Feb. 28, 1939. L. W. YOUNG 2,148,666

PORTABLE BLOWPIPE MACHINE

Filed Oct. 7, 1936 3 Sheets-Sheet 1

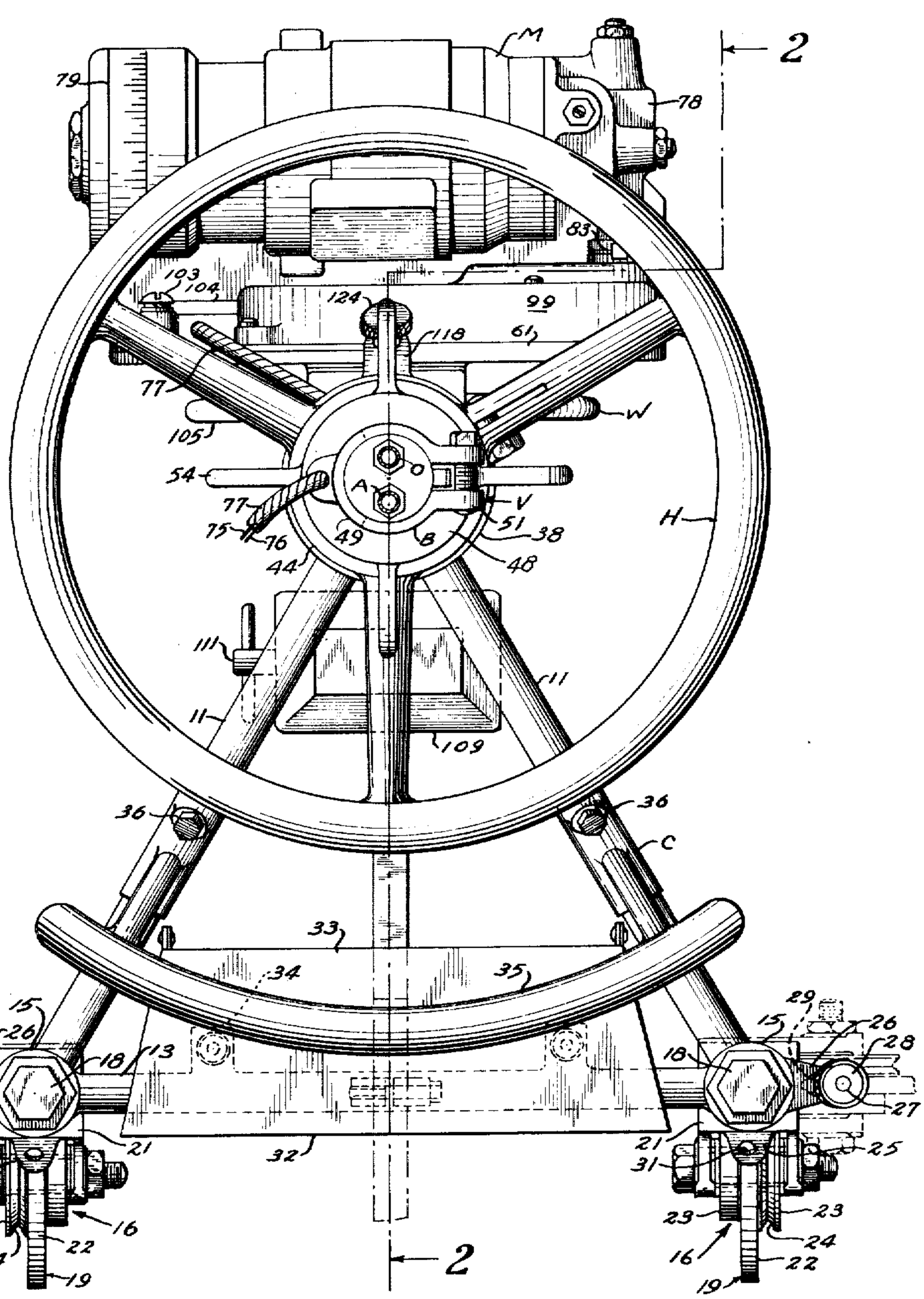

FIG. 1

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PORTABLE BLOWPIPE MACHINE

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