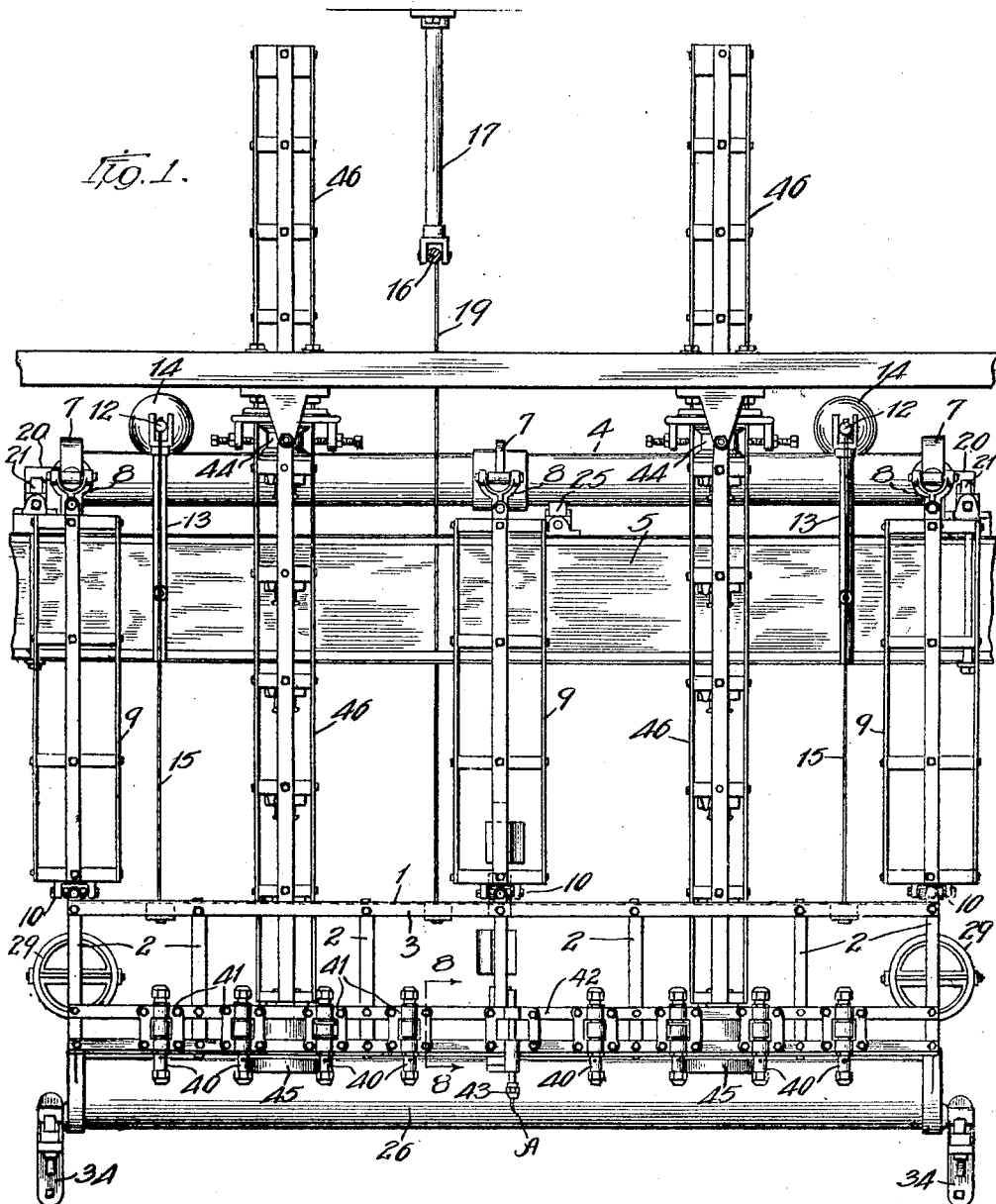


D. B. SALSTROM.
WOOD CARVING MACHINE.
APPLICATION FILED MAR. 1, 1917.

1,324,567.

Patented Dec. 9, 1919.

