D. B. SALSTROM.

CARVING MACHINE.

APPLICATION FILED APR. 28, 1910.

1,013,618.

Patented Jan. 2, 1912.

2 SHEETS—SHEET 1.

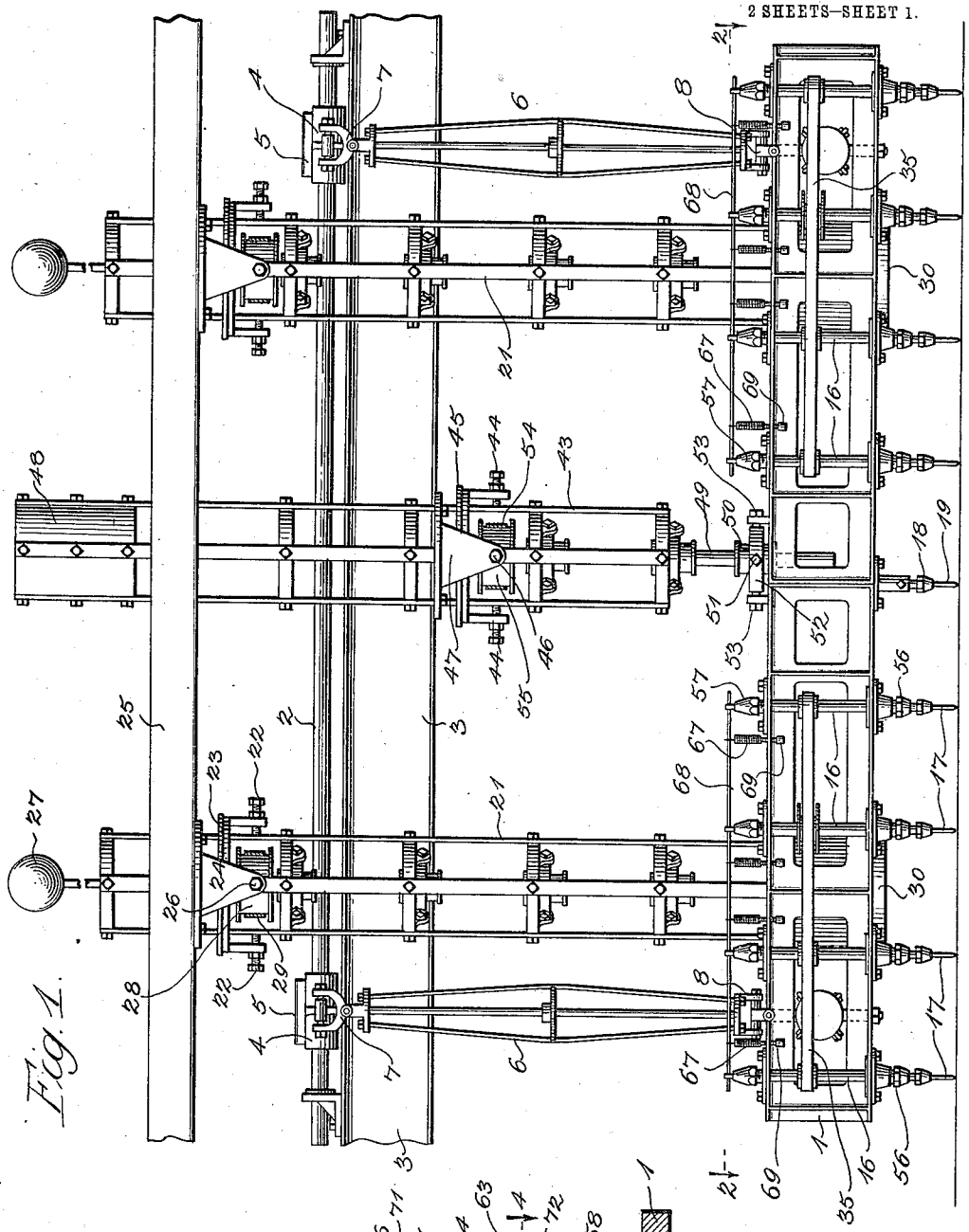

Fig. 1.

