(No Model.) 3 Sheets—Sheet 1.

J. H. BASSLER.

METAL WORKING.

No. 501,038. Patented July 4, 1893.

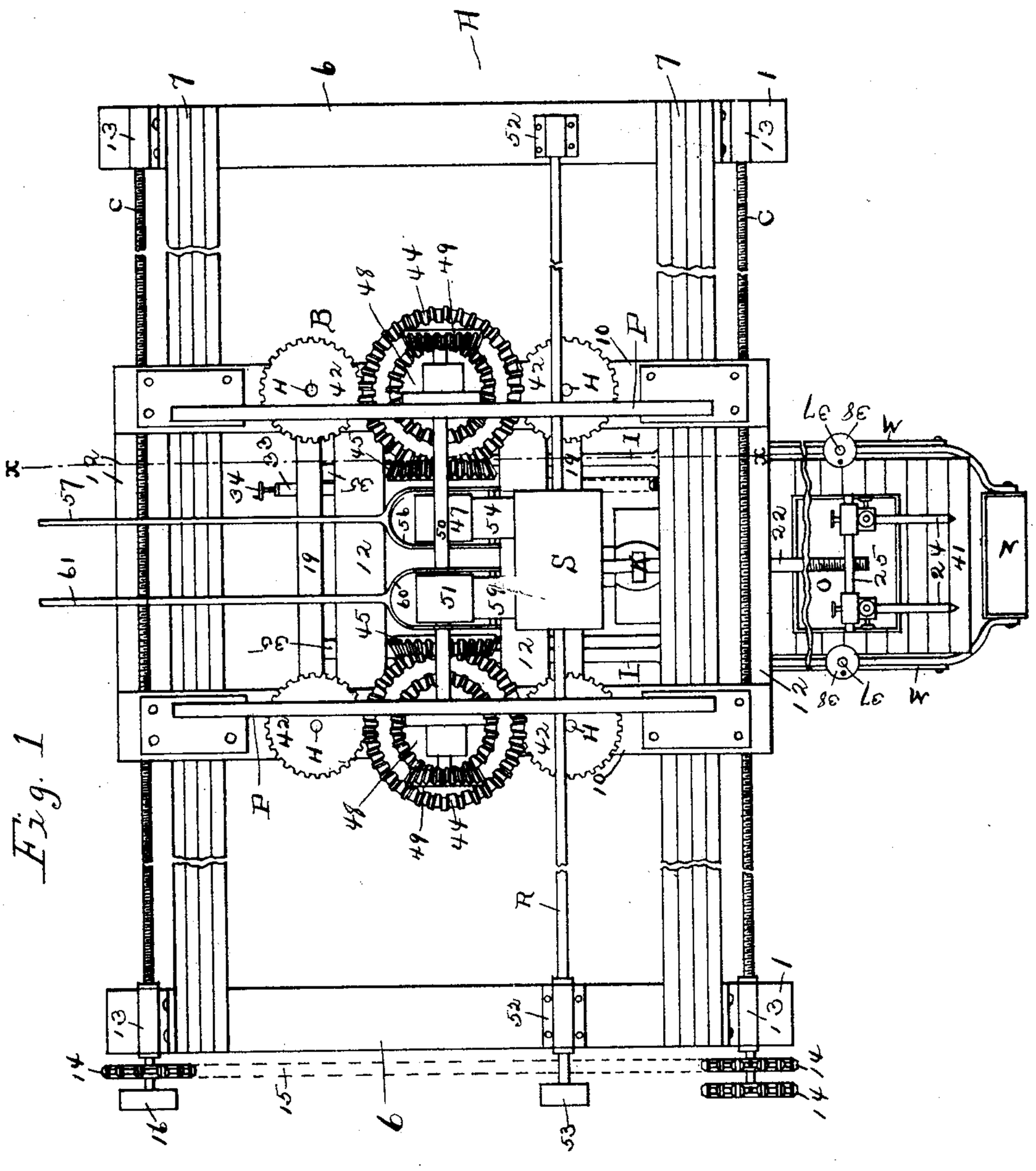

Fig. 1

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(No Model.) 3 Sheets—Sheet 2.