4 SHEETS—SHEET 1.



Witnesses:
Harry R. L. White.
W. P. Hilroy

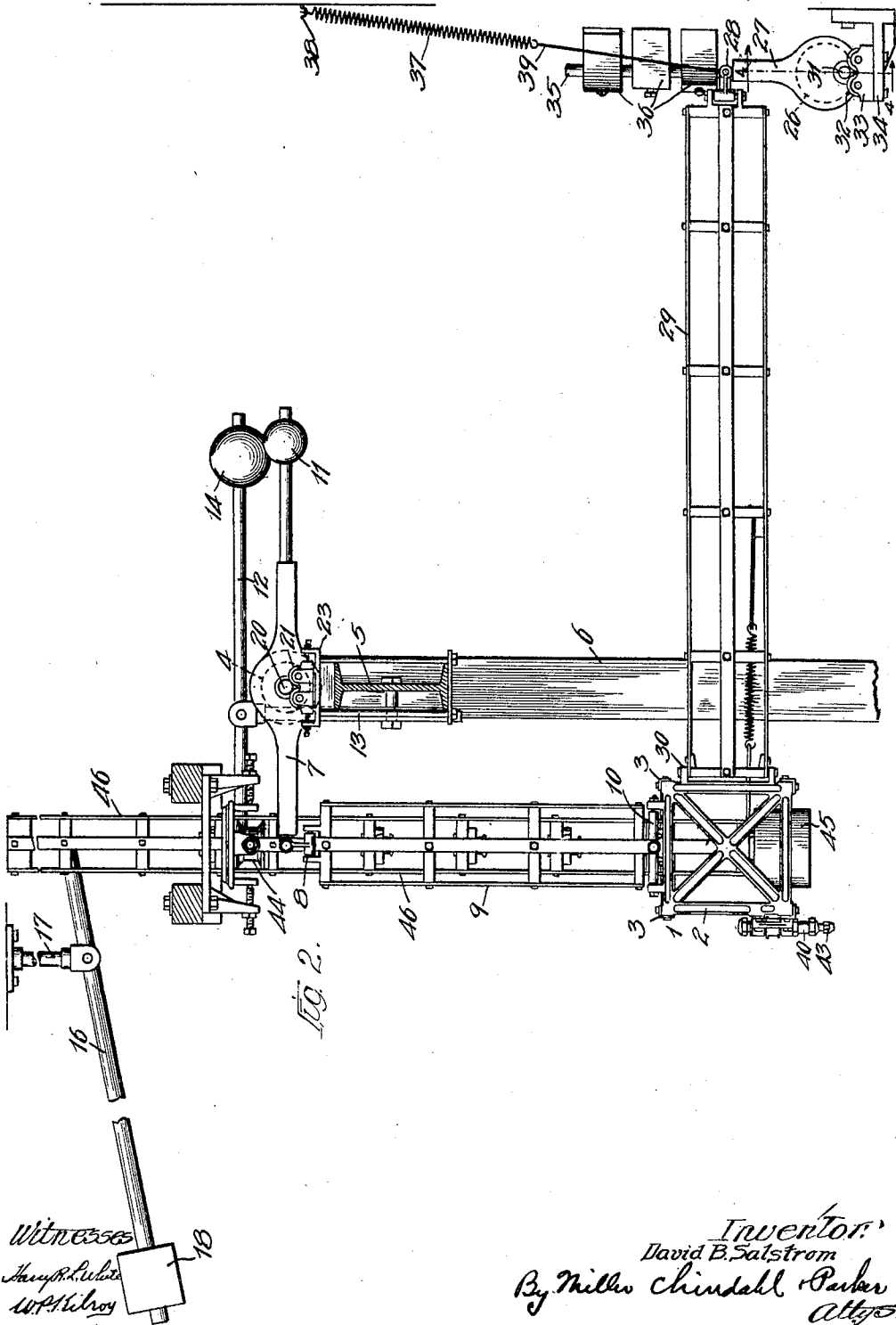
Inventor:
David B. Salstrom
By Miller Chindahl Parker
attys.

D. B. SALSTROM.
WOOD CARVING MACHINE.
APPLICATION FILED MAR. 1, 1917.

1,324,567.

Patented Dec. 9, 1919.