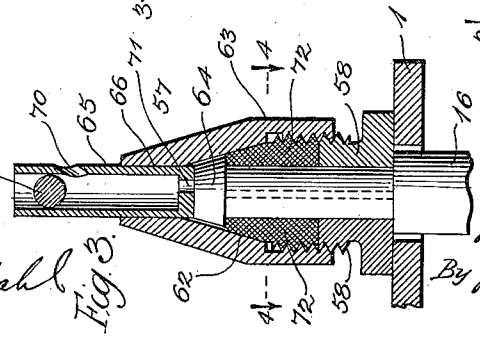

Fig. 3.

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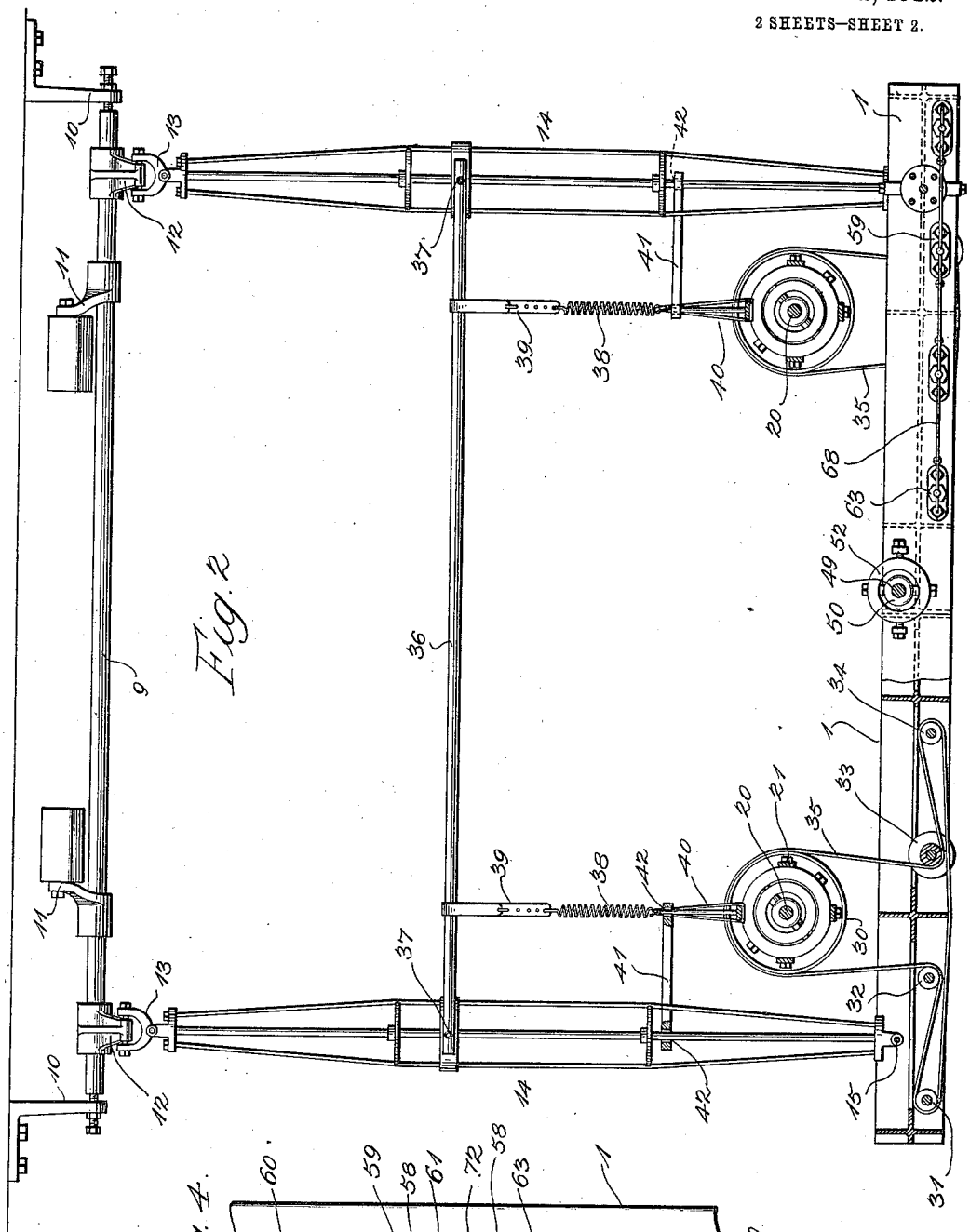

Fig. 2.

