H. J. FLETCHER.
HAMMER SAW OR LINE HAMMER.
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4 SHEETS—SHEET 1.

INVENTOR
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ATTORNEYS
To all whom it may concern:

Be it known that I, HENRY J. FLETCHER, of Brainer, Minnesota, have invented a new and improved hammer-saw or line-hammer, of which the following is a specification.

My invention primarily has for its object to provide a new and improved stone cutting means in which the cutting elements are in the nature of hammer saws or line hammers that operate along one or more straight lines, depending on the number of blades used, until the cut or cuts are made clear through the stone, thereby performing, as it were, the same kind of task as is required in the use of stone saws, particularly gang saws.

My invention also has for its purpose to provide an improved construction of stone cutting machine of the hammer saw type, that is, of a comparatively simple and economical form, in which the parts are especially designed and cooperatively combined for hammer cutting the stone in a rapid and effective manner.

Another object of my invention is to provide an improved construction of hammer saw or line hammer that is especially adapted for rendering quicker and more economical service than is possible in that type of stone cutting machines whose efficiency does not depend upon short and rapid or short or rapid strokes or blows, during the application of the cutting elements against the stone being lined.

Another and essential feature of my invention is embodied in an improved means for suspending the cutting elements and the power driving mechanism above the stone to be worked, whereby to provide for an automatic feed or lowering of the cutting elements and the power mechanism in vertical direction as the line cut or cuts are being made, the said means including a substantially counterbalanced vertically sliding frame upon which the cutting elements and the driving power therefore are mounted and whereby the weight of the cutting elements, the power mechanism and their connections is utilized for regulating the weight of the hammering blows of the cutting elements as they constantly gravitate into the line or cuts made thereby and which extend from the top face of the stone being worked.

Again, my invention includes an improved construction and arrangement of the elements that make the cuts or lines down through the stone, and devices that impart such movement of the hammering or stone impacting members, whereby to constantly discharge the slush or dust over one end of the line or lines being cut; an improved means for governing the length of the stroke or hammering blows being also present in my construction of stone cutting machine.

In the general or structural arrangement of the parts that constitute my improved stone sawing machine, is a compact assemblage of the framing and a power mechanism capable of four different adjustments that may be collectively utilized, or one of the four adjustments of such transmission used at a time.

In its more complete nature, my invention includes an improved construction of line hammer that comprises a blade to which the line of cutters are so secured that the sharp cutting edges are constantly maintained during the operation of cutting the line, an improved means cooperatively connected with the series of line hammers also being provided for imparting movement to the hammer blade in a substantially circular path and in which the blade connection is sufficiently flexible to withstand the shock and jars incident during hammering blows, and the cutting elements held from becoming disarranged or out of proper relation with the power and transmission means.

With other objects in view that will hereinafter be explained, my invention consists in certain subordinate details of construction and peculiar combination of parts, all of which will be explained in the following description of the construction, specifically pointed out in the appended claims and illustrated in the accompanying drawings, in which:

Figure 1 is a front elevation of my improved stone cutting machine, the same being shown as operatively mounted over a stone carriage or rollway, the cutter carrying the hammer head being shown as elevated from the work.

Fig. 2 is a vertical section thereof taken...
Referring now more particularly to Figs. 2 and 3, it will be seen that on a bracket 27, secured in any suitable manner to the upright 28, is mounted power mechanism, preferably an air motor 5, as shown, whose driving shaft pulley transmits, through a belt drive 58, power to a pulley 32 fixedly mounted on a short driving shaft 32 that is journaled in a suitable bearing on one end of the beam 27 and whose inner end carries one part of a coupling device, the peculiar construction of which, best shown in Figs. 7 and 8, will be hereinafter fully described.

It should be stated, that in the construction shown in the drawings, an oppositely disposed pair of the said coupling devices is located adjacent each pair of the uprights 28—30 and 29—31 and each of the said oppositely disposed pairs of coupling devices cooperate with an operating shaft that constitutes a part of the hammer or cutter elements actuating mechanism before referred to.

The opposite sets of coupling devices and their operating shafts work in unison and for such purpose each pair of pulleys 32a, at the opposite sides, are joined by a link rod 53 whose ends connect with cranks 32b—32c on the pulleys 32a—32b, as shown. Since the hammer or cutting elements actuating means at each end of the vertically movable carriage frame operate alike, a detailed description of such means at one end of the carriage, will apply for both of the said means.

Referring more particularly to Figs. 2, 4, 5 and 6, 36 designates a shaft, on each end of which is fixedly attached a disk 35. Each of the disks 35 forms a part of the coupling devices that connect the said shaft with the driving shaft 32, at one end and a corresponding shaft 32 mounted on the opposite beam 26 and in alinement with the other shaft 32.