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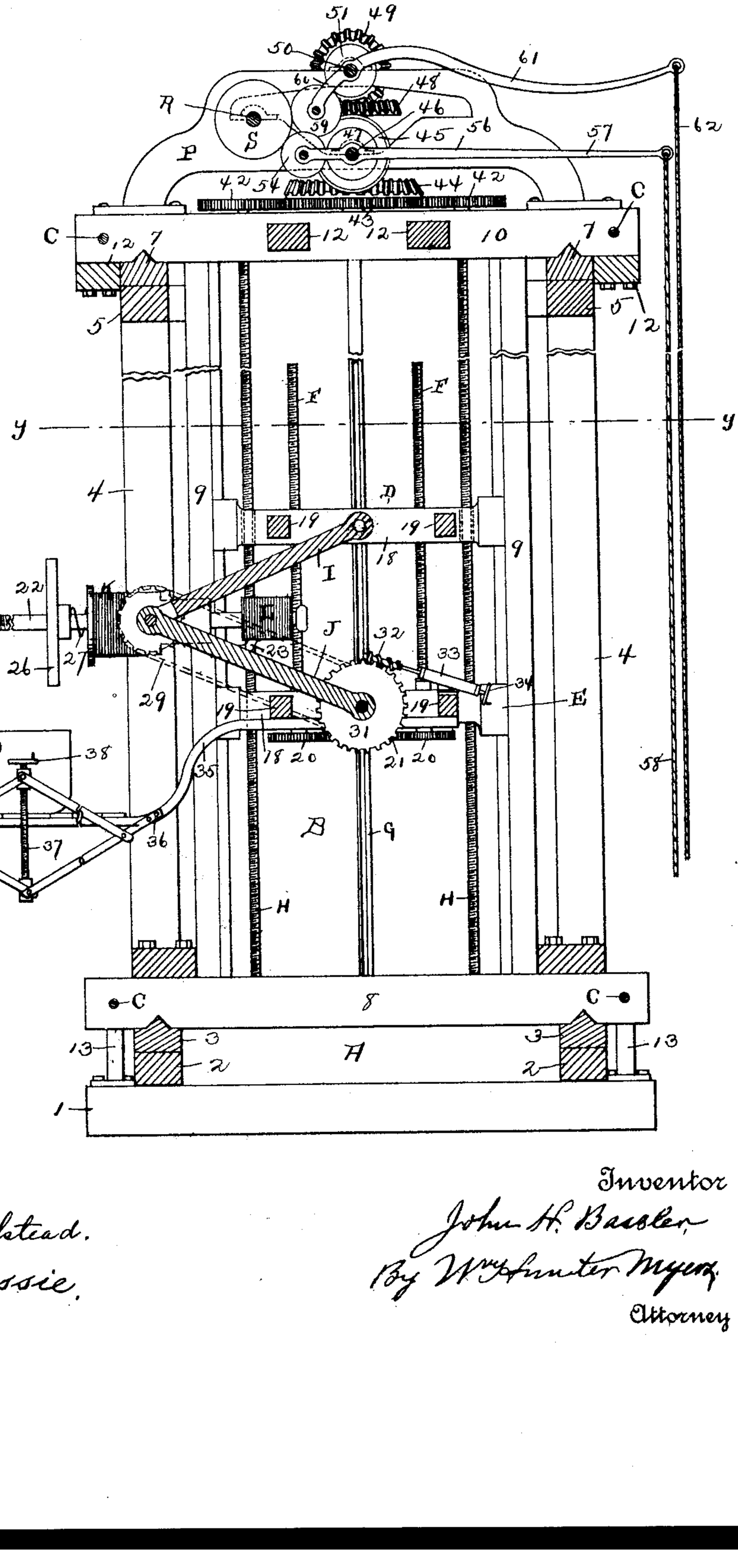
Fig. 2



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(No Model.) 3 Sheets—Sheet 3.