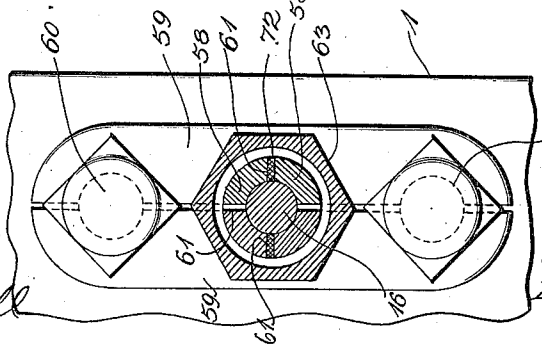

Fig. 4.

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UNITED STATES PATENT OFFICE.

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CARVING-MACHINE.

1,013,618. Specification of Letters Patent. Patented Jan. 2, 1912.

Application filed April 28, 1910. Serial No. 558,215.

To all whom it may concern:

Be it known that I, DAVID B. SALSTROM, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Carving-Machines, of which the following is a specification.

This invention relates to carving machines, and particularly to that type of carving machine in which the tool spindles are mounted in a head which is supported so that it may be moved up and down, back and forth, and laterally.

It is highly desirable that vibration of the tools be eliminated or reduced to a minimum, since such vibration gives the work a rough or pitted appearance, and it is one of the objects of this invention to prevent vibration of the tools. I have discovered that vibration of the tools can be substantially eliminated by so supporting the tool-driver that it has no positive connection with the spindle carrying head. A head carrying a suitable number of spindles is quite heavy, and when it becomes necessary for the operator to move the head some distance out from under the points of support of the head considerable exertion is required to hold the head in such position.

One of the objects of this invention is to provide means for counterbalancing the weight of the head when it is so displaced.

In the accompanying drawings, Figure 1 is a front elevation of a carving machine embodying the features of my invention, the work-supporting table being omitted. Fig. 2 is a horizontal sectional view taken in the plane of dotted line 2 2 of Fig. 1. Fig. 3 is a sectional view illustrating an improved form of spindle bearing. Fig. 4 is a section on line 4 4 of Fig. 3.

The spindle-carrying head 1 is supported, in this instance, by means comprising a rock shaft 2, which shaft in turn is carried by a beam or other suitable fixed support 3. Rigidly mounted upon the shaft 2 are two levers 4 carrying counterbalancing weights 5 at their rear ends, and connected at their front ends to links 6. Each lever 4 is connected to its link 6 by means of a universal joint 7 of any suitable construction permitting the link to swing back and forth and from side to side. The lower ends of the links 6 are connected to the spindle-carrying head 1 by means of universal joints 8 of suitable form. It will be seen that the head 1 may be moved up and down, from side to side, and forwardly and rearwardly.

In order to maintain the head 1 in parallelism with the rock shaft 2, I provide suitable means such as a rock shaft 9 (Fig. 2), mounted in stationary bearings 10, said shaft having fixed thereto weighted arms 11 and a pair of arms 12. The arms 12 are connected by means of universal joints 13 with the rear ends of links 14, the forward ends of which links are pivoted, as at 15, to the end portions of the head 1. It will be seen that the shaft 9, arms 12, and links 14 equalize the movement of the ends of the head 1 so as to maintain said head in parallelism with the shafts 2 and 9.

Mounted in the head 1 is any suitable or desirable number of spindles 16 provided at their lower ends with chucks to receive the carving tools 17. At a suitable point upon the head 1, as, for example, near the middle portion thereof, is mounted a chuck 18 to receive a tracer 19. In this instance, the head is provided with eight spindles divided into two groups of four spindles each. As shown in Fig. 2, the spindles are arranged in alinement with each other. For each group of spindles independent driving means is provided, and in this instance, each group is driven by a single driver or driving means. Said driver is located outside of the spindle-carrying head and is flexibly or resiliently connected to said head so that as little vibration as possible shall be transmitted from the driver to the head or spindles.

