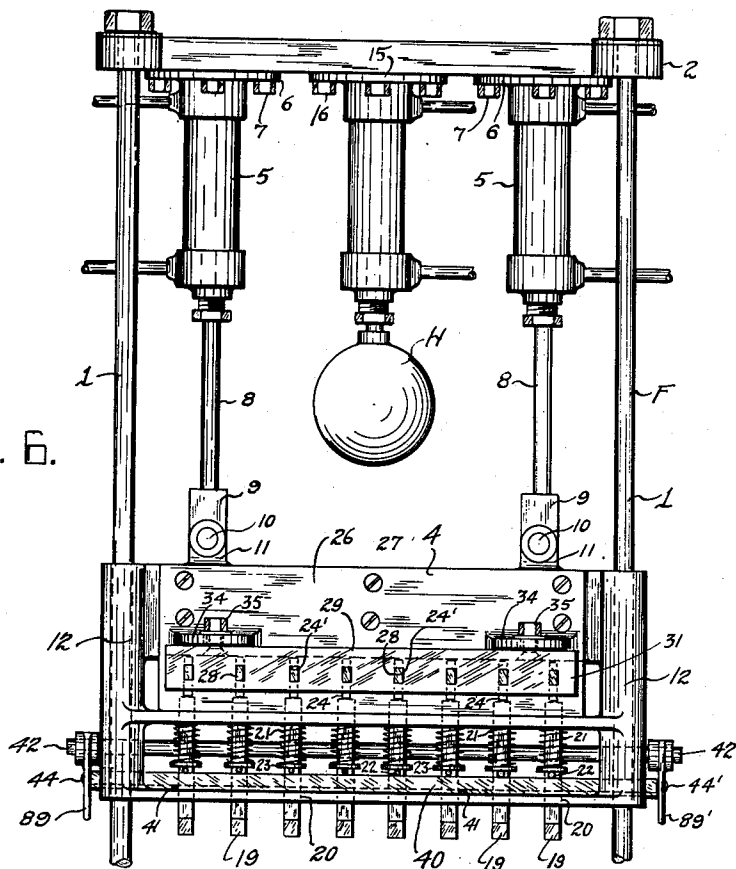
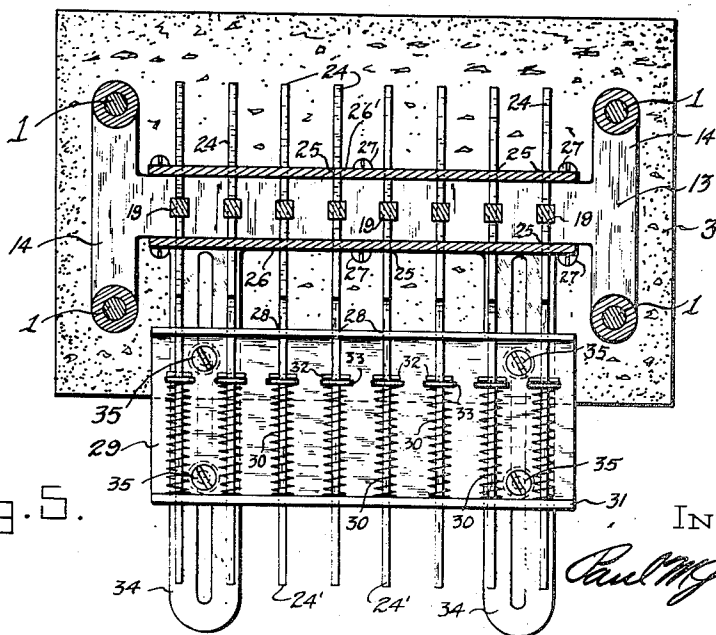


Fig. 5.



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STONE CUTTING MACHINE

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7 Claims. (Cl. 125—23)

My invention relates to improvements in machines of the general class known as stone breaking machines.