Each of the shafts 32—32 carries a disk 39 and each of the disks 39 has an eccentric connection with its adjacent disk 35 on the opposite ends of the shaft 36, it being understood that the disks 39—39 are fixedly mounted on the shafts 32—32 and the disks 35 are likewise mounted on their respective shafts 36—36. The disks of each operating pair 35—39, are of like diameter and the two disks are pivotally joined by an eccentric or crank pin 39a.

Each of the disks 39 that are fixedly mounted on the ends of their respective operating or eccentric shafts 36 is adjustably attached to its corresponding disk 39 secured upon the said shaft 32, by a bolt 37 that passes through an eccentric slot 38, in the said opposing disk 39, as is clearly shown in Figs. 6, 7, and 8.

For holding the cutter blades or the cutter carrying members braced against sidewise...
buckling or disarrangement, grid plates 50–50 are provided and they are adjustably attached to the cross beams 24–25, the said beams having horizontally elongated slots 51–51, for receiving the adjusting bolts 52–52 that clamp the grid or guide plates 50 in the desired position.

For cutting certain grades of stone the cutting elements are a series of plain plates 75, arranged as shown in Figs. 3 and 6, are used, but for the harder grade of stone, granite for example, the cutting elements consist of a series of cutter carrying members, preferably flat plates, similar to the plates before referred to and they are attached at their opposite ends to the shafts 36–36 in the same manner as the plates are attached as shown in Figs. 4, 5 and 6.

When the plates, designated 75, are used, Figs. 1 and 2, a series of hard steel cutters 76 are attached to the lower edge of each of the plates and the said cutters are so mounted on the said lower edge that continued use thereof tends to hold them firmly wedged and locked on the said plate edges.

For such purpose, the cutters, 76 are shaped as shown in detail in Fig. 10, which illustrates the upper or body portion of the cutter bifurcated as at 76a.

In practice, the cutters are assembled in close relation along the bottom edge of the plate 75 and the entire series of cutters along the said bottom edge are held separated by spacers 77 of soft steel and the body portions of the said spacers are also bifurcated as at 77a to readily slip over the lower edge of the plates, as shown.

All of the cutters and the spacers are held in a clamped relation along the lower edge of the plate 75 and the complete series of such cutters and spacers are firmly clamped into position between a recessed rest member 78, which attaches to the lower edge of the plate, near one end thereof, by a bolt or rivet 79 which passes through the said member 78 and the plate 75 and a clamping member 80, which is also bifurcated to fit onto the lower edge of the plate 75 and to which it is secured by a bolt or rivet 81.

82 designates an adjusting bolt which passes through the base of the clamping member and engages the adjacent spacer plate for clamping all of the plates and the cutters firmly in place.

In practice, after the cutters and spacers are applied onto the lower edge of the plate 75, the operator by using any suitable tool, a pair of pliers for instance, holds the cutters in position on the bottom edge of the plate 75, it being understood that a few blows of the cutters against the face of the stone will tend to wedge them tightly in place, this being made possible by reason of having the spacers of a softer metal than that of the cutters, since the softer metal spacers tend to wear away first and spread and in consequence the cutting faces of the cutters always remain in condition for properly engaging with the face of the stone being dressed.

By reason of the peculiarly constructed connecting devices that join the power driven shafts 32–32, with the eccentric shaft members 36–36, the said devices act as variable shiftable throw eccentrics, which through their connections with the opposite ends of the blades or cutter carrying members 75, operate to impart a substantially circular shifting motion to the blades in vertical direction to thereby cause the said blades, with their cutters, to operate as a hammering saw for impacting with the stone along definite lines or cuts.

This feature of my invention will be readily understood by referring to Figs. 6 and 8 of the drawings and, assuming the disks 39 to be rotating in the direction of the arrows 2, the movement of the blade 75 continues upwardly and outwardly to the dotted position 9, which is the now highest lifting point of the blade, it being understood that as the rotation of the coupled members 35–39 continues, the blade 75 will be moved downwardly and forwardly within the cut or line made with the stone to effect the hammer sawing operation at the face of the cut.

The length of the hammering stroke of the blade and consequent force of the blows, is governed by the character of the stone being cut.

For the softer grades, where only short and rapid strokes are required, the disks 35–39 may be assembled so that the axes of the shafts 32–32 and the corresponding operating shaft members 36 are but slightly out of alinement (that is the members 36 being eccentically disposed) as in Fig. 8.

When working the harder grades of stone, where rapid and long hammering strokes are required, the disks 35–39 may be adjusted with the axes of the shafts 32–32 and the corresponding operating shafts 36 considerably out of alinement or eccentric, as shown in Fig. 7.