In the present embodiment, the driving means comprises a shaft 20 supported in a substantially vertical position in a frame 21. The upper end of this frame is pivoted at 22 in a gimbal ring 23, said ring in turn being pivoted upon an axis extending at right angles to the axis of the pivots 22 in hangers 24 fixed to a suitable stationary support 25. The pivots for the frame 23 are indicated at 26. The upper end of the frame 21 extends upwardly past the gimbal bearing just described, and to said upper end is fixed a suitable counterbalance weight 27. It will be seen that the frame 21 carrying the shaft 20 is free to swing back and forth and from side to side by reason of its gimbal support.

The shaft 20 may be rotated by any suitable means. I have herein shown a pulley 28 fixed to the upper end of the shaft 20 and receiving a drive belt 29. Said belt transmits power to the machine from a countershaft (not shown) or other suitable source. To the lower end of the shaft 20 is fixed a drum or pulley 30. Upon the spindles 16 are fixed pulleys 31, 32, 33, and 34. The pulleys 31, 32 and 34 may be plain band wheels, but the pulley 33 is preferably provided with top and bottom flanges to retain the drive belt 35 thereon. This belt extends from the drum 30, around the pulley 33, to the pulley 34, thence to the pulley 31, thence to the pulley 32, and thence to the drum 30. It will be observed that the drum 30 is not mounted for vertical movement, but said drum is of sufficient length so that the belt 35 remains thereon as the head is moved up and down.

The frame 21 is connected to move laterally and backward and forward with the head 1, the connecting means being of such character as to transmit substantially no vibration from the shaft 20 to the head 1. In the construction herein shown, I provide a rod 36 pivoted at 37 to the links 14. A spring 38 is connected at one end to the rod 36 by means of an adjustable strap 39, and at its other end is connected to the lower part of the frame 21 by means of the connection 40. It will be seen that the spring 38 tends to move the frame 21 in the direction to take up slack in the belt 35 and thus maintain said belt at proper driving tension. Special means for taking up slack in the belt is thus rendered unnecessary. The tension of the belt may be adjusted by means of the adjustable strap 39. The parts 35, 36, 38, 39 and 40 cause the frame 21 to swing backward and forward with the head 1. To cause the frame 21 to follow the head in its lateral movements, I provide a spacing and connecting member 41 which is connected at its ends with the link 14 and the connector 40. The member 41 has openings 42 therein through which the connector 40 and one of the members of the link 14 extend, said opening being large enough to afford the desired flexibility.

By the arrangement just described, the driver 30 is connected with the head 1 so as to move therewith, but the connecting devices are flexible and resilient so as to prevent the transmission of vibration from the driver to the head. I have avoided a rigid construction, since such a construction readily transmits vibration from one part to another.

Referring to Fig. 1: it will be understood that gravity causes the head 1 to hang directly below its points of support at the ends of the arms 4, and that when the operator moves the head, say, to the right or left, or front or rear, the weight of the head and parts connected to it tends to cause the head to return to its normal position. To hold the head for some time in a position other than its normal position requires considerable exertion on the part of the operator. To relieve the operator of this burden, I provide a counterbalancing means, which consists, in this instance, of a frame 43 arranged in a substantially upright position and pivoted between its ends at 44 to a gimbal ring 45. Said ring in turn is pivoted at 46 to hangers 47, fixed to the beam 3 or any other suitable support. It will be seen that the frame 43 is free to swing backward and forward and from side to side. The upper end of the frame 43 carries a counterbalance 48 of any suitable construction. In the lower part of the frame 42 is mounted a shaft 49 which extends through a bearing 50, said bearing being pivoted at 51 in a gimbal ring 52, said ring being pivoted at 53 to the head 1. The shaft 49 is slidable and rotatable in its bearing 50 and said bearing is free to rock because of its universal connection with the head 1. When the head 1 hangs freely from its points of suspension, the weighted frame 42 is substantially vertical and is in substantial equilibrium. When the operator moves the head, say, to the right, the weight 48 is moved to the left of its pivotal support 46 and counterbalances the head.