The primary object of my invention is to provide a machine for breaking stratified stone slabs into smaller stones of substantially uniform size, or any size desired, for purposes of building construction and any other purposes, and to provide a machine which will perform the work faster, better and cheaper than heretofore. It consists of a machine for dividing or breaking a slab of stone into smaller blocks or building stones of desired shape by simultaneous application of pressure and percussion exerted along predetermined breaking lines, of a plurality of chisel-like implements, arranged in a row upon opposite faces of the stone slab, each and all of the chisels being instantly, automatically and independently adjusted and held positively, under pressure to the irregular contour or surface of the slab, on both opposing sides thereof prior to and during the breaking operations. In the cutting or breaking operation, as soon as the two opposing rows or sets of chisels are automatically adjusted in cutting position against the opposing surfaces of a stone slab, a considerable pressure, such as may be exerted by hydraulic jacks, is equally exerted on each chisel in each row, prior to the percussion blow which breaks the stone.

Further objects of the invention are:

To provide opposing spring-urged groups, or a single group, of cutting chisels associated with a hammer bed, whereby individual chisels will compensate and contact with the irregular face of the product to be cut, and the chisels will be positively blocked in engagement with the hammer bed to directly receive a common blow; and

To provide the spring-controlled chisel ends under working conditions to assume different distances from a hammer bed, which distances or spaces will be blocked by spring-controlled wedges between the bed and ends of said chisels, whereby a direct hammer blow imparted to the bed will be equally distributed to the chisel points for cutting.

Other objects of the invention will become apparent from the following description of the machine which is illustrated in the accompanying drawings in its preferred form of embodiment.

In the drawings:

Figure 1 is a front, elevational view of the preferred form of my improved stone breaking machine, embodying my invention, shown partly in

central vertical section and having parts removed for clearness.

Figure 2 is a side elevational view of the completely assembled machine shown in Figure 1, shown largely in central vertical section, being drawn on the line 2—2 of Figure 1.

Figure 3 is a side view of the upper portion of the machine, shown in Figure 2, parts thereof being broken away.

Figure 4 is a horizontal cross-section of a detail portion of the machine, drawn on the line 4—4 of Figure 3.

Figure 5 is a horizontal cross-section of the machine, shown in Figure 2, drawn on the line 5—5 thereof, and

Figure 6 is a front view of the upper portion of the completely assembled machine shown in Figure 2.

Like parts are identified by the same reference characters throughout the several views.

My improved machine comprises a steel frame F, including four vertical standards 1 connected together at their upper and lower ends by fixed horizontal cross-heads 2, 2', respectively, the lower head 2' being shown as anchored in a fixed base support 3.

Another horizontal cross-head 4 is arranged to reciprocate on the standards 1, and is moved as by means of two double-action hydraulic jacks 5 in operative connection between the top cross-head 2 and said reciprocable cross-head 4. The hydraulic jacks 5 are of any well known form of construction and comprise a base 6 affixed to the top cross-head 2, as by screws 7. The outer ends of piston-rods 8, of the jacks 5, are shown coupled to the cross-head 4, as through coupling members 9, 10 and 11, therefor provided, in operative arrangement. The cross-head 4 has a sliding fit upon the four standards 1 through the integral interconnecting guide members 12.

Another horizontal cross-head 13, of similar general construction to that of the cross-head 4, likewise has a sliding fit upon the four standards 1, through the integral interconnecting guide members 14. Said cross-head 13 normally rests upon the base support 3 of the frame F, but it may be raised, as by means of shims, or reciprocated, as by any well-known means, as herein disclosed, to suit the operating or working conditions of the machine.

A percussion producing device, herein shown and described as a pneumatic or steam-driven hammer H, and of any well known construction, is affixed by its base 15 to the top cross-head 2,

as by means of screws 16, for a purpose to be herein below described.

The lower cross-head 13 is provided with a work-table or upper deck 17 and a lower deck 18, horizontally disposed and shown integrally connected with the cross-head 13.

A row of square-shanked chisels 19, vertically disposed, are slidably fitted in holes 20 in the decks 17 and 18 and are arranged to reciprocate with respect to said decks. The chisels 19 are preferably equally spaced apart as shown.