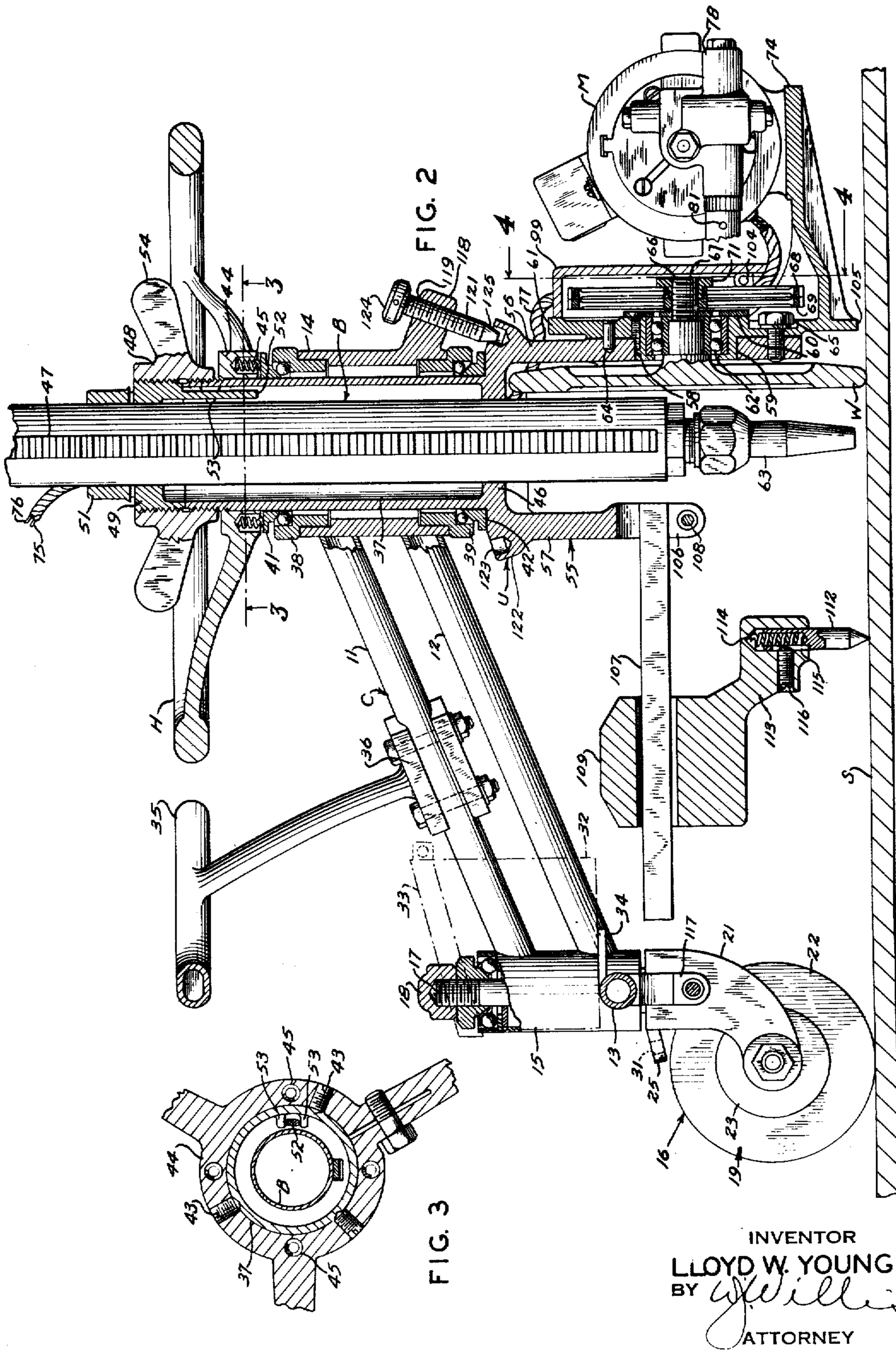

FIG. 2

FIG. 3

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PORTABLE BLOWPIPE MACHINE

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FIG. 4

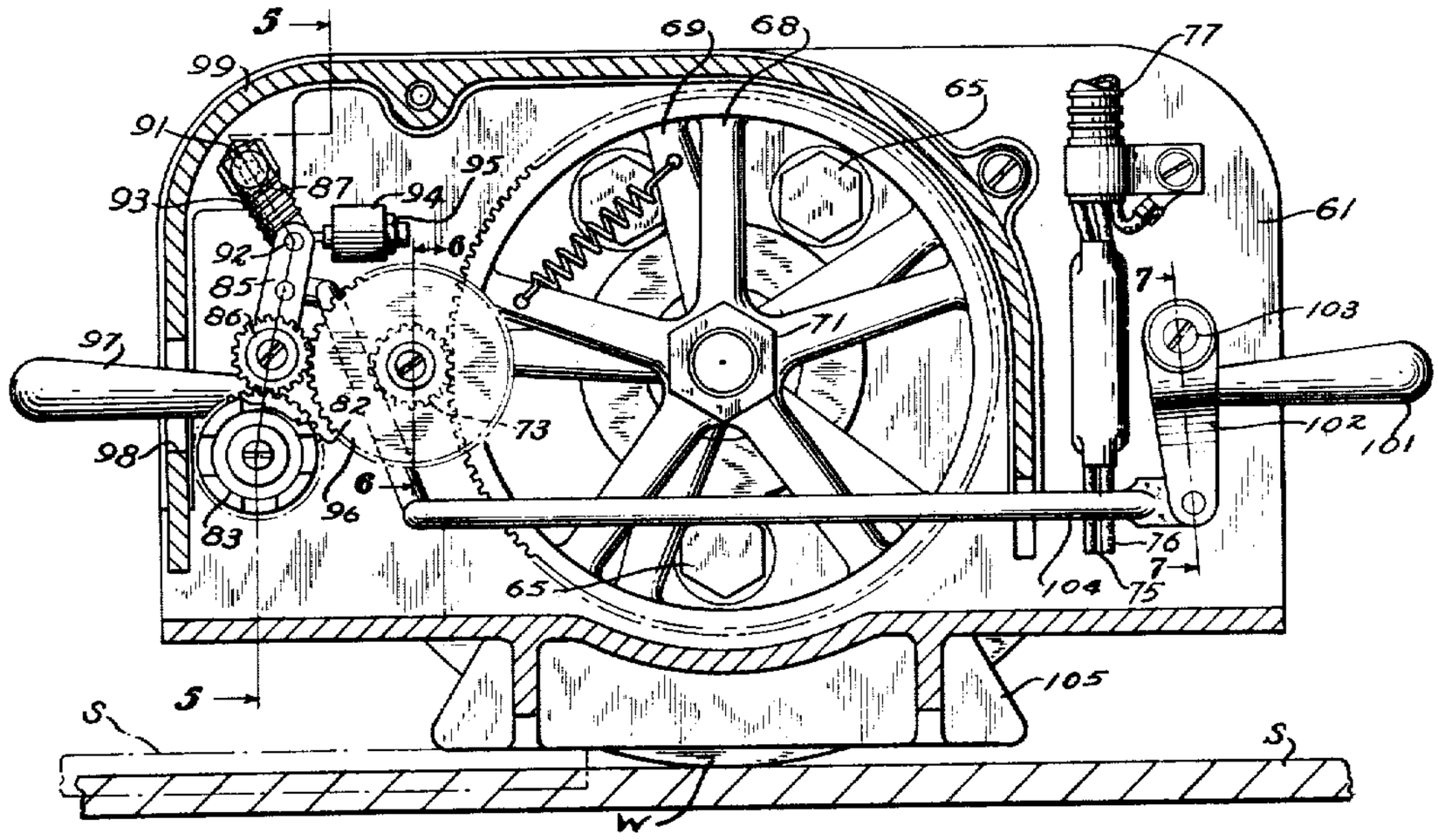
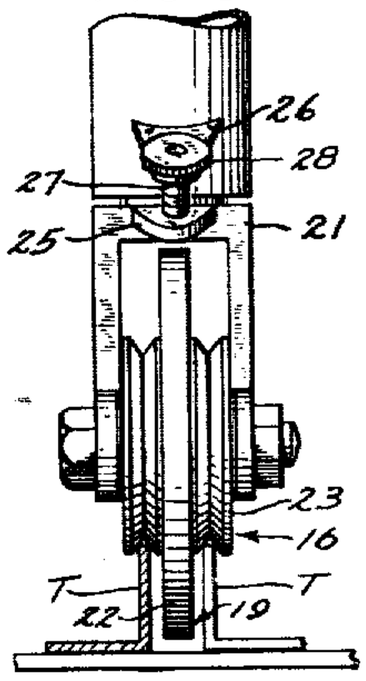


