F. A STEVENSON.

SIDE REAMING MACHINE.

APPLICATION FILED MAR. 4, 1916.

1,256,073.

Patented Feb. 12, 1918.

6 SHEETS—SHEET 1.

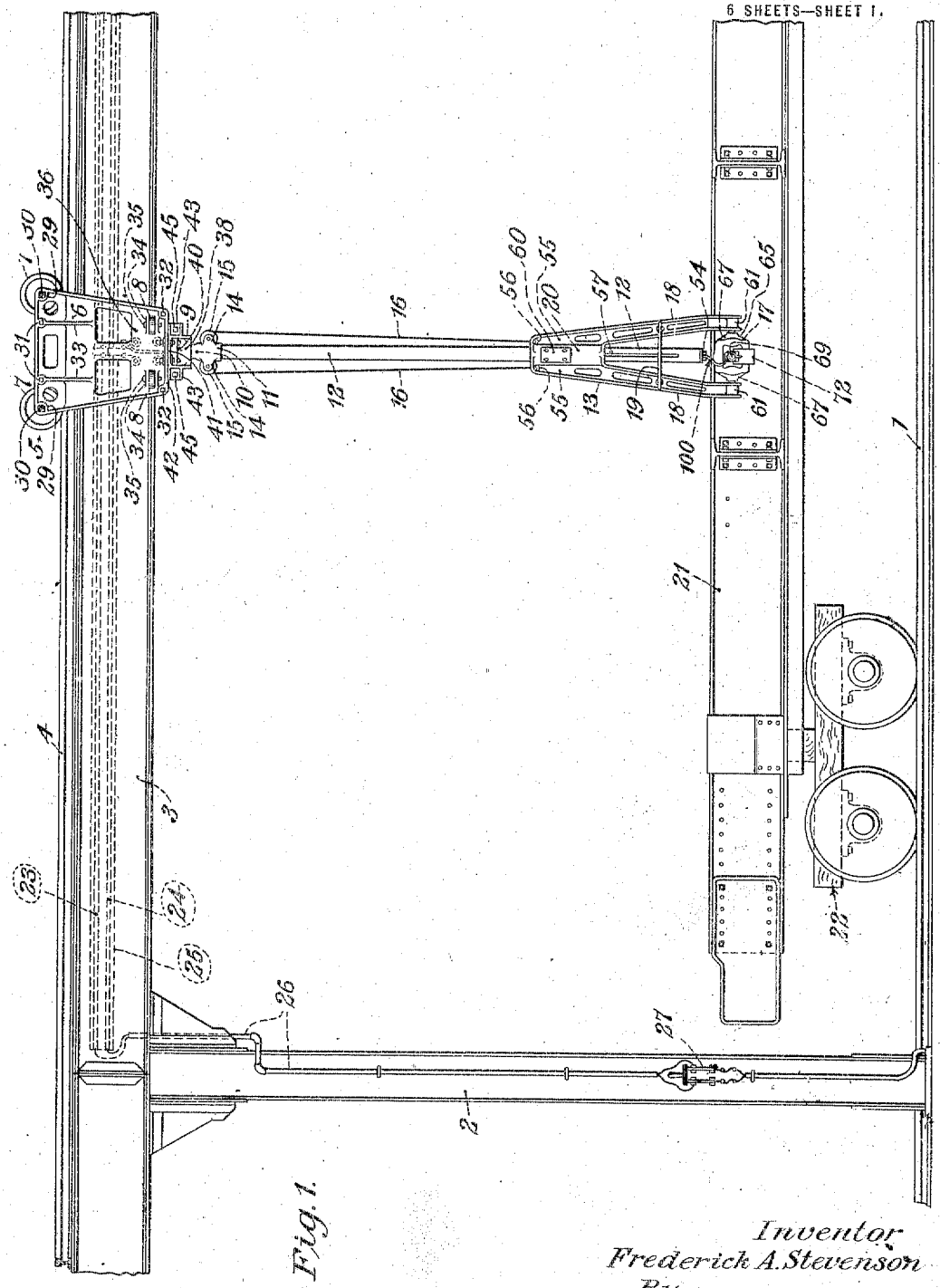


Fig. 1.

Inventor
Frederick A. Stevenson
By T. H. Gibbs
Attorney

F. A. STEVENSON.

SIDE REAMING MACHINE.

APPLICATION FILED MAR. 4, 1916.

1,256,073.

Patented Feb. 12, 1918.

6 SHEETS—SHEET 2.

Fig. 4.