4 SHEETS—SHEET 2.

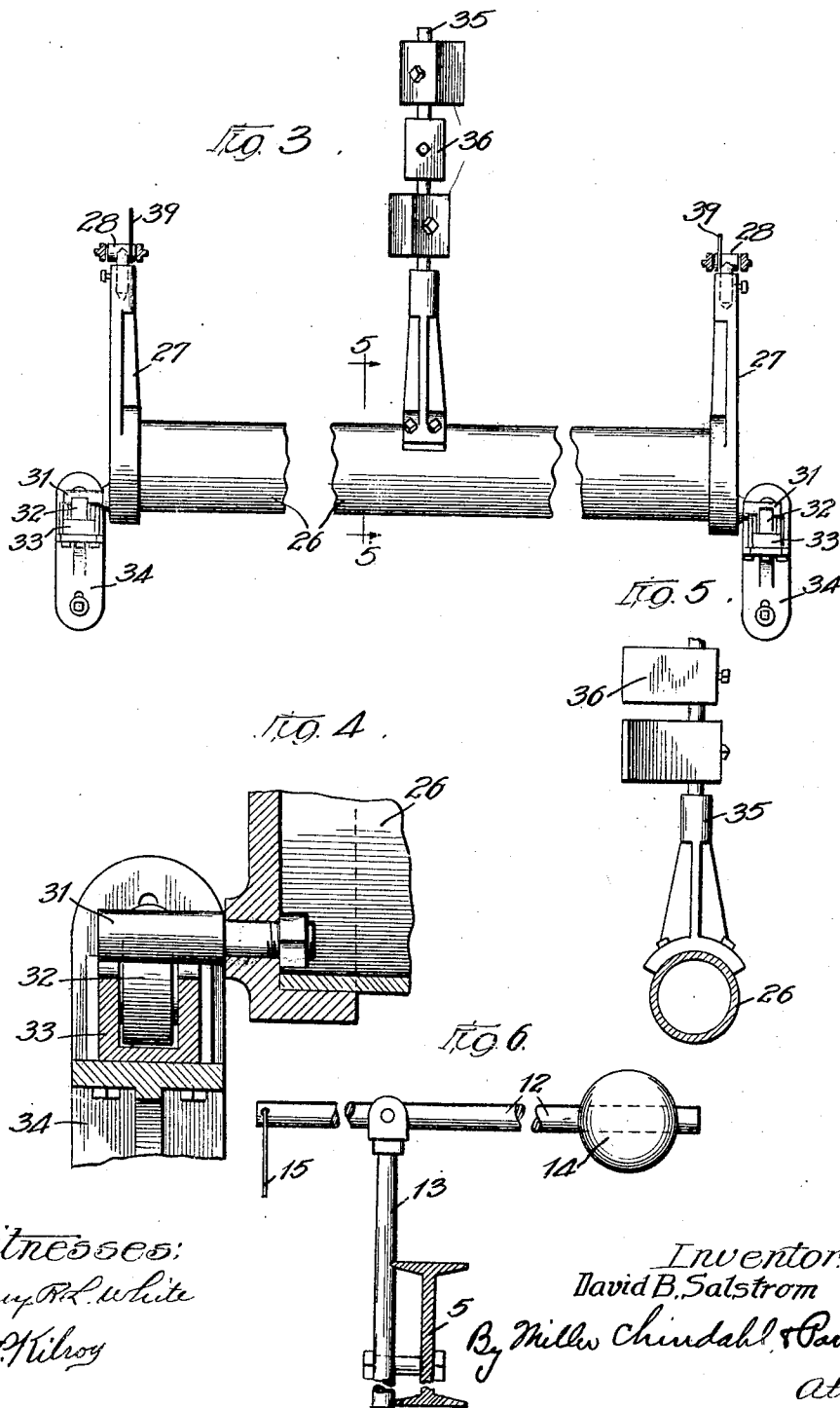


D. B. SALSTROM.
WOOD CARVING MACHINE.
APPLICATION FILED MAR. 1, 1917.

1,324,567.

Patented Dec. 9, 1919.