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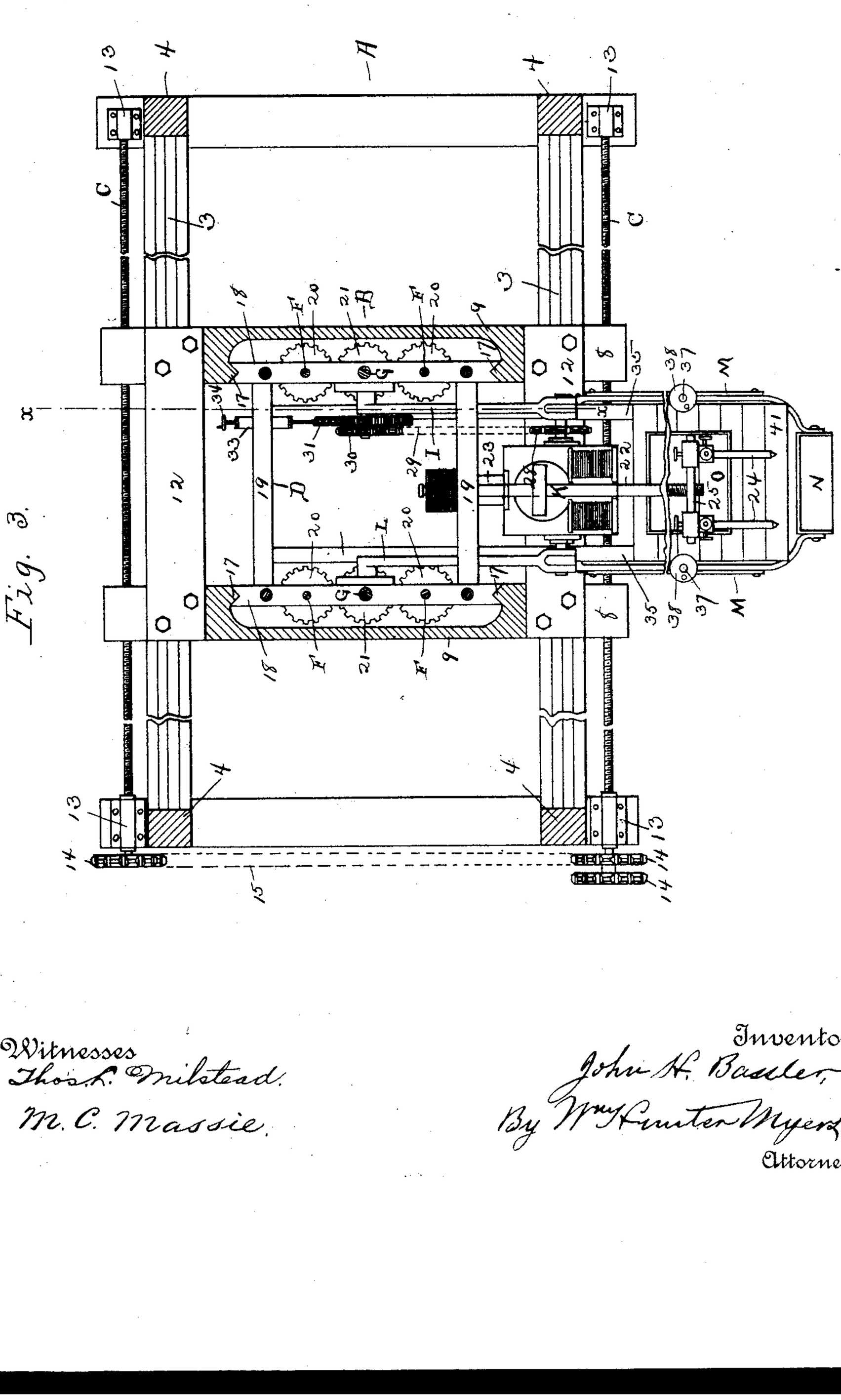
Fig. 3.



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UNITED STATES PATENT OFFICE.

JOHN H. BASSLER, OF MYERSTOWN, PENNSYLVANIA.

METAL-WORKING.

SPECIFICATION forming part of Letters Patent No. 501,038, dated July 4, 1893.

Application filed December 23, 1892. Serial No. 456,116. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. BASSLER, a citizen of the United States of America, residing at Myerstown, in the county of Lebanon and State of Pennsylvania, have invented certain new and useful Improvements in Methods of and Apparatus for Uniting Metals, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to an improved method of and apparatus for uniting metals.

The invention consists, broadly, in heating the materials along their joint, then pouring molten aluminum or aluminum alloy into the joint, and finally passing an electric current transversely through the joint.