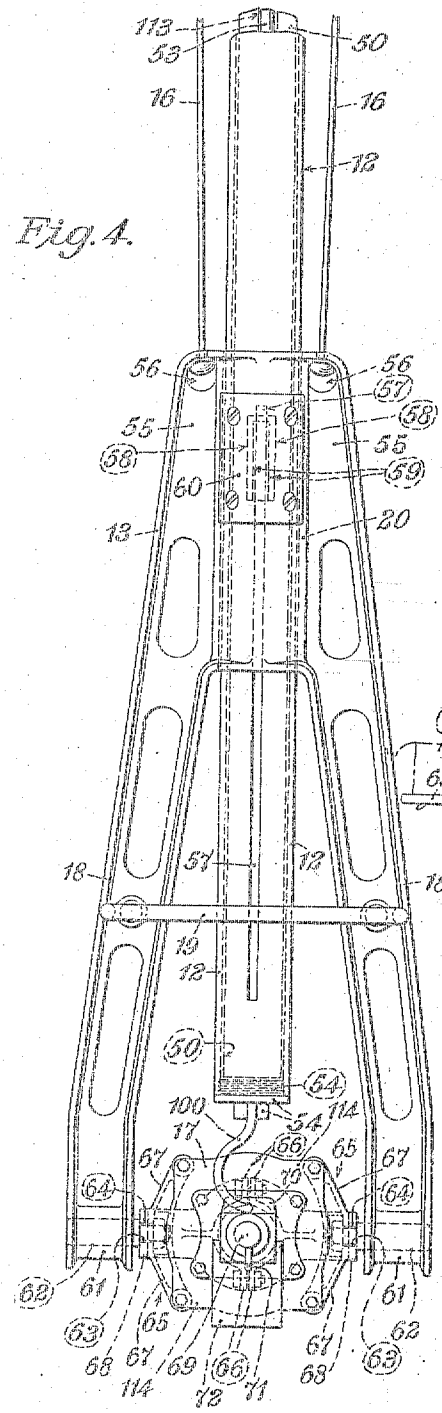


Fig. 2.

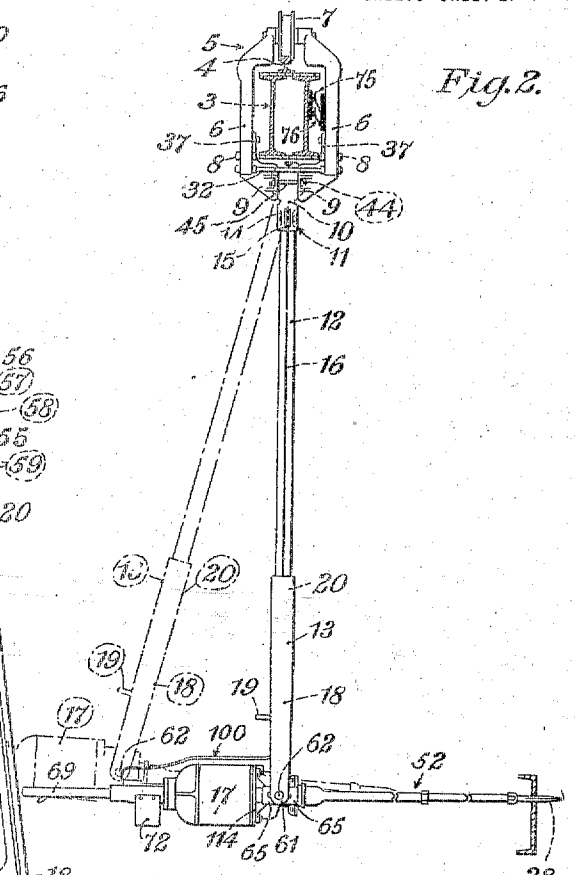
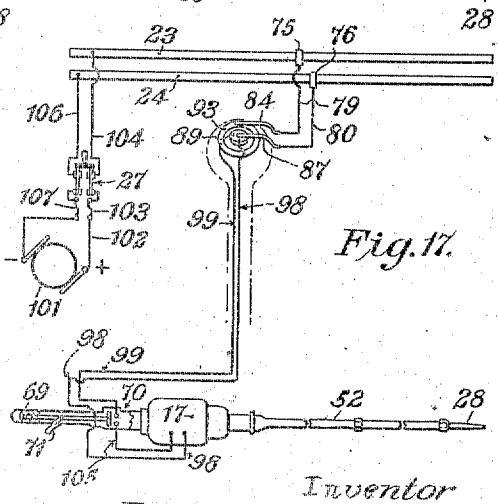


Fig. 17.