4 SHEETS—SHEET 3.



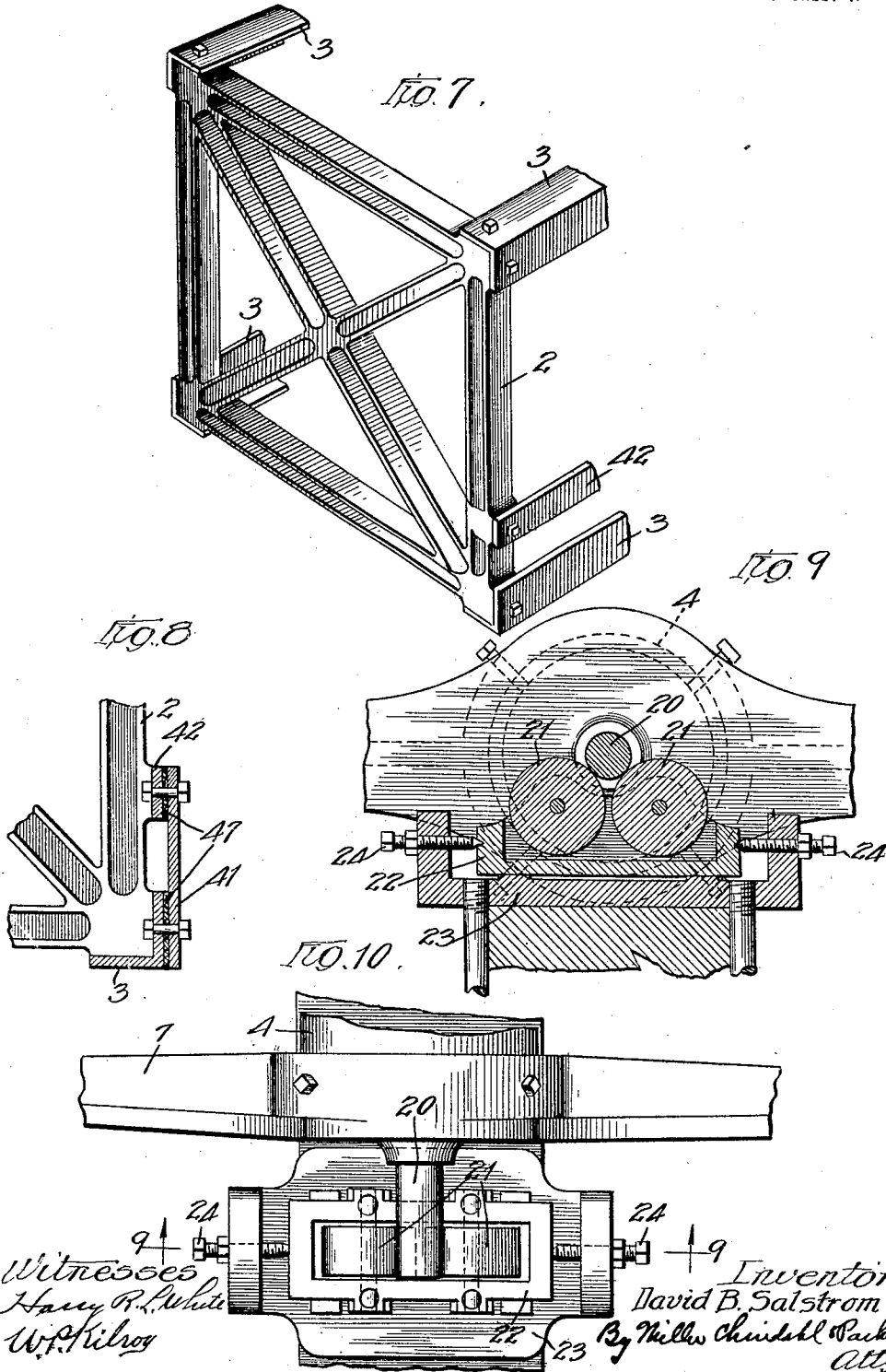
Witnesses:
Harry R. L. White
W. P. Kilroy

Inventor:
David B. Salstrom
By Miller Chindahl & Parker
Attys.

D. B. SALSTROM.
WOOD CARVING MACHINE.
APPLICATION FILED MAR. 1, 1917.

1,324,567.

Patented Dec. 9, 1919.
4 SHEETS—SHEET 4.