The invention consists, further, in heating the materials by means of an electric current, then pouring aluminum or aluminum alloy into the joint, and finally causing the electric current to flow through the aluminum or aluminum alloy and the adjacent materials.

The invention consists, further, in heating the materials by a pair of electric arcs, one on each side of the joint, then pouring aluminum or aluminum alloy into the joint.

The invention consists, further, in coating the materials to be united with a layer of carbon, then heating the materials, and finally pouring molten aluminum or aluminum alloy into the joint.

The invention consists further of an apparatus well adapted for carrying out my method.

The object of my invention is to provide means for uniting large plates of metal, particularly in ship-building where the joints of the materials lie in vertical planes, being either horizontal or vertical.

In carrying out my method I first heat the materials at one end of the joint by means of a pair of electrodes; then I pour molten aluminum or aluminum alloy, or fine aluminum filings, or aluminum alloy filings, into the joint where heated, and at the same time move the electrodes forward along the joint, thereby continuously heating the materials, while also causing the current to divide, a portion of the current passing through the aluminum or aluminum alloy and aiding in the combination of the iron and aluminum. This will be better understood after a description of the apparatus and its operation.

In the drawings, Figure 1 is a plan view of my improved apparatus. Fig. 2 is a vertical sectional view on the line *x x*, Figs. 1 and 3. Fig. 3 is a horizontal sectional view on the line *y y*, Fig. 2.

Referring to the drawings, A is a main frame, consisting of cross-ties 1, on which are secured sills 2, provided with V-shaped rails or ways 3 on their upper surfaces. Posts 4 carry plates 5 and tie-beams 6, the upper surfaces of the plates having rails or ways 7. Longitudinally movable in this main frame is a vertical frame B, consisting of base-beams 8 adapted to slide on the ways 3, and carrying vertical supports 9, on which rest top beams 10, adapted to slide on the ways 7, the top beams being connected by cross-pieces 12. This vertical frame is moved in the main frame by means of endless screws C passing through threaded openings in the base beams and top beams, being journaled on the main frame at each end, as shown at 13, and connected so as to move synchronously by sprocket wheels 14 and chains 15, the whole series of screws being operated by means of a band-wheel 16, driven by a belt from any source of power.

The vertical supports 9 are provided with ways 17, in which move an upper horizontal frame D and a lower horizontal frame E, each frame consisting of a pair of slide-beams 18 connected by a pair of cross-braces 19, the vertical distance between the frames being adjustable by means of short vertical screws F, journaled in the lower frame E and passing through threaded openings in the upper frame D, these screws being revolved by means of gear-wheels 20, secured to their lower ends and meshing with gear-wheels 21 journaled in the lower frame and provided with feathers which engage slots in the vertical shafts G, the latter being journaled in the vertical frame B and adapted to be rotated as desired by gearing on top of the said frame, which will be more fully described hereinafter.

Both the horizontal frames D and E are synchronously movable in a vertical direction on the ways 17 by means of a series of vertical endless screws H, each stepped upon one

of the base-beams 8, passing through a threaded opening in the slide-beam 18 of the lower frame E, thence loosely through an opening in the slide-beam of the upper frame D, and journaled in the top beam 10, being provided with suitable gearing at its upper end, as will be described hereinafter.

To the slide-pieces of the upper frame D are pivoted links I, having forked outer ends, pivoted to links J, which are pivotally secured to the slide-pieces of the lower frame E. In the outer ends of the links is trunnioned an electro-motor K, having an armature-shaft 22, adapted to be reciprocated by an electro-magnet L attached to the motor-frame by a standard 23. The armature-shaft carries a pair of electrodes 24, attached to the outer ends of a cross-bar 25, and adjustable thereon. A shield 26 of iron is secured to the armature-shaft, and between the shield and the motor is inserted a spring 27, which tends to force the armature-shaft outward when the electro-magnet L is demagnetized.

On one of the trunnions of the moter is fixed a sprocket-wheel 28, connected by a chain 29 to a sprocket-wheel 30, revoluble on the pivot of one of the lower links J, as shown, this sprocket-wheel 30 being rotated by means of a worm-wheel 31 fixed to it, and actuated by a worm 32, journaled at 33 on the cross-brace 19, and provided with a hand-wheel 34. It is apparent that by turning the hand-wheel the motor, and with it the electrodes, may be rotated in a vertical plane on the trunnions.