Referring especially to Figures 1 and 2, each of said chisels 19 is shown independently spring-urged outwardly, with respect to its supporting decks 17 and 18, as by means of an encircling coiled spring 21, interposed between the lower deck 18 and a cross-pin 22 and washer 23 affixed to said chisel. Each of said chisels 19 is also independently, automatically and firmly held in its respective stone-cutting or breaking position against a slab of stone S placed upon the upper deck 18, as by means of said springs 21 and as by the additional means of a wedge 24, horizontally disposed and reciprocably arranged with respect to each of said chisels 19 and with respect to said cross-head 13. Each wedge 24 is slidably fitted in holes 25, equally spaced apart,—provided in wedge-supporting members 26 and 26', affixed to the cross-head 13, as by screws 27. Each wedge has a shank 24' which is also slidably fitted in holes 28,—also equally spaced apart,—provided in a channel-shaped wedge supporting and manipulating member 29. Each wedge 24 is shown as being spring-urged outwardly with respect to said channel member 29, and inwardly with respect to its cross-head as by means of an encircling coiled spring 30, interposed between the flange member 31 of channel 29 and a cross-pin 32 and washer 33 affixed to said shank 24'. The channel 29 is shown slidably arranged and adapted to be manually reciprocated horizontally with respect to said cross-head 13 and is operatively connected, as by means of bolts 35, to a pair of slotted arms 34, affixed to said cross-head through the member 26.

The upper reciprocable cross-head 4 is in most respects of identical construction to that shown and above described with respect to said lower cross-head 13, but the upper head 4 is shown inverted with respect to the lower cross-head 13.

The lower cross-head 13 is shown provided with belt conveyors 36 and 37, of any well known construction, for convenience in conveying the stone slabs S to the deck 17 on one side of the machine, and to carry the cut or broken pieces T away from the machine on the other side thereof, as fast as cut off from the slab. For this purpose, the lower cross-head 13 is shown provided with conveyor belts B and B' operating upon rollers 38, 38', respectively journaled in journal bearings 39, 39' affixed to said cross-head 13.

Referring to Figures 2, 3 and 4, the cross-heads 4 and 13 are each also shown provided with means for retracting or moving the row of chisels simultaneously away from the stone slab S as when the latter is being shifted upon the deck 17 as to a new cutting position, and said means is shown as comprising a pair of hand-operated levers 89, 89' in operative retracting connection with the chisels 19, through a horizontally disposed channel bar 40 reciprocably fitting upon the chisels 19, in holes 41 provided in said channel bar. Levers 89—89' are affixed to each end

of a rock-shaft 42, which is journaled in supports 43 affixed to each of the cross-heads 4 and 13. The channel bars 40 are each provided at their ends with trunnions 44, 44', operatively connected, respectively, to said hand levers 89, 89', in slots 45, 45' intermediate the ends of the levers.

The chisel-retracting hand-levers 89, 89' may be provided with ordinary, well-known ratchet and pawl elements 90, as illustrated in Figure 3 of the drawings in operative connection with the respective cross-heads 4 and 13, for convenience in holding the two opposing rows of chisels in a retracted position as while an uncut slab of stone S is being positioned upon the deck 17 of the machine prior to the breaking operation and while aligning the slab with respect to the rows of chisels at the desired breaking line.

When it is desired to cut the stone or other product having irregular faces, the operator will withdraw the chisel ends from their exposed positions above the decks, whereby the block is inserted therebetween. For example, by actuating one of the handles 89—89', the channel bars will cause compression of the springs, whereby the ends of all of the chisels will come in contact with the central solid bed portion of the cross head 4, which may be termed a hammer bed. However, before this manual operation of lifting the chisels, the operator will manually slide out the member 29 upon its support. This lateral movement of the wedges will withdraw the same from their interposed position between the hammer bed and ends of the wedges, as shown in Figure 2, to the position of the wedge as indicated in Figure 3. Hence, the wedges, which serve as blocks between the solid bed and ends of the chisels, are removed, leaving spaces. Either one of the handles 89—89', as previously stated, are then manipulated to lift the associated group of chisels until their ends abut the hammer bed. This movement thus causes the cutting ends of the chisels to recede to a position in approximate alignment with the supporting deck, it being understood that the lower deck serves as a base or bed for the reception of the slab to be cut.