Witnesses
Harry R. White
W. P. Kilroy

Inventor
David B. Salstrom
By Miller Chindahl Packer
Attys

UNITED STATES PATENT OFFICE.

DAVID B. SALSTROM, OF CHICAGO, ILLINOIS, ASSIGNOR TO E. KOPRUVA COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

WOOD-CARVING MACHINE.

1,324,567.

Specification of Letters Patent.

Patented Dec. 9, 1919.

Application filed March 1, 1917. Serial No. 151,630.

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 Wood-Carving Machines, of which the following is a specification.

This invention relates to wood-carving machines of the type in which a tracer and a number of rotary cutter-carrying spindles are mounted upon a head which is supported for movement in various directions. In a machine provided with a large number of spindles, the weight of the head and the parts carried thereby is so considerable that the head must be very nicely counterbalanced, as otherwise it will be impracticable for the workman to move the tracer over the surface of the pattern, particularly when the head is moved from the position directly beneath its points of suspension. When the head is of considerable length it also is of vital importance to equalize the movements of both ends of the head so that there shall be no turning movement of the head.

The object of this invention, generally stated, is to produce a wood-carving machine having a large number of spindles and constructed and arranged to obviate the difficulties hereinbefore alluded to. The manner in which this object has been attained will be apparent from the following description, taken in connection with the drawings, in which latter—

Figure 1 is a fragmental front elevation of a wood-carving machine embodying the features of my invention. Fig. 2 is a fragmental side elevation thereof. Fig. 3 is a fragmental view of a counter-weighted equalizing shaft for the head. Fig. 4 is a section taken in the plane of dotted line 4—4 of Fig. 2. Fig. 5 is a section on dotted line 5 of Fig. 3. Fig. 6 is a fragmental view of one of the counterbalance levers. Fig. 7 is a fragmental perspective view of the head. Fig. 8 is a detail view taken in the plane of line 8—8 of Fig. 1 illustrating a means for preventing conduction of heat from the spindles to the head. Fig. 9 is a view illustrating one of the bearings for the counterbalance shaft, the view being taken in the

plane of dotted line 9—9 of Fig. 10. Fig. 10 is a plan view of the parts shown in Fig. 9.

For the sake of clearness, the table upon which are mounted the pattern and the pieces that are to be carved has been omitted from the drawings. Said table is located directly below the head 1. Upon this head are supported the tracer A and the cutter spindles. When the machine comprises a considerable number of spindles, the head 1 is correspondingly long.

It is very important that the head shall be extremely rigid in order that there may be no relative movement among the cutter spindles and tracer, as such relative movement would impair or destroy the accuracy of the work. In the present embodiment of the invention, the head 1 comprises a plurality of rectangular transverse frames 2, rigidly united at their corners by angle bars 3. The frames 2 and bars 3 constitute a skeleton frame of great rigidity and of comparatively light weight.

The head 1 is supported by means including a rock-shaft 4 supported in bearings upon an overhead horizontal girder 5, said girder being supported at its ends upon substantial piers 6. Fixed upon the rock-shaft 4 is a suitable number of levers 7, the forwardly extending arms of which are connected by means of universal joints 8 to the upper ends of suspending frames 9. The lower ends of the suspending frames 9 are connected by means of universal joints 10 to the upper side of the head 1. By reason of the universal joints 8 and 10 the head 1 is capable of moving up and down, forward and back, and from side to side. The rear ends of the levers 7 carry counterweights 11.

In addition to the counterweights 11, the head 1 and the parts suspended thereto are counterbalanced by means of a suitable number of levers 12 supported in any preferred way, as, for example, from posts 13 fixed to the girder 5. Upon the rear end of each lever 12 is fixed a counterbalancing weight 14. The forward ends of the levers 12 are connected to the head 1 by means of cables 15.

The head 1 is further counterbalanced by means of a counterbalancing lever 16 supported in a suitable manner, as, for example, by means of a ceiling bracket 17. The for-

ward end of said lever carries a counterbalancing weight 18, while the rear end of the lever is connected to the head 1 by means of a cable 19. Preferably the effective weight of the mass 18 is equal to the effective weight of the two masses 14.