Inventor

Frederick A. Stevenson

By T. N. Tibbs

Attorney

F. A STEVENSON.

SIDE REAMING MACHINE.

APPLICATION FILED MAR. 4, 1916.

1,256,073.

Patented Feb. 12, 1918.

6 SHEETS—SHEET 3.

Fig. 3.

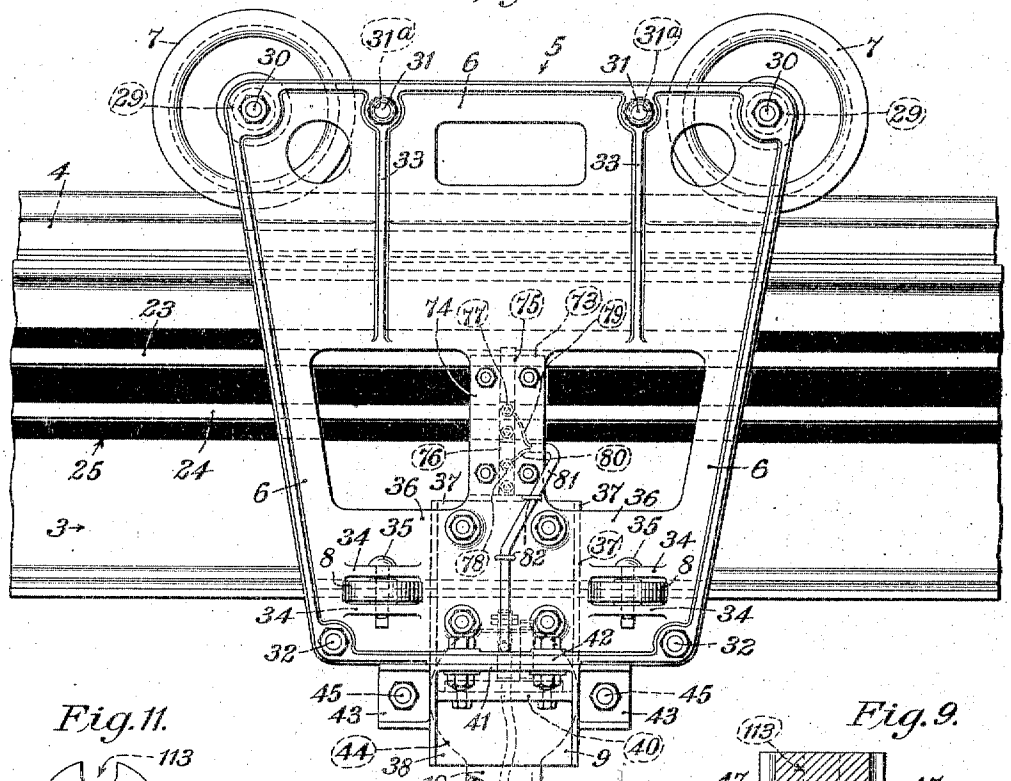


Fig. 11.

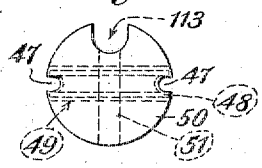


Fig. 9.

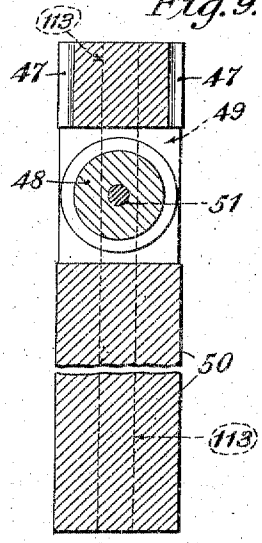


Fig. 10

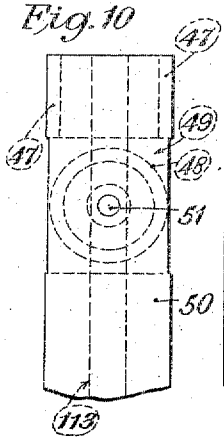
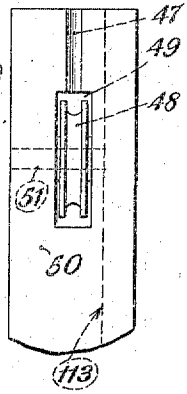


Fig. 12.



Inventor

Frederick A. Stevenson

By T. H. Gibbs

Attorney

F. A. STEVENSON.

SIDE REAMING MACHINE.