In operation,—see especially Figures 1 and 2,—a stone slab S is conveyed, by said belt conveyor 36, to the deck 17 of the machine, next the two opposing rows of chisels 19 are retracted sufficiently to allow the slab S to rest upon said deck (Figure 3 shows the upper row of chisels in their fully retracted position). Next the slab S is positioned on the deck 17 on the desired cutting or breaking line of the slab, with respect to alignment with the two opposing rows of chisels, when the latter are released from their retracted positions to the positions shown in said Figures 1 and 2 with the cutting edges of the chisels each independently spring-urged against the irregular contour line of the slab at the desired breaking line. The slab S may be shimmed upon the deck 17 or otherwise held in place thereon by any convenient and well-known holding means not herein shown. Next, the upper reciprocable cross-head 4 is urged down toward the stationary cross-head, as with controlled hydraulic pressure exerted by the jacks 5, the pressure being distributed equally to each and all the chisels in the two opposing rows to put nearly a breaking pressure upon the slab S, when a sudden blow as by the percussion hammer H is delivered on the top centrally of the cross-head 4, which results in the shearing or breaking of the slab. The operation is repeated until the slab

S is all cut or broken up as desired. The cut stone blocks T are placed in turn, as fast as cut, upon the belt conveyor B', which carries the blocks away to the desired delivery point.

A machine, substantially as is herein shown and described, has already been constructed and fully tested by me and the same has been found to be highly efficient economical and better than any other heretofore produced for the purpose.

It will now be obvious that many changes and modifications may be made in the structure as is herein disclosed without departing from the essence or spirit of the invention defined in the following claims.

Furthermore, I desire it to be fully understood that, while I have herein shown and described the machine illustrating my invention as being vertically disposed or designed, it will be obvious that, with slight modifications, it may be designed to operate in a horizontal position, without departing from the scope of my invention defined in the following claims.

It should also be understood that both groups of chisels may be blow-actuated against the opposite faces of the stone, or other product.

I claim:

1. In a machine for breaking or dividing stone slabs, the combination of a frame, a stationary cross-head in operative connection with said frame, a reciprocable cross-head slidably connected to said frame, combined means in operative connection with the machine for reciprocating said reciprocable cross-head and for urging the same under pressure toward the stationary cross-head, a row of chisels operatively and reciprocably associated arranged and connected in opposed and aligned stone cutting relation in each of said cross-heads, means for urging each of said chisels independently of the others up to the desired cutting contour line of the stone slab to be cut, provisions operatively associated arranged and connected with each of said cross-heads for positively holding each of said chisels independently of the others up to the said desired cutting contour line of the stone slab during the cutting or breaking operation, and provisions operatively associated and arranged with respect to the machine for delivering a percussion impact upon the reciprocable cross-head.

2. In a machine for breaking or dividing stone slabs, the combination of a frame, a stationary cross-head in operative connection with said frame, a reciprocable cross-head slidably connected to said frame, a deck affixed to said stationary cross-head, combined means in operative connection with the machine for reciprocating said reciprocable cross-head and for urging the same under pressure toward the stationary cross-head, a row of chisels operatively and reciprocably associated arranged and connected in opposed and aligned stone cutting relation in each of said cross-heads, means for urging each of said chisels independently of the others up to the desired cutting contour line of the stone slab to be cut, provisions operatively associated arranged and connected with each of said cross-heads for positively holding each of said chisels independently of the others up to the desired cutting contour line of the stone slab during the stone cutting or breaking operation, and provisions operatively associated and arranged with respect to the machine for delivering a percussion impact upon the reciprocable cross-head.