It will be seen that when the head 1 is raised or lowered, the upper end of each of the suspending frames 9 is caused to travel in an arc corresponding to the arcs described by the forward ends of the levers 7. Accordingly, the head also tends to swing slightly by reason of the action of gravity, out of a given vertical plane. Such lateral movement of the head, however slight, is objectionable. Therefore, the weighted lever 16 is arranged to counteract such tendency of the head to move, the lever 16 being adapted to exert a pull in one direction substantially equal to the pull in the opposite direction by the levers 7 and 12. Thus, when the operator desires to raise and lower the head in a given vertical plane, he is able to do so with much greater facility and accuracy.

In order that the shaft 4 shall be perfectly rigid, it is made of considerable diameter, being preferably formed of a pipe of suitable length and diameter. The ends of the shaft are provided with axial trunnions 20 which rest upon anti-friction rollers 21 (Figs. 9 and 10). The rollers 21 are journaled in bearing boxes 22 which are supported upon plates 23 rigidly mounted upon the girder 5. The boxes 22 are secured in place upon the plates 23 by means of adjusting screws 24.

Between its ends the rock-shaft 4 may be supported by means of anti-friction rollers 25 (Fig. 1), said rollers being mounted in a manner similar to that just described in connection with the rollers 21.

In order to maintain the head 1 in parallelism with the rock-shaft 4, I provide a rock-shaft 26 located rearwardly of the head and connected thereto by means of suitable arms and links. As it is highly important that the shaft 26 shall be exceedingly rigid, it is preferably formed of a pipe of comparatively large diameter. Rigidly secured to the ends of the shaft 26 are two upwardly extending arms 27, the upper ends of which are connected by means of universal joints 28 with the rear ends of links 29. The forward ends of the links 29 are pivoted at 30 (Fig. 2) to the rear sides of the end portions of the head 1. For the sake of rigidity and lightness, the links 29 are preferably formed of skeleton frames, as indicated in Figs. 1 and 2.

The rock-shaft 26 is provided with trunnions 31 that rest upon anti-friction rollers 32. The rollers 32 are journaled in boxes 33 that are supported upon brackets 34 rigidly secured to any suitable solid support. The

shaft 26, arms 27 and links 29 serve to equalize the movement of the ends of the head 1 so as to maintain said head at all times in perfect parallelism with the shafts 4 and 26.

It will be understood that when the head 1 is drawn forward or pushed rearwardly by the operator, the weight of the head and the parts suspended therewith tends to cause the head to return to its former position directly below its points of support at the ends of the levers 7. To hold the head for some time in a position other than that to which gravity tends to return it would require considerable exertion on the part of the operator, if means were not provided to obviate the same. This means includes various instrumentalities and adaptations, among which is the placing of the trunnions 31 below the center of gravity of the shaft 26. When the head 1 hangs in its position of rest beneath its point of support upon the levers 7, the shaft 26 is in equilibrium. When the head 1 is drawn forward, the shaft 26 also is tilted forwardly, the unbalanced weight of the said shaft resisting in some measure the tendency of the head 1 to return by gravity to its normal position. Likewise when the head 1 is pushed rearwardly, the shaft 26 also is rocked rearwardly and its unbalanced weight tends to hold the head 1 in the position to which it has been moved by the operator. Further to assist in counteracting the tendency of the head 1 to gravitate to its normal position, I provide an arm 35 fixed to and extending upwardly from the shaft 26, said arm carrying one or more counterbalancing weights 36. To facilitate the counterbalancing of the head to a nicety, the weights 36 may be eccentrically mounted for rotation upon the arm 35 so that more or less of the mass of said weights may be located directly above the axis of the trunnions 31.

Tension springs 37 (Fig. 2) are secured at their upper ends to suitable fixed points 38 and at their lower ends to links 39 which are attached to the upper ends of the arms 27. These springs tend to check the fall or downward swing of the weights 36.

Mounted in the head 1 is any suitable or desired number of sprindles 40 provided at their lower ends with chucks to receive the carving tools (not herein shown). Each spindle is provided with bearings mounted upon a base 41. The bases 41 are secured to the lower forward bar 3 of the head 1 and to a bar 42 extending parallel with the bar 3.