By reason of the peculiar construction of the means for adjustably connecting the disks 35–39, when set for giving the blades the desired length of stroke, the said disks are rigidly joined, and hence a positive and circular movement is imparted to the hammering blades, which movement is broken only when the blades come into contact with the stone, which occurs once at every revolution at the bottom of the described circle, and at the time the blades come into contact 125 with the stone.

To provide for taking up jar and the force of the rebound and the impact of the
blades, the said blades are flexibly connected with the shafts 36—36 at the opposite ends thereof, in the manner clearly illustrated in detail in Figs. 4 and 5 of the drawings.

By referring to the aforesaid Figs. 4 and 5, it will be observed that each end of the blade 75 has pivoted hooks 40 that engage with a pair of upper and lower rods 41—41 which are supported in the eyes of bolts 42—42 which latter are supported for yieldable movement in the direction of their length, in the upper and lower ends of brackets 43—43, a pair of which is clamped upon each eccentric or operating shaft 36—36.

Each of the said brackets comprises two half sections and these are secured together in the manner shown in Fig. 5 and each is provided with an aperture 44 at the upper and lower ends through which the shanks of the upper and lower eye bolts pass.

The outer or free ends of the bolts 42 have a cushion bearing connection with the brackets and for such purpose the outer face of one bearing section has a seat 45.

A stout coil spring 55 is mounted around the outer or free end of each of the eye bolts 42 and at one end the spring seats in the seat 45 in the face of the bracket and at the other end it engages a cup sleeve 47 that is slidable mounted upon the threaded bolt end 48 and which is shiftable along the bolt by an adjusting nut 49 that engages the bolt as shown. By connecting the cutter blade to the shaft 36—36 in the manner stated and shown, the connection between the cutter blades and the shaft 36 is sufficiently rigid to cause the blades to take the circular path as the shafts 36 are driven in such direction owing to their eccentric connection with the driving shafts 32—32, as stated and shown, the flexibility of the mount for the blade being sufficient to permit the necessary rebound as the blades contact with the stone and for taking up the jars and vibrations incident in the rapid strokes of the hammering saw.

From the foregoing description taken in connection with the accompanying drawings, the complete construction, the general operation and the advantages of my invention will be apparent to those skilled in the art to which my said invention relates.

By providing a carriage or frame that is vertically movable on a main frame and sustaining the said carriage by an overhead adjustable counterbalancing means, a simple and effective provision is made for adjusting the carriage up or down relatively to the face of the stone to be cut.

In my construction, since the carriage and the driving power sustained thereon are flexibly supported from overhead, on the main frame, the shocks or jars incident in the hammering or blows of the cutting elements are held from disarranging the power and transmission means.

It is to be noted that in my construction of stone cutting machine, the entire operating device, the motor, the hammer head, the means for intermittently actuating the hammer or cutting elements, the means for imparting vibratory motion to the cutters, as also the guides for holding the individual cutters in their properly set positions, are all sustained by an overhead counterbalanced line support.

The hammering action or blows of the cutting elements is explained as follows:

After the line or channel in the stone surface has begun, as stated, all downward pressure on the rope or counterbalance by the operator is released, after which the weight of the said suspended or inside frame, together with the cutter blade connections and the power devices, causes the cutter elements to continue to follow down into the line or channel made in the stone, it being understood the weight or force of the blows imparted to the stone is dependent upon the weight of the suspended frame, plus the mounting, the cutters, power devices, &c., and assuming the combined weight of the parts stated to be twenty-five pounds, then each hammering blow of the cutters is backed by twenty-five pounds force.

What I claim is:

1. In a machine of the character described, a suitable overhead frame, a counterbalanced frame mounted upon the overhead frame and having vertical movement with respect to the said overhead frame, and means for channeling the stone, the said means comprising a cutting member mounted upon the counterbalanced frame, and devices mounted upon the said counterbalanced frame for imparting simultaneous longitudinal and vertical movement to the channeling member, whereby to cause the said member to impart rapid hammering blows against the stone.