APPLICATION FILED MAR. 4, 1916.

1,256,073.

Patented Feb. 12, 1918.

6 SHEETS—SHEET 4.

Fig. 5.

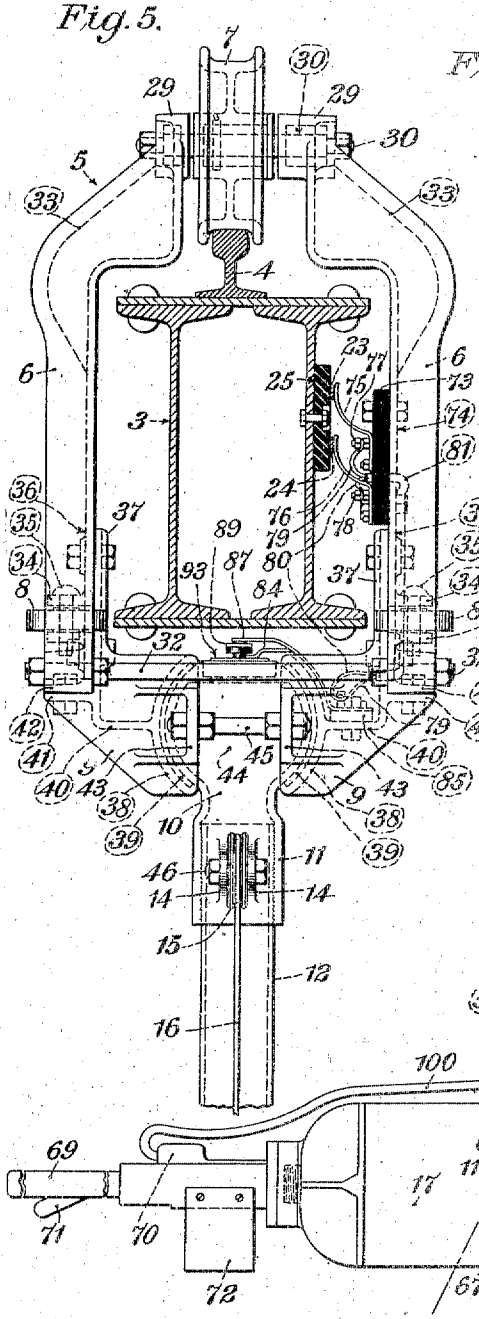


Fig. 6.

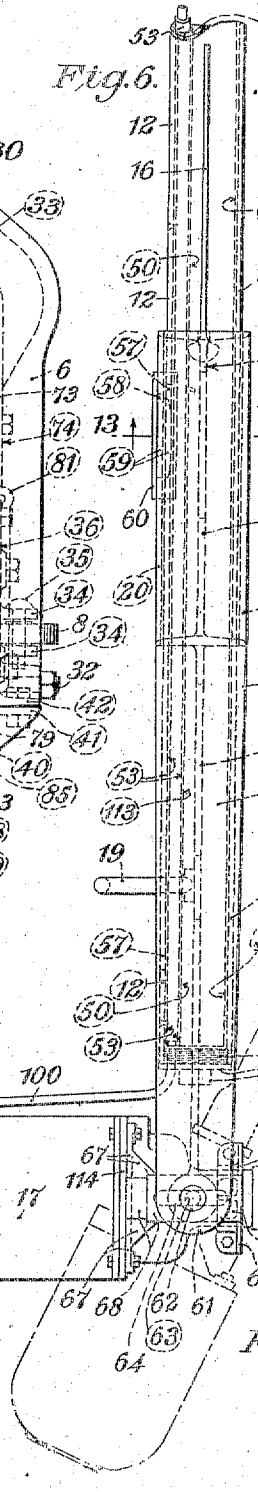


Fig. 13.

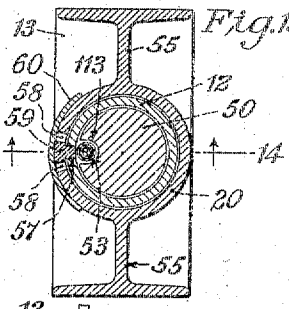
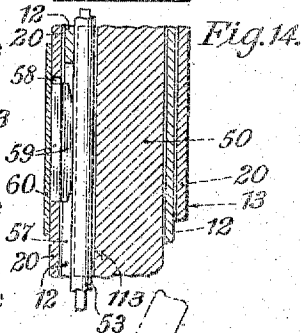


Fig. 14.