To the cross-braces 19 of the lower frame E are attached arms 35, to each of which a lazy-tongs frame M is secured, as at 36, the frames being extensible by means of screws 37 provided with hand-wheels 38. At the outer end of each frame M is secured a pouring cup N, open on its top side 39 and outer side 40, and below the electrodes. Across the arms 35 are placed boards or planks 41 on which the operator may stand if desired and on which the crucible O may be placed.

The upper ends of the vertical screws H are provided with gear-wheels 42, in mesh with wheels 43, which are loose upon vertical shafts G, and are fixed to bevel gear-wheels 44, also loose upon shafts G. These bevel wheels intermesh with bevel-pinions 45 mounted on a shaft 46 on which is fixed a friction-wheel 47, shaft 46 being journaled in frames P.

On the top ends of the vertical shafts G are secured bevel-gear wheels 48, into which mesh pinions 49 on a shaft 50 provided with a friction-wheel 51.

R is a horizontal shaft running the entire length of the machine and journaled on the main-frame at 52, being provided with a suitable band-wheel 53, to which motion is transmitted by a belt from any source of power. On shaft R is loosely mounted a friction-drum S, adapted to slide longitudinally on the shaft with the longitudinal movement of the vertical frame B. The shaft R is slotted and the drum S provided with a suitable feather, whereby when the shaft R is rotated the drum S will be also revolved.

To transmit motion from the friction-drum to the friction-wheel 47 as desired, an idler-wheel 54 is provided, being mounted in a fork 56 pivoted on the shaft 46 and provided with a lever 57 to which a rope 58 is attached, whereby the idler-friction-wheel 54 may be pulled into contact with both the revolving friction-drum S and the friction wheel 47, thus rotating the latter.

Friction-wheel 51 is rotated from the friction-drum S by an idler friction-wheel 59 mounted in a forked frame 60 having a lever 61 to which is attached a rope 62, the forked frame 60 being pivoted on shaft 50.

It is apparent that by turning the hand-wheel 34 the motor K and with it the electrodes 24, may be turned in a vertical plane, revolving on the motor trunnions. By pulling on the rope 58 the idler wheel 54 will transmit motion from the drum S to the friction wheel 47, thereby revolving the endless screws H and raising the two frames D and E sychronously, and at the same time raising the motor and electrodes. By reversing the direction of rotation of pulley 53 it is obvious that the frames D and E and with them the motor will be lowered. By pulling down on rope 62, the idler-wheel 59 will transmit motion from the drum S to the friction-wheel 51, revolving the latter, and with it the vertical shafts G, thereby actuating the screws F, altering the distance apart of the frames D and E and drawing in the motor and electrodes. By reversing the direction of rotation of pulley 53, the motor will be pushed out.

When power is applied to pulley 16, frame B will be moved longitudinally in frame A, according to the direction of rotation of said pulley.

It is apparent that by this apparatus the electrodes may be brought to bear upon all points requisite in heating materials, either along a vertical joint or along a horizontal joint, whether these joints be straight or curved as in the curved side of a vessel. As the materials become heated, the cup N is pushed up so as to cover that part of the joint which has been heated. Then the operator, standing on the platform 41, dips the molten aluminum or alloy from the crucible O and pours it into the cup N, from whence it runs into the joint, a refractory material, such as fire-brick, being placed behind the joint to prevent the molten aluminum or alloy from running out of the joint. While the molten aluminum is being poured into the joint, the electrodes are slowly moved forward and the current which flows from one electrode through the materials and up through the other electrode will form an arc on each side of the joint, and will also divide when traversing the materials according to the resistance it meets, therefore mostly flowing across the joint at the place where the