In order that the parts 49 and 50 shall slide as freely as possible upon each other, means is provided for keeping one of them in constant rotation. Herein I have shown the shaft 49 as rotated by a belt 54 extending about a pulley 55 on the shaft 49 and driven from a countershaft (not shown) or other suitable source of power.

Each spindle 16 is mounted so as to run without lateral or longitudinal vibration in its bearings. The lower bearing 56 may be of any suitable form, as, for example, that illustrated in my copending application Serial No. 400,510, filed November 4, 1907. The upper bearing 57 is preferably constructed as shown in Figs. 3 and 4. The upper part of the spindle is rotatably held between two similar members 58 having attaching flanges 59. Said members are secured to the head 1 by screws 60. The members 58 are slotted as at 61 to render them compressible. The upper end 62 of the members 58 is conical and the portion below said conical part is externally screw-threaded to receive a nut 63, which has a conical inner surface to contact the conical portion 62. It will be seen that when the nut 63 is tightened, the slotted portion of the members 58 will be compressed upon the spindle to hold the upper end thereof against lateral play or vibration.

To prevent longitudinal play of the spin-

dle, a head 64 is formed on the upper end of said spindle, which head rests upon the upper end of the members 58. The head 64 is held against its seat by a pin 65 which is mounted in an opening 66 formed in the upper end of the nut 63, said pin being acted upon by a spring 67. A rod 68 is extended through a plurality of adjacent pins 65, and one or more springs 67 are attached to said rod and anchored to the head. The anchoring means may be a screw 69 so as to permit of adjusting the tension of the spring. The latter holds the spindle head 64 firmly against its seat and thus prevents endwise play of the spindle.

Lubricant may be supplied to the bearing 57 by making the pin 65 tubular, as shown, and by providing an inlet opening 70 and an outlet opening 71. Said outlet is in the lower end of the pin 65 and is preferably eccentric to the pin so that the rotation of the spindle will distribute the lubricant. Strips of felt 72 or the like may be placed in the slots of the members 58 to hold lubricant.

In operation, the operator moves the tracer 19 over the surface of the pattern, thereby causing the tools 17 to cut similar surfaces upon the pieces of work located below said tools. The spindle drivers 30 being free from positive connection with the head, a minimum amount of vibration is transmitted from the shafts 20 to the spindles. As the head is moved to carry the tracer over the pattern, the weight 48 counteracts the tendency of the head to gravitate into its normal position.

It will be understood that so far as the connection between the head and the drivers is concerned, the head might be supported in other ways than that herein shown.

Various changes may be made in the present embodiment without departing from the spirit of the invention.

I claim as my invention:

1. In a carving machine, a movable supported head, spindles in said head, a driver located outside of said head and having driving connection with said spindles, and a yielding connection between the driver and the head to cause the former to follow the head in its movements.

2. In a carving machine, a movably supported head, spindles in said head, a movably supported drive pulley located outside of said head, belt connection between the drive pulley and the spindles, said connection causing said pulley to follow the head when the latter moves in one direction, and yielding means for causing said pulley to follow the head when the latter moves in another direction.

3. In a carving machine, a movably supported head, spindles in said head, a movably supported drive pulley, belt connection between the drive pulley and the spindles, said connection causing said pulley to follow the head when the latter moves in one direction, and means for causing the pulley to follow the head when the latter moves in the opposite direction, said means including a spring tending to move the pulley away from the head and taking up slack in said belt connection.

4. In a carving machine, a head supported for lateral and forward and backward movement, spindles in said head, a movably supported drive pulley, belt connection between the pulley and the spindles, said connection causing said pulley to follow the head when the latter moves forwardly, means including a spring for causing the pulley to follow the head when the latter moves rearwardly, and means for causing the pulley to follow the head when the latter moves laterally.