3. In a machine for breaking or dividing stone slabs, the combination of a frame, a stationary

cross-head in operative connection with said frame, a reciprocable cross-head slidably connected to said frame, combined means in operative connection with the machine for reciprocating said reciprocable cross-head and for urging the same under pressure toward the said stationary cross-head, a row of chisels operatively and reciprocably associated arranged and connected in opposed and aligned stone cutting relation in each of said cross-heads, means for urging each of said chisels independently of the others up to the desired cutting contour line of the stone slab to be cut, provisions operatively associated arranged and connected with each of said cross-heads for positively holding each of said chisels independently of the others up to the said desired cutting contour line of the stone slab during the stone cutting or breaking operation, provisions operatively associated and arranged with respect to the machine for delivering a percussion impact upon the reciprocable cross-head, and means operatively associated arranged and connected with each of said cross-heads to retract each row of chisels away from said stone cutting position.

4. In a machine for breaking or dividing stone slabs, the combination of a frame, a stationary cross-head in operative connection with said frame, a reciprocable cross-head slidably connected to said frame, combined means in operative connection with the machine for reciprocating said reciprocable cross-head and for urging the same under pressure toward the said stationary cross-head, a row of chisels operatively and reciprocably associated arranged and connected in opposed and aligned stone cutting relation in each of said cross-heads, means for urging each of said chisels independently of the others up to the desired cutting contour line of the stone slab to be cut, provisions operatively associated arranged and connected with each of said cross-heads for positively holding each of said chisels independently of the others up to the desired cutting contour line of the stone slab during the stone cutting or breaking operation, provisions operatively associated and arranged with respect to the machine for delivering a percussion impact upon the reciprocable cross-head, and stone conveying and delivering provisions conveying toward and away from the machine, respectively, operatively associated arranged and connected therewith.

5. In a machine for breaking or dividing stone slabs, the combination of a frame, a stationary cross-head in operative connection with said frame, a reciprocable cross-head slidably connected to said frame, a deck affixed to said stationary cross-head, combined means in operative connection with the machine for reciprocating said reciprocable cross-head and for urging the same under pressure toward the stationary cross-head, a row of chisels operatively and reciprocably associated arranged and connected in opposed and aligned stone cutting relation in each of said cross-heads, means for urging each of said chisels independently of the others up to the desired cutting contour line of the stone slab to be cut, provisions operatively associated arranged and connected with each of said cross-heads for positively holding each of said chisels independently of the others up to the desired cutting contour line of the stone slab during the stone cutting or breaking operation, provisions operatively associated and arranged with respect to the machine for delivering a percussion

impact upon the reciprocable cross-head, means operatively associated arranged and connected with each of said cross-heads for retracting each row of chisels away from said stone cutting position, and stone conveying and delivering provisions conveying toward and away from the machine, respectively, operatively associated and arranged with respect to the machine.

6. In a machine for breaking or dividing stone slabs, the combination of a frame, a stationary cross-head in operative connection with said frame, a reciprocable cross-head slidably connected to said frame, a deck affixed to said stationary cross-head, combined means including hydraulic jacks in operative connection with the machine for reciprocating said reciprocable cross-head and for urging the same under pressure toward the stationary cross-head, a row of chisels operatively associated arranged and connected in opposed and aligned stone cutting relation in each of said cross-heads, means including a spring for urging each of said chisels independently of the others up to the desired cutting contour line of the stone slab to be cut, provisions including a wedge operatively associated arranged

and connected with each of said cross-heads for holding each of said chisels independently of the others up to the desired cutting contour line of the stone slab during the stone cutting or breaking operation, means including a spring for urging each of said wedges independently of the others up under the shank-end of each chisel, provisions operatively associated and arranged with respect to the machine for delivering a percussion impact upon the reciprocable cross-head, and means operatively associated arranged and connected with each of said cross-heads for retracting each row of chisels away from said stone cutting position.

7. In a machine for dividing slabs, a frame, a hammer bed reciprocatively mounted thereon, and a slab-supporting base; the combination therewith of a gang of spring-urged chisels carried by the reciprocated bed, a like group of spring-urged wedges adapted to be interposed between the chisels and hammer bed, and means for shifting the wedges clear from their blocking engagement between the chisels and hammer bed.

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