FIG. 8



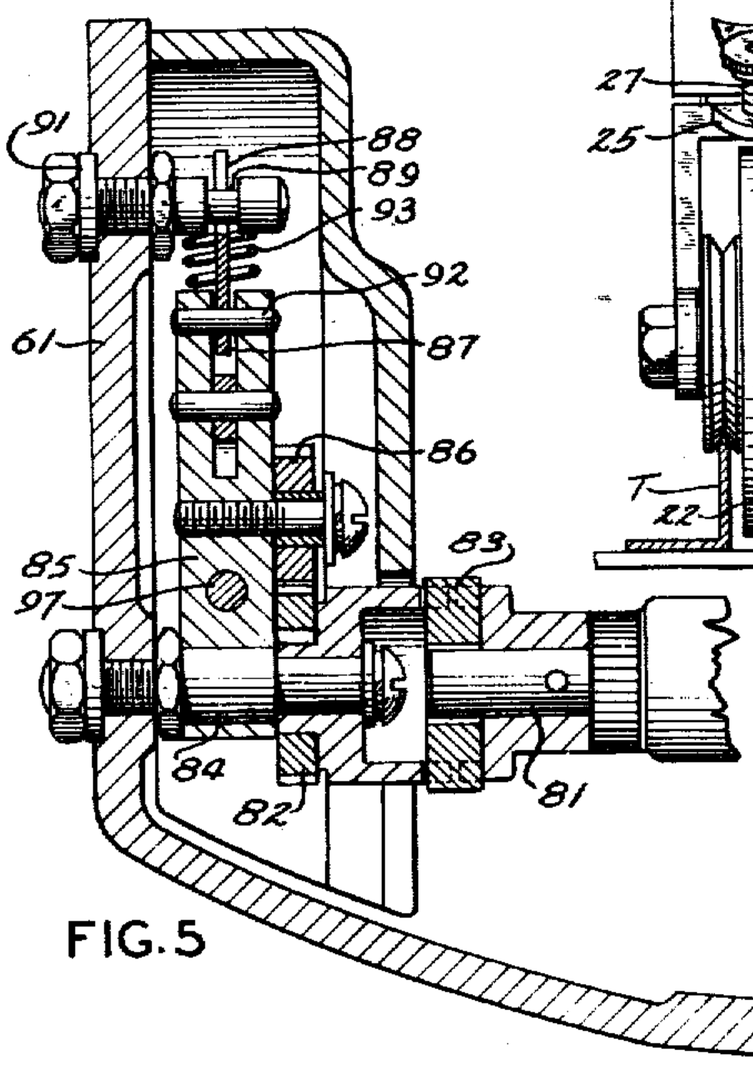


FIG. 5

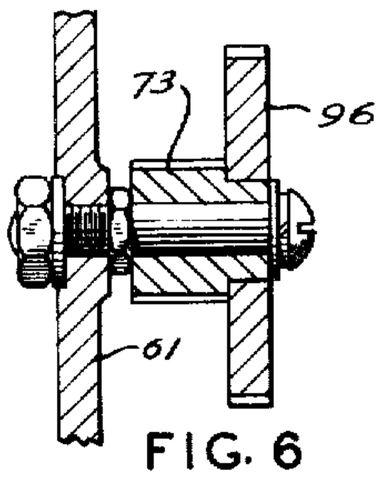


FIG. 6

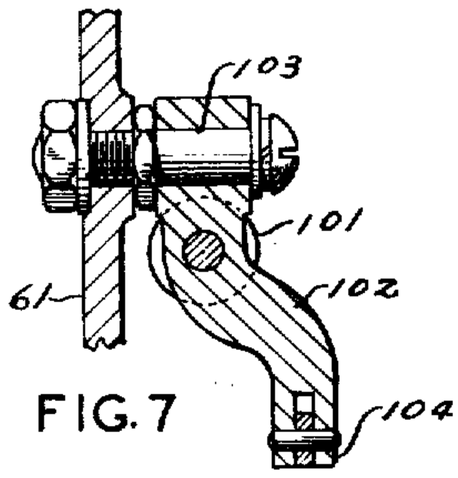


FIG. 7

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Patented Feb. 28, 1939 2,148,666

UNITED STATES PATENT OFFICE

2,148,666

PORTABLE BLOWPIPE MACHINE

Lloyd W. Young, Scotch Plains, N. J., assignor to The Linde Air Products Company, a corporation of Ohio

Application October 7, 1936, Serial No. 104,368

31 Claims. (Cl. 266—23)

This invention relates to an apparatus for performing welding, flame cutting, localized heat treating, and other similar operations, and more particularly to a small portable blowpipe apparatus capable of traveling on templet rails or directly over a working surface.

Generally speaking, the invention has for its object to provide a self-propelled apparatus which is light in weight and simple in design and operation so as to adapt it to perform a wide range of useful operations in the welding, cutting, and related fields.