5. In a carving machine, a head supported for forward and backward movement, spindles in said head, a drive pulley having belt connection with the spindles, said belt connection causing the pulley to follow the head when the latter moves forwardly, and means for causing the pulley to follow the head when the latter moves rearwardly, said means including a spring tending to move the pulley away from the spindles and serving to take up slack in the belt connection.

6. In a carving machine, a head supported for forward and backward movement, means for equalizing the movement of the ends of said head, said means including a link attached to said head, spindles in said head, a driver having a driving connection with the spindles, and means for causing the driver to move with the head, said means comprising a spring attached at its forward end to the driver and means for connecting the rear end of the spring to the link.

7. In a carving machine, a movably-supported head, means for equalizing certain movements of the head, said means including a link attached to the head, spindles in the head, a driver having a driving connection with the spindles, and means for causing the driver to move with the head, said means comprising a spring attached at its forward end to the driver, means for attaching the rear end of the spring to the link and means for connecting the forward part of the spring to and for spacing it from the link.

8. In a carving machine, a movably supported head, a rock shaft, arms fixed on said shaft, links connecting the ends of the head to the arms, two groups of spindles in said head, a driver for each group of spindles, a driving connection between each driver and its spindles, a member attached to and extending between said links, and tension springs attached to said member and to the

drivers, said springs exerting their tension against said driving connections.

9. In a carving machine, a movably supported head, a rock shaft, arms fixed on said shaft, links connecting the ends of the head to the arms, two groups of spindles in said head, a driver for each group of spindles, a driving connection between each driver and its spindles, a member attached to and extending between said links, tension springs attached to said member and to the drivers, said springs exerting their tension against said driving connections, and means extending between the springs and the links and serving to space the drivers from the links.

10. In a carving machine, a movably supported head, spindles in said head, a spindle driver located rearwardly of and outside of said head and free from positive connection with said head, a driving connection between the spindles and the driver, and yielding means for spacing the driver from the head and for causing the driver to move with the head.

11. In a carving machine, a spindle-carrying head, means for movably suspending said head, and means for counterbalancing the head when the latter is swung out from a point directly beneath the suspending means.

12. In a carving machine, a spindle-carrying head, means for suspending said head for vertical, lateral and forward and backward movement, and means for counterbalancing the head when the latter is swung laterally, backward or forward.

13. In a carving machine, a spindle-carrying head, means for movably suspending said head, and counterbalancing means for the head, said counterbalancing means having a sliding connection with the head.

14. In a carving machine, a spindle-carrying head, means for movably suspending said head, and a pivotally-supported weight-carrying member connected to said head for counterbalancing the latter, said member being in equilibrium when the head is hanging freely from its points of suspension.

15. In a carving machine, a spindle-carrying head, means for movably suspending said head, a member pivotally supported at a point between its ends, and connected at its lower end to the head, and a weight at the upper end of said member, the latter occupying a substantially vertical position when the head is hanging freely from its points of suspension.

16. In a carving machine, a spindle-carrying head, means for movably suspending said head, a member pivotally supported at a point between its ends, a sliding connection between the lower end of said member and the middle portion of said head, and a weight carried by the upper end of said member.

17. In a carving machine, a spindle-carrying head, means for movably suspending said head, counterbalancing means for said head, members forming a sliding connection between the head and the counterbalancing means, and means for rotating one of said connecting members.

18. In a carving machine, a spindle-carrying head, means for movably suspending said head, a frame pivotally supported at a point between its ends, a weight carried by the upper end of said frame, a shaft extending longitudinally of said frame and in the lower part thereof, a bearing in which said shaft is slidably mounted, a universal joint connection between the bearing and the middle portion of the head, and means for rotating said shaft, said frame being in equilibrium when the head is hanging freely from its points of suspension.

19. A spindle having a head thereon, an adjustable bearing for said spindle adjacent to said head, said bearing supporting said head, and means for holding said head against its support.

20. In a carving machine, the combination of a movably supported head, spindles in said head, a driver located outside of the head and mounted non-rigidly with respect thereto, whereby the transmission of vibration from said driver to said head will be substantially eliminated, and a driving connection between said driver and said spindles.

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