At a suitable point upon the head 1, as, for example, near the middle thereof, is mounted a chuck 43 to receive the tracer A.

The spindles 40 may be driven in any suitable manner, as, for example by the means fully illustrated and described in Patent

No. 1,013,618, granted January 2, 1912. The pulleys 44 and 45 herein shown correspond to the pulleys 28 and 30 described in said patent, and the swinging frames 46 herein shown are substantially similar to the frames 21 disclosed in the before-mentioned patent.

The production of smooth, accurate work requires that the spindles 40 shall rotate without vibration, and therefore it is necessary to mount the spindles in bearings that fit the spindles very closely. As a result the bearings when in use become quite hot, and it has been found that if the heat is transmitted to the head 1, the slight warping of the bars 3 and 42 produced thereby affects the accuracy of the work. I therefore place material 47 (Fig. 8) which is a poor conductor of heat between the bases 41 and the bars 3 and 42, thereby preventing distortion of the head 1 through heat.

For the sake of clearness, I have shown only eight cutter spindles, but it will be understood that the equalizing and counterbalancing methods herein disclosed may be employed in connection with heads carrying a larger number of spindles.

I claim as my invention:

1. A wood-carving machine having, in combination, a head, means for suspending the head for forward and rearward movement, and means for equalizing the movement of the ends of the head comprising a shaft extending parallel of the head, said shaft having trunnions located below its center of gravity, bearings for said trunnions, arms extending upwardly from the shaft, connections between said arms and the head, a weighted arm extending upwardly from said shaft, and a spring arranged to check swinging movement of said shaft.

2. A wood-carving machine having, in combination, a head, means for suspending the head for forward and rearward movement, and means for equalizing the movement of the ends of the head comprising a shaft extending parallel of the head, said shaft having trunnions located below its center of gravity, bearings for said trunnions, arms extending upwardly from the shaft, and connections between said arms and the head.

3. A wood-carving machine having, in combination, a head, means for suspending

the head for forward and rearward movement, and means for equalizing the movement of the ends of the head comprising a shaft extending parallel of the head, said shaft having trunnions located below its center of gravity, bearings for said trunnions, connections between said shaft and the head, and a weighted arm extending upwardly from said shaft.

4. A wood-carving machine having, in combination, a head, means for suspending the head for forward and rearward movement, and means for equalizing the movement of the ends of the head comprising a shaft extending parallel of the head, said shaft having trunnions located below its center of gravity, bearings for said trunnions, and connections between said shaft and the head.

5. A wood-carving machine having, in combination, a head, a plurality of counterbalance levers from the forward ends of which said head is suspended, weights upon the rear ends of said levers, a counterbalance lever the rear end of which is connected to said head, a weight upon the forward end of the last mentioned lever, a counterbalance lever the forward end of which is connected to the head, and a weight upon the rear end of the last mentioned lever.

6. A wood-carving machine having, in combination, a head, a plurality of counterbalance levers from the forward ends of which said head is suspended, weights upon the rear ends of said levers, a counterbalance lever the rear end of which is connected to said head, and a weight upon the forward end of the last mentioned lever.

7. A wood-carving machine having, in combination, a head, an overhead shaft, a plurality of equalizing levers fixed to said shaft, the ends of said head being connected to the forward end of said levers, a counterbalance lever the rear end of which is connected to said head, and a weight upon the forward end of the last mentioned lever.

8. A wood-carving machine having, in combination, a skeleton frame forming a head, a spindle, a bearing for the spindle, said bearing being secured to the head, and heat insulation between the bearing and the skeleton frame.

In testimony whereof I have hereunto set my hand.

DAVID B. SALSTROM.

It is hereby certified that the assignee in Letters Patent No. 1,324,567, granted December 9, 1919, upon the application of David B. Salstrom, of Chicago, Illinois, for an improvement in "Wood-Carving Machines," was erroneously described and specified as E. Kopriva Company, whereas said assignee should have been described and specified as *E. Kopriva Company*, as shown by the records of assignments in this office; in the printed specification, page 2, line 117, for the word "sprindles" read *spindles*; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 13th day of January, A. D., 1920.

[SEAL.]

M. H. COULSTON,

Acting Commissioner of Patents.