More specifically, the objects of the present invention are to provide a portable blowpipe apparatus of relatively small size for operation where space is limited; to provide in such an apparatus improvements in the design thereof adapting it to perform a wide range of useful operations; to provide a carriage structure in a portable blowpipe apparatus of efficient design and light weight; to provide in such an apparatus means for selectively allowing the apparatus to perform straight line operations, or operations in which the blowpipe follows an irregular contour in response to a steering or guiding movement imparted by the operator; to provide carriage supporting means permitting the apparatus to move universally in a plane directly upon the working surface, while compensating for irregularities in the working surface; to provide new and improved means for adapting a portable blowpipe apparatus for following circular paths; to provide means for steadying the hand of the operator when the apparatus is guided manually; to provide means for supporting a wheeled blowpipe carriage in operative position when one of the supporting wheels has rolled off of the working surface; and to provide other improvements in the structure and design which contribute to make the apparatus of simplified and improved design. These and other objects and advantages will become apparent from the following description and from the accompanying drawings which disclose one form of apparatus embodying the present invention.

Referring to the drawings:

Fig. 1 is a plan view of the apparatus;

Fig. 2 is a longitudinal cross sectional view taken on the line 2—2 of Fig. 1 with the tool box shown in broken lines;

Fig. 3 is a detailed cross sectional view of a portion of the steering handwheel taken on the line 3—3 of Fig. 2;

Fig. 4 is an enlarged view of the transmission mechanism taken on the line 4—4 of Fig. 2;

Fig. 5 is an enlarged sectional view of the clutch toggle lever and motor drive connection taken on the line 5—5 of Fig. 4;

Fig. 6 is a cross sectional detail of a portion of the gearing mechanism taken on the line 6—6 of Fig. 4;

Fig. 7 is a cross sectional view of the remote control clutch-operating mechanism taken on the line 7—7 of Fig. 4; and

Fig. 8 is an end view of a modified caster in rolling engagement with a series of templets or tracks.

Generally speaking, the invention comprises a blowpipe-steering-and-driving unit U which supports a vertically disposed blowpipe B, adjacent the lower portion of which is mounted a rotatable traction wheel W for rolling engagement with a working surface S. A steering handwheel H disposed at the upper portion of the blowpipe B provides means for turning the traction wheel W and blowpipe B as a unit, preferably about the axis of the blowpipe. A triangular or three-cornered carriage C, provided with casters at two apexes, is journalled to the blowpipe-steering-and-driving unit at the third apex in such a manner that the entire carriage may pivot or rotate about the unit U without affecting the directional position of the unit with respect to the working surface S.

As shown in Figs. 1 and 2, the wheeled carriage C has tubular frame members 11, 12, and 13 disposed so as to form the sides of a triangle. A vertically positioned steering post 14 is secured at one apex to the members 11 and 12, for example, by welding, and the respective members 11 and 12 diverge downwardly therefrom. A vertically disposed caster-mounting sleeve 15 at each of the two remaining apexes joins the members 11 and 12 with the member 13. Casters 16 are swivelly held within the caster mounting sleeves 15 with the pintles thereof 17 extending coaxially upward into the sleeves. A nut 18 on each pintle maintains the caster in proper assembled position. The caster wheels 19, which are rotatably mounted within clevises 21 preferably comprise a large diameter portion 22 and one or more reduced diameter portions 23 coaxial with the large diameter portion and preferably on either side thereof. If desired, either or both of the portions 23 may be provided with an annular grove 24 for engagement with the upper edge of a templet, track, or rail T as shown in Fig. 8.

Lugs 25 and 26 are secured respectively to each clevis 21 and each sleeve 15. Each upper lug 26

is apertured and threaded to receive a locking screw 27 having a knurled head 28. Each screw 27 is provided with a chamfered tip 29 to firmly engage an aperture 31 in the lugs 25 so as to securely align the caster wheels 19 with each clevis facing away from the carriage, thereby increasing the wheel base or distance between the supports. If desired, other lugs 25 may be mounted in various positions about the clevis 21 in order that the casters 16 may be rigidly held in more than one predetermined position.

A metallic container 32 consisting of a sheet metal box having a hinged cover 33 is supported upon the member 13 as by means of mounting lugs 34. The container 32 may be used as a tool box to house lubricating fluid, waste, wrenches, etc., such as might be used for maintenance of the apparatus. A tubular hand rest 35 extends between the two frame members 11 to which members it is secured by clamps 36. Besides reinforcing the carriage, the hand rest serves as a means for assisting the operator in controlling the movement of the steering handwheel H, since the upper portion of the hand rest is of circular configuration spaced a slight distance from the periphery of the handwheel H. The blowpipe-steering-and-driving unit U is journalled within the steering post 14 in such a manner that the carriage C may revolve or rotate about the axis of the blowpipe as a center without affecting the directional position of the traction wheel. The carriage C thus functions to maintain the blowpipe B in a vertical position at all times and permits the traction wheel W to drive the blowpipe along the predetermined path. Preferably the blowpipe B is axially positioned within a hollow vertically disposed spindle 37 bifurcated at its lower end to receive a radius rod and the traction wheel mounting. The spindle 37 is journalled within the steering post 14 by means of an upper bearing 38 and a lower bearing 39, having an upper cone 41 and a lower cone 42 positioned so as to take up radial and end thrust. The handwheel H is secured to the spindle 37 as by a plurality of set screws 43 extending radially through the hub 44 and engaging the wall of the spindle 37. Resilient means, such as a plurality of compression springs 45 housed within the hub 44 exert a pressure upon the upper cone 41 so as to take up undesirable end play in the bearings. The spindle 37 is provided near its lower end with an inwardly projecting annular flange 46 which slidably engages the blowpipe B while holding it against lateral displacement. The blowpipe B, which is herein disclosed as a machine cutting blowpipe having a straight head, is mounted axially within the spindle in any convenient way which admits of vertical adjustment with respect to a working surface S. Acetylene and oxygen supply hoses A and O connect the blowpipe with sources of the respective gases. The blowpipe adjusting means may comprise a conventional thumb wheel and pinion for engagement with a longitudinally extending rack 47 secured to the blowpipe head. The blowpipe adjustment mechanism may otherwise comprise a rotatable sleeve 48, the inner periphery of which is preferably provided with right and left hand threads for operative engagement with corresponding threads formed respectively on the upper end of the spindle 37 and on the outer periphery of a clamping nut 49. The nut 49 is provided with a contractible clamp 51 for firmly gripping the blowpipe head. A finger 52 depends from the nut 49 in the annular space between the blowpipe and the inner wall of the spindle 37. A pair of tongues 53 project inwardly from the wall of the spindle 37 and serve as a vertical guide for the finger 52 and at the same time inhibit rotational movement of the nut 49 with respect to the spindle 37. A plurality of radially extending handles 54 integral with the sleeve 48 provide means for rotating the sleeve so as to obtain vertical positioning or adjustment of the blowpipe B. The finger 52 is of sufficient length to engage the tongues 53 throughout the entire distance travelled in the vertical adjustment.