molten aluminum or alloy has been poured. This current thus flowing through the molten aluminum or alloy and through the materials causes the mutual interpenetration of the molecules, forming a complete union of the particles of materials and aluminum or alloy. To insure this transportative action in each direction it is better to alternate the current through the joint, and this I do by oscillating the electrodes by means of the motor K, which is adapted to rotate its armature half a revolution in one direction and then back in the other direction, the armature-shaft being also adapted to reciprocate by means of the electro-magnet L, in the same manner and by the same construction described in my application, Serial No. 453,716. As fast as the electrodes are moved forward the cup N is also advanced, the aluminum or alloy rapidly cooling behind it and uniting the materials into a solid mass. It will be seen that the operation is thus conducted continuously from one end of the joint to the other, it being necessary at the extreme end of the joint to stop the reciprocation of the electrodes and hold them down on the materials while still oscillating them, thereby extinguishing the arcs, yet keeping the molten aluminum or alloy still hot by the action of the current and at the same time continuing the transportative action until the particles of materials and aluminum or alloy have been combined to the desired extent.

I find it advisable when uniting materials by my method, to first coat the materials along the joint with a layer of carbon, consisting of pulverized gas-carbon and some sticky material, such as molasses, which prevents the heated materials from being oxidized, the molten aluminum, when poured into the joint, driving out the carbon and uniting directly with the materials. Furthermore, the carbon-paste forms the molecular material which keeps up the arcs, thus protecting the materials from the action of the arcs.

While I have more particularly mentioned the use of molten aluminum or molten aluminum alloy in carrying out my method, yet it is apparent that when the materials have been heated to the desired temperature I may pour into the joint fine filings of aluminum or aluminum alloy instead of the molten matter, and the filings will be almost immediately fused and will effect the same result as the molten aluminum.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A method of uniting metals, which consists in heating the materials to be united, then pouring aluminum or aluminum alloy into the joint of the materials, and finally passing an electric current through the materials and through the aluminum or alloy.

2. A method of uniting metals, which consists in first heating the materials to be united, then pouring molten aluminum or aluminum alloy into the joint of the materials, and finally passing an electric current through the materials and through the molten aluminum or alloy.

3. A method of uniting metals, which consists in first heating the materials to be united by an electric current, and while the current is still flowing, pouring aluminum or aluminum alloy into the joint.

4. A method of uniting metals, which consists in first heating the materials to be united by an alternating current, and while the current is still flowing, pouring molten aluminum or aluminum alloy into the joint.

5. A method of uniting metals, which consists in first heating the materials to be united by a pair of electric arcs, and then pouring molten aluminum or aluminum alloy into the joint.

6. A method of uniting metals, which consists in first coating the materials to be united with a layer of carbon, then electrically heating said materials, and finally pouring aluminum or aluminum alloy into the joint of the materials.

7. A method of uniting metals, which consists in first coating the materials to be united with a layer of carbon, then electrically heating said materials, and finally pouring molten aluminum or aluminum alloy into the joint of the materials.

8. A method of uniting metals, which consists in first coating the materials to be united with a layer of carbon, then heating said materials by an electric current, and finally, while the current is still flowing, pouring molten aluminum or aluminum alloy into the joint of the materials.

9. A method of uniting metals, which consists in first coating the materials to be united with a layer of carbon, then heating said materials by an electric arc on each side of the joint, and finally, while the arcs are still in use, pouring molten aluminum or aluminum alloy into the joint of the materials.

10. In an apparatus of the class described, a pair of horizontal frames, a pair of links pivoted to each frame, an electric motor trunnioned in the outer ends of both pairs of links, and means for adjusting the vertical distance apart of the horizontal frames, whereby the motor may be moved in a horizontal plane.

11. In an apparatus of the class described, a vertical frame provided with vertical slideways, a pair of horizontal frames, means for moving said frames synchronously in the slideways, a pair of links pivoted to each frame, an electro-motor trunnioned in the ends of both pairs of links, and means for adjusting the vertical distance between the horizontal frames.

12. In an apparatus of the class described, a main-frame, a vertical frame having vertical slideways, means for moving said vertical frame longitudinally in the main-frame, a

pair of horizontal frames, means for moving said horizontal frames synchronously in the vertical slideways, a pair of links pivoted to each horizontal frame, means for adjusting the vertical distance between the horizontal frames, an electric motor trunnioned in the outer ends of both pairs of links, and means for rotating the motor on its trunnions, substantially as described and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN H. BASSLER.

Witnesses:

WM. HUNTER MYERS,

M. C. MASSIE.