2. In a machine of the character described, the combination with a suitable overhead frame and a counterbalanced frame mounted upon the overhead frame and having vertical movement with respect to the overhead frame, of a means for cutting the stone in a straight line the said means comprising a cutting member suspended from the counterbalanced frame, and power transmission mechanism carried on the counterbalanced frame for imparting a substantially circular motion to the cutting member in vertical plane for imparting rapid hammering blows against the stone, the said power transmission mechanism including means flexibly connecting the cutting member and the transmission mechanism whereby to take up the rebound of the cutting member as it engages the stone under rapid hammering like blows.
3. In a machine of the character described, the combination with a suitable overhead frame; of a means for cutting the stone in a straight line, the said means comprising:

5. ing a cutting member suspended from the overhead frame, power transmission mechanism for imparting a substantially circular motion to the cutting member in vertical direction whereby to impart rapid hammering blows against the stone, the said power transmission mechanism including means oppositely disposed and aligned power driven shafts, other oppositely disposed shaft sections by which the cutting elements are supported and eccentric devices that join the adjacent ends of the several driven and eccentric shaft portions.

4. In a machine of the character described, an overhead frame, a counterbalanced frame mounted upon and having vertical yieldable movement with respect to the overhead frame, means for cutting a dividing line across the stone, the said means including a cutting element and a power mechanism connected with the cutting element, the latter and the power mechanism being supported on and movable with the yieldable counterbalanced frame, the said power mechanism including devices for imparting rapid hammering strokes to the cutting element.

5. In a machine of the character described, a suitable overhead frame and a supplemental frame vertically movable within the overhead frame, means for counterbalancing the said supplemental frame, means for cutting a dividing line across the stone, the said means including a cutting element and a power mechanism connected with the cutting element adapted for imparting intermittent hammering strokes to the said element, the cutting element being supported upon and movable with the vertically movable frame, said power mechanism including transmission devices adapted for imparting irregular motion to the face of the cutting elements as it being vertically shifted for effecting its hammering blows.

6. In a stone cutting machine, an overhead support, a counterbalanced frame hung from the overhead support and having vertical adjustment, means for making line cuts across the stone, the said means including a plurality of spaced blades, grids on the counterbalanced frame in which the ends of the blades are actuated, a power mechanism mounted on the said frame, power transmission that connects the said mechanism with the cutting blades, the said transmission comprising a pair of driven shaft sections and a supplemental shaft section for each of the driven shaft sections, the said supplemental shafts constituting the supports for the cutting blades, and connections that join the said pair of driven shaft sections and their respective supplemental shaft sections.

7. In a stone cutting machine, an overhead support, a counterbalanced frame hung from the overhead support and having vertical adjustment and a stone supporting carriage, means for making line cuts across the stone, the said means including a plurality of spaced blades, grids on the counterbalanced frame in which the ends of the blades are actuated, a power mechanism mounted on the said frame, power transmission that connects the said mechanism with the cutting blades, the said transmission comprising a pair of driven shaft sections and a supplemental shaft section for each of the driven shaft sections, the said supplemental shafts constituting the supports for the cutting blades and connections that join the said pair of driven shaft sections and their respective supplemental shaft sections.

8. In a stone cutting machine, an overhead support, a counterbalanced frame hung from the overhead support and having vertical adjustment and a stone supporting carriage, means for making line cuts across the stone, the said means including a plurality of spaced blades, grids on the counterbalanced frame in which the ends of the blades are actuated, a power mechanism mounted on the said frame, power transmission that connects the said mechanism with the cutting blades, the said transmission comprising a pair of driven shaft sections and a supplemental shaft section for each of the driven shaft sections, the said supplemental shafts constituting the supports for the cutting blades and the connections that join the said pair of driven shaft sections and their respective supplemental shaft sections, including adjustable members that control the extent of the combined vertical and reciprocable movements of the supplemental shafts for increasing or diminishing the stroke of the cutting blades.

9. In a stone cutting machine, an overhead support, a counterbalanced frame hung from the overhead support and having vertical adjustment and a stone supporting carriage, means for making line cuts across the stone, the said means including a plurality of spaced blades, grids on the counterbalanced frame in which the ends of the blades are actuated, a power mechanism mounted on the said frame, power transmission that connects the said mechanism with the cutting blades, the said transmission comprising an opposite pair of driven shaft sections and a supplemental shaft section for each of the driven shaft sections, the said supplemental shaft constituting the support for the cutting blades and connections that join the said pair of driven shaft sections and their respective supplemental shaft section whereby to impart an irregular motion to the said supplemental shaft, and means for flexibly connecting the cutting blades with the supplemental shafts for taking up the rebound of the hammering strokes of the cutter blades.

10. In a machine of the character described, an overhead frame, a counterbalanced supplemental frame hung from the
said overhead frame, a mechanism for cutting a dividing line across the stone, the said mechanism including a cutting element and power devices connected with the said cutting element and adapted for imparting rapid hammering strokes to the said element, the said cutting mechanism and the power mechanism being supported upon the supplemental frame and tending, by reason of their weight, to constantly cause the supplemental frame to gravitate to cause the cutting element to follow the cut as it is being made in the stone.

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