The lower portion of the spindle 37 terminates in a fork 55 composed of a radius rod mounting bracket 57 and a traction wheel mounting bracket 56. The bracket 56 is provided with an aperture 58 to receive a hollow cylindrical stud 59 projecting from the face of a motor mounting bracket 61. The traction wheel W and shaft 66 are rotatably mounted by means of a bearing 62, secured coaxially within the stud 59 by a retaining plate 60. The traction wheel W is positioned closely adjacent to the nozzle 63 at the lower end of the blowpipe B and is adapted to roll about its own axis and to revolve in an orbit about the blowpipe directly upon the metal plate or working surface S under treatment. The motor mounting bracket 61 is secured to the bracket 56 in any conventional manner as by means of a dowel pin and machine screws 65. The traction wheel shaft 66 engages the bearing 62 at its intermediate portion while the end portion remote from the traction wheel is provided with threads 67 to accommodate a gear 69 which is threaded upon the shaft 66 and is held in position by a locking bushing 71. An identically dimensioned gear 68 floats about the bushing 71 in concentric alignment with the gear 69, and both gears being in operative engagement with a pinion 73 in the transmission gear train. A heavy tension spring connected between arms of the respective gears 68 and 69 urges the gear 68 to rotate with respect to the gear 69, thus causing the teeth to tightly grip the teeth of the pinion 73 without objectionable backlash.

The bracket 61 is provided with a horizontal platform 74 which extends substantially parallel to the working surface transversely away from the blowpipe B for receiving the power means or driving motor M. Electric current is supplied to the motor M through wires 75 and 76 contained in an armored conduit 77 which extends upwardly through the spindle in the annular space between the inner periphery of the spindle and the wall of the blowpipe. The upper terminals of the wires 75 and 76 make suitable connection with a source of electric power. The motor M is provided with a built-in speed reduction unit 78 and a centrifugal type governor 79 suitably calibrated preferably in terms of linear velocity as indicated in Fig. 1.

Power is transmitted from the speed reduction unit 78 to the gear transmission system through shaft 81 which connects with gear 82 through a flexible shaft coupling 83. A post 84, projecting outwardly from the bracket 61 as indicated in Fig. 5, serves as a rotatable mount for the gear 82, and as a fulcrum for a toggle lever 85. A pinion 86 is rotatably mounted to the lever 85 in rolling engagement with the gear 82. A toggle arm 87, having a forked end 88 engaging an annular grooved portion 89 of a post 91, is articulated with respect to the toggle lever 85 by means of a pin 92. A compression spring 93 inserted

between the end of the lever 85 and the post 91 urges the lever 85 to either side of the dead center position. A boss 94, provided with an adjustable stop 95, limits the movement of the toggle lever 85 at the right of the dead center position, as indicated in Fig. 4. The stop 95 is adjusted so that when the lever 85 is in the extreme right position, the pinion 86 is properly meshed with the gear 96. The pinion 73 which is coaxially fixed to the gear 96 is enmeshed with the gears 68 and 69 to complete the gear train. Accordingly, when rotary motion is imparted to the shaft 81 while the gear train is in the position shown in Fig. 4, the motion is transmitted respectively through the gear 82, pinion 86, gear 96, and pinion 73 to the gears 68 and 69, the latter of which are secured to the traction wheel. In order to disengage the traction wheel from the motor to provide free-wheeling, the toggle lever 85 is shifted to the left position in order to move the pinion 86 out of engagement with the gear 96. This may best be accomplished by means of a clutch lever 97 extending outwardly through a slot 98 in the transmission housing 99. A downward motion of the lever 97 causes the toggle members 85 and 87 to snap into the left hand position against the transmission housing 99, thereby disengaging the pinion 86 from the gear 96. A similar clutch lever 101 is positioned on the opposite side of the bracket 61 and consists of a bell crank 102 fulcrumed to a pivot 103 and having a connecting rod 104 articulated at its ends with the lever 85 and the bell crank 102 respectively. Accordingly, the clutch mechanism may be disengaged by a downward pressure on either lever 97 or 101. An auxiliary carriage support or skid 105 may be provided for one or more of the supporting wheels. The skid 105 may comprise an extension or projecting rib of the bracket 61, which extends downwardly adjacent to and substantially parallel with the traction wheel W to within a short distance of the working surface S. The support 105 extends horizontally beyond the periphery of the traction wheel W to engage the working surface and support the traction wheel and carriage when the traction wheel abuts against an edge of the working surface at the beginning or end of its travel, as indicated in broken lines in Fig. 4.