Inventor
Frederick A. Stevenson
By J. H. Libby
Attorney

F. A STEVENSON.

SIDE REAMING MACHINE.

APPLICATION FILED MAR. 4, 1916.

1,256,073.

Patented Feb. 12, 1918.

6 SHEETS—SHEET 5.

Fig. 7.

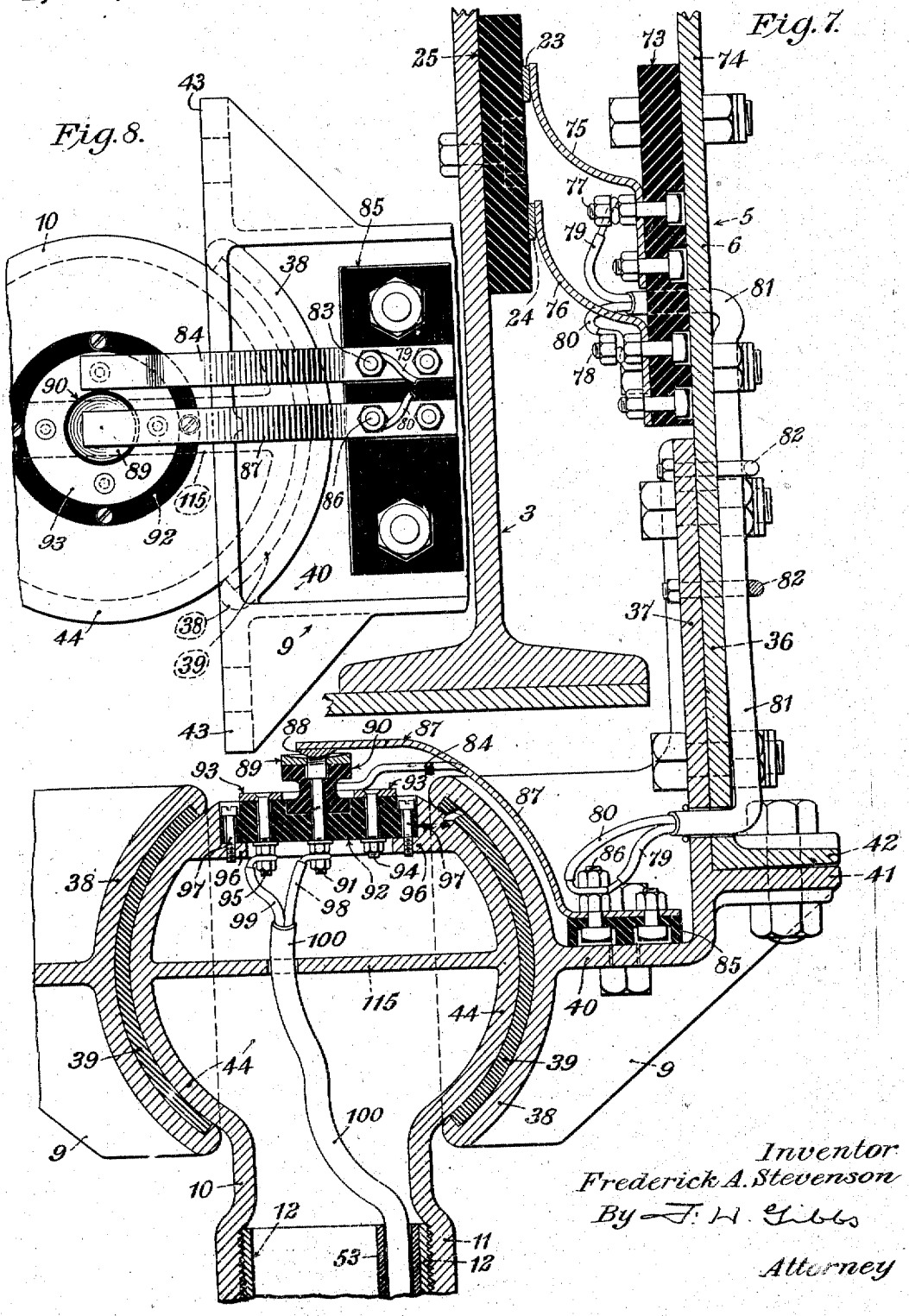


Fig. 8.

Inventor
Frederick A. Stevenson
By F. H. Gibbs
Attorney

F. A STEVENSON.

SIDE REAMING MACHINE.

APPLICATION FILED MAR. 4, 1916.

1,256,073.

Patented Feb. 12, 1918.

6 SHEETS—SHEET 6.

Fig. 18.