The radius rod mounting bracket 57 of the fork 55 depends from the spindle 37 on the side of the blowpipe opposite the traction wheel W and terminates in a radius rod clamp 106. A radius rod 107, which is detachably secured rigidly within the clamp 106 substantially parallel to the working surface by means of a clamping screw 108, extends beneath the carriage in the plane of the blowpipe. A collar 109 is adapted to slide along the radius rod 107 and may be held in any desired position by means of a thumb screw 111. A pivot point 112 is mounted within a depending post 113 of the collar 109 and is tubular at its upper portion to receive a compression spring 114. A longitudinally extending slot 115 is formed in the wall of the tubular portion to slidably receive the end of a set screw 116. The spring 114 urges the pivot point downwardly while the set screw rides within the slot 115 and retains the pivot point 112 when the machine is lifted from the supporting surface. The radius rod 107 preferably is of square or other polygonal cross section, and the bore formed in the collar 109 to receive the radius rod may be of similar cross section, to properly guide the collar upon the rod in one or more radial positions. If desired, however, the collar aperture may comprise a circular bore circumscribing the polygonal radius rod 107. In this manner, the collar may be maintained in the position indicated in Fig. 2 by pressure of the thumb screw 111 against the flat side of the square radius rod 107. The pivot point 112 may be shifted 90° from the operative position by loosening the thumb screw 111, rotating the collar a quarter turn, and again tightening the thumb screw so that it engages the flat bottom surface of the radius rod 107. The depending post 113 is offset from the collar 109 so as to clear the clamp 106, thereby permitting the pivot point 112 to come closely adjacent to the nozzle 63 of the blowpipe B to allow cutting circles of small diameter. The circle cutting range of the apparatus may be extended by reversing the position of the collar 109 so that the post 113 is positioned away from the blowpipe B. For cutting circles of extremely large radius, the rod 107 may be removed from the clamp 106 and inserted in a similar auxiliary clamp 117 depending from the frame member 13.

A locking boss 118 extends outwardly from the lower extremity of the steering post 14 and is provided with a threaded aperture 119 to receive a locking screw 121. Lugs 122 extend outwardly on opposite sides of the fork 55 and are provided with recesses 123, which may be selectively aligned with the threaded aperture 119. The locking screw 121 preferably is provided with a knurled cap 124 and a chamfered tip 125 for engagement with the respective recesses 123 so as to firmly clamp the fork in one or more predetermined positions. When the locking screw 121 is raised into disengaged position and the screws 27 of the casters are likewise in inoperative position, the carriage C may be rotated about the blowpipe-steering-and-driving unit without changing the position of either the blowpipe or the traction wheel. This arrangement permits the apparatus to be employed on plates of relatively small size, for example, those only slightly in excess of the size required to support the machine.

Preferably the contour to be followed is drawn directly on the plate or working surface S and the machine placed thereon with the blowpipe or similar tool positioned directly over the contour line. With the pivot point 112 in disengaged position, the motor is started and the proper drive speed selected by means of the governor 79. The vertical position of the blowpipe B is adjusted by means of the sleeve 48, after which the blowpipe jet is ignited and the traction wheel set in motion at the desired time by raising either lever 97 or 101. The direction of the traction wheel and hence that of the blowpipe is changed by rotating the handwheel H. Under ordinary conditions, the carriage C supported by the casters 16 will trail behind the blowpipe. However, where space is limited, the carriage C may be shifted manually into any position on the working surface capable of providing a support for the casters 16. When the apparatus is in an initial or final position adjacent to an edge of the plate or working surface, the casters rest on the supporting surface with the blowpipe positioned a slight distance over from the edge. The traction wheel W at such time no longer rests on the working surface and provides neither traction for the blowpipe nor support for the carriage. Under these conditions, the auxiliary support 105 engages the working surface adjacent to the edge and supports the traction wheel and blowpipe substantially in operative position without the need of

an extra supporting plate. When it is necessary for the blowpipe to turn about a sharp corner, or a corner having a relatively small radius, without stopping the machine, the traction wheel should preferably follow about the outside of the contour being followed so that the blowpipe may pivot solely about its own axis. Since the entire supporting mechanism consisting of handwheel H, spindle **37**, and fork **55**, pivots about the axis of the blowpipe, very sharp corners may be formed.

When cutting circles, the radius rod is secured to either the clamp **106** or the auxiliary clamp **117** and the collar positioned along the rod so that the pivot point is spaced from the blowpipe nozzle **63** a distance equivalent to the radius of the circle to be cut. A slight indentation may be made in the working surface by means of a center punch to properly locate the point **112**. With the casters **16** free to swivel within the sleeves **15**, and with the carriage free to rotate about the spindle **37** if clamp **106** is used, the necessary preliminary adjustments to the motor and blowpipe are made, after which the traction wheel is set in motion. As the carriage C is provided with three-point support, automatic compensation is made for irregularities in the working surface. When the pivot point is placed in engaging position against the working surface, a fourth support is provided for the carriage. Unless compensation were made, irregularities in the working surface would cause the machine to rock about two of its supports. By providing the compression spring **114**, the pivot point **112** may slide in and out of the post **113**, and the weight of the machine is at all times distributed to the three wheels and the pivot point. Since the radius rod **107** is rigidly secured to the fork **55**, the pressure exerted against the pivot point may be controlled by suitably designing the spring **114**. In this manner, the pivot point may be maintained in its position by a relatively strong pressure without the need of an exceptionally heavy collar **109** for weighting the pivot point.

When making straight line cuts, the casters **16** and the traction wheel W may be locked in parallel relationship by means of the screws **27** and **121**. The traction wheel may be locked either in the position indicated in Fig. 1, or in a position 180° therefrom with the motor under the carriage, and the casters may be locked in the position indicated in broken lines in Fig. 1 so that the machine in effect travels sidewise. However, by properly positioning the lugs **25** on each clevis **21**, the casters may be locked in the position indicated in full in Fig. 1, and in a similar manner the traction wheel may be locked in a position perpendicular to that shown in Fig. 1. If straight line cutting of greater precision is required, a templet rail, for example, the upturned edge of a structural angle T may be used to engage the grooves **24** of the casters **16**, preferably while the casters are locked in the position indicated in broken lines in Fig. 1. If each caster is provided with two grooved reduced diameter portions, a series of templet rails T may be set parallel in spaced overlapping relationship so that the casters roll successively on alternate reduced diameter portions, as shown in Fig. 8.

It is obvious that various modifications may be made to the apparatus herein disclosed without departing from the scope of the invention or sacrificing any of its advantages.

I claim:

1. A portable blowpipe apparatus comprising a wheeled carriage; a vertically disposed blowpipe; and a traction wheel rotatable about its own axis, and revolvable about the axis of said blowpipe.

2. A portable blowpipe apparatus comprising a wheeled carriage; a vertically disposed blowpipe rotatably mounted on said carriage; a traction wheel spaced from said blowpipe and being free to revolve about said blowpipe as said blowpipe is rotated; and means for rotating said traction wheel about its own axis.

3. A portable blowpipe apparatus comprising a blowpipe-steering-and-driving unit; and a carriage provided with a plurality of casters for supporting said unit in operative relation to a working surface, said carriage being mounted to revolve about said unit.

4. A portable blowpipe apparatus comprising a blowpipe-supporting-and-driving unit; and a wheeled carriage for supporting said unit in operative relation to a working surface, said carriage being secured at one end to said unit and being revolvable in an orbit about said unit.

5. A portable blowpipe apparatus comprising a carriage; a vertically disposed blowpipe supported by said carriage; a traction wheel adjacent to said blowpipe; and a hand wheel for steering said traction wheel about the axis of said blowpipe.

6. A portable blowpipe apparatus comprising a substantially three-cornered carriage; a directionally-movable traction wheel adjacent to one apex of said carriage; a blowpipe adjacent to said traction wheel; a handwheel for steering said wheel about a vertical axis; and casters supporting said carriage at the remaining apexes thereof.

7. A portable blowpipe apparatus comprising a substantially three-cornered carriage; a vertical steering post adjacent to one apex of said carriage; a hollow spindle journalled within said post; a blowpipe secured axially within said spindle; a traction wheel rotatably mounted about a substantially horizontal axis to the lower portion of said spindle in spaced relation to said blowpipe and revolvable about the axis of said blowpipe in response to rotary movement of said spindle; and casters secured to said carriage at the remaining apexes thereof.

8. Blowpipe apparatus comprising a carriage free to move universally in a plane; a blowpipe mounted on said carriage; steering mechanism; a traction wheel; power means; transmission mechanism extending between said power means and said traction wheel; said traction wheel, said transmission mechanism, and said power means being mounted on the lower portion of said steering mechanism and being free to revolve about the axis of said steering mechanism beneath said carriage.

9. Blowpipe apparatus comprising a carriage free to move universally in a plane; a vertical steering post secured to said carriage; a hollow steering spindle journalled within said post; a handwheel secured to the upper portion of said spindle; a blowpipe axially positioned within said spindle; a traction wheel rotatably mounted about its axis to the lower portion of said spindle, whereby the directional position of said traction wheel may be varied in response to rotational movement of said steering handwheel.

10. Blowpipe apparatus as claimed in claim 9

including means for selectively locking said traction wheel in at least one directional position.

11. Blowpipe apparatus as claimed in claim 9 including a rotatable sleeve in threaded engagement with said spindle and with said blowpipe for adjusting the vertical position of said blowpipe.

12. A portable blowpipe apparatus comprising a supporting carriage; and a blowpipe-steering-and-driving unit; said blowpipe-steering-and-driving unit including a hollow spindle, a blowpipe mounted vertically within said spindle, a steering handwheel on said spindle, a traction wheel and traction-wheel driving means mounted against said spindle adjacent to the lower end of said blowpipe; said supporting carriage comprising a frame journalled to said spindle, and a plurality of casters supporting said frame at points separated from said spindle, whereby said carriage may rotate about said spindle without affecting the directional position of said blowpipe-steering-and-driving unit.

13. Portable blowpipe apparatus as claimed in claim 12 including means for locking said carriage with respect to said blowpipe-steering-and-driving unit; and means for locking said casters in a position parallel to said traction wheel.

14. A blowpipe apparatus comprising a carriage free to move universally in a plane over a working surface; a blowpipe supported by said carriage; a traction wheel rotatably secured to said carriage and engaging the working surface; a rigid radius rod secured to said carriage substantially parallel to the working surface; a pivot point extending from said rod toward the working surface; and resilient means for urging said point against the surface.

15. In a portable blowpipe apparatus, a carriage having at least one wheel-support in rolling contact with a working surface; a rigid blowpipe supported by said carriage; a radius rod secured to said carriage substantially parallel to the working surface; a pivot point depending from said rod and movable toward and away from the working surface; and resilient means for urging said point against said surface.

16. A portable blowpipe apparatus comprising a wheeled carriage; and blowpipe-supporting and driving means; said means comprising a hollow spindle journalled to said carriage; a blowpipe supported within said spindle; a traction wheel rotatably mounted on said spindle; thrust bearings for journalling said spindle to said carriage; and resilient means acting upon said bearings to take up end play therein.

17. In a welding and cutting machine, a carriage free to travel over a working surface; a traction wheel rotatably secured to said carriage for rolling engagement with the working surface; a blowpipe supported by said carriage; and an auxiliary carriage support comprising a skid adjacent to the traction wheel at one side of and a slight distance above the point of rolling contact, normally in spaced relation to the working surface, whereby when said blowpipe and said traction wheel reach the end of travel at an edge of the working surface, said skid is lowered into engagement with the working surface to stop the motion of said carriage.

18. In a portable blowpipe apparatus, a vertically disposed blowpipe; a traction wheel mounted for rolling engagement with a working surface in fixed relation to said blowpipe, and a wheeled carriage for maintaining said blowpipe and said traction wheel in operating position, said carriage being journalled with respect to said blowpipe and said traction wheel, and being free to rotate about said blowpipe.

19. In a portable blowpipe machine, a wheel-supported carriage; a blowpipe and a traction wheel journalled about the axis of said blowpipe to said carriage; a handwheel secured to said blowpipe for turning said blowpipe and steering said traction wheel; and a hand rest secured to said carriage adjacent to said handwheel.

20. In a portable blowpipe machine, a carriage; a blowpipe supported thereby; a plurality of casters supporting said carriage, said casters comprising a large diameter portion for rolling engagement with a working surface, and a grooved smaller diameter portion concentrically arranged on either side of said large diameter portion for engaging the top edge of a templet rail.

21. A portable blowpipe machine comprising a wheeled carriage; and a blowpipe-steering-and-driving mechanism journalled to said carriage, said mechanism comprising in combination with a vertically disposed blowpipe, a directionally movable traction wheel rotatably mounted adjacent to the lower end of said blowpipe, a bracket adjacent to said traction wheel extending transversely away from said blowpipe, and a traction wheel motor mounted on said traction wheel and bracket.

22. A portable blowpipe machine as claimed in claim 21 wherein said traction wheel, said bracket, and said traction wheel driving means are mounted lower than said carriage, and are free to rotate beneath said carriage as a unit about a vertical axis.

23. A portable blowpipe apparatus comprising a blowpipe-steering-and-driving unit; a bracket secured to the lower portion of said unit; power means operatively connected with said unit, said power means being supported by said bracket; and a wheeled carriage for supporting said unit in operative relation to a working surface, said carriage being revolvable in a horizontal plane about the axis of said unit and above said bracket and power means.

24. A portable blowpipe as claimed in claim 21 wherein said carriage is provided with frame members sloping downwardly away from the journalled connection between the carriage and the blowpipe steering and driving mechanism.

25. In a portable blowpipe machine, a carriage; a traction wheel rotatably secured to said carriage; a blowpipe supported by said carriage; power means; and transmission mechanism extending between said power means and said traction wheel, said mechanism including a train of gears, a toggle pivoted to the axis of one of the gears in said train, a pinion rotatably mounted on said toggle and meshing with the gear to which said toggle is pivoted, and operating means for actuating said toggle to engage and disengage said pinion from another gear in said train of gears to thereby connect and disconnect said traction wheel from said power means.

26. In a portable blowpipe machine, structure as claimed in claim 25 including a casing for surrounding said transmission mechanism, and wherein said operating means extends outwardly through said casing.

27. In a blowpipe apparatus, a movable carriage; a blowpipe supported thereby; power means; and transmission mechanism connected

to said power means for driving said carriage, said transmission mechanism including a train of gears at least one of which comprises a pair of identical gears in concentric juxtaposed relation free for relative rotational movement, a pinion meshed with both of said identical gears, and means compensating for backlash comprising resilient means connecting said identical gears and urging one to be displaced rotationally with respect to the other so as to tightly engage the teeth of said pinion.

28. A portable blowpipe apparatus comprising a blowpipe-steering-and-driving unit; a carriage having a plurality of wheels for supporting said unit in operative relation to a working surface, said carriage being mounted to revolve about said unit; and a radius rod secured to said unit at right-angles to and coplanar with the axis of said unit for pivoting said apparatus about a fixed center.

29. A portable blowpipe apparatus comprising a blowpipe-steering-and-driving unit; a radius rod secured to and extending away from said unit for pivoting said apparatus about a fixed center; and a wheeled carriage for supporting said unit in operative relation to a working surface, and being mounted to said unit to revolve above said radius rod and about the axis of said unit.

30. In a portable blowpipe apparatus, a carriage; a traction wheel rotatably mounted to said carriage; a blowpipe supported by said carriage adjacent to said traction wheel; a radius rod for pivoting said apparatus about a fixed center; a radius rod mounting means adjacent to said blowpipe; and a second radius rod mounting means secured to said carriage remote from said blowpipe, said means being thereby adapted to secure said radius rod at respectively different distance from said blowpipe to vary the effective radius of said apparatus.

31. A portable blowpipe apparatus comprising a triangular carriage; a steering post at one apex thereof; casters at the remaining apexes thereof; a hollow spindle journalled within said post; a vertically adjustable blowpipe axially secured within said spindle; a directionally movable traction wheel mounted upon said spindle adjacent to said blowpipe; steering means for varying the rotary position of said spindle; means for locking said steering means in at least one position; a bracket at the lower portion of said spindle; traction wheel driving means on said bracket; a radius rod rigidly secured to said spindle; a collar slidable on said radius rod; means for inhibiting rotation of said collar on said rod when in interfitted relation; a pivot point extending from said collar; and an auxiliary support for supporting said carriage when said traction wheel no longer rests on the supporting surface.

LLOYD W. YOUNG.

CERTIFICATE OF CORRECTION.

Patent No. 2,148,666. February 28, 1939.

LLOYD W. YOUNG.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 68, strike out the word "from"; page 5, first column, line 40, claim 15, strike out the word "rigid" and insert the same before "radius" in line 41, same claim; and second column, line 30, claim 21, strike out "traction wheel and" and insert the same after "said" in line 29, same claim; line 48, claim 24, after "blowpipe" insert machine; page 6, second column, line 8, claim 30, for "distance" read distances; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 4th day of April, A. D. 1939.

Henry Van Arsdale

(Seal) Acting Commissioner of Patents.

to said power means for driving said carriage, said transmission mechanism including a train of gears at least one of which comprises a pair of identical gears in concentric juxtaposed relation free for relative rotational movement, a pinion meshed with both of said identical gears, and means compensating for backlash comprising resilient means connecting said identical gears and urging one to be displaced rotationally with respect to the other so as to tightly engage the teeth of said pinion.

28. A portable blowpipe apparatus comprising a blowpipe-steering-and-driving unit; a carriage having a plurality of wheels for supporting said unit in operative relation to a working surface, said carriage being mounted to revolve about said unit; and a radius rod secured to said unit at right-angles to and coplanar with the axis of said unit for pivoting said apparatus about a fixed center.

29. A portable blowpipe apparatus comprising a blowpipe-steering-and-driving unit; a radius rod secured to and extending away from said unit for pivoting said apparatus about a fixed center; and a wheeled carriage for supporting said unit in operative relation to a working surface, and being mounted to said unit to revolve above said radius rod and about the axis of said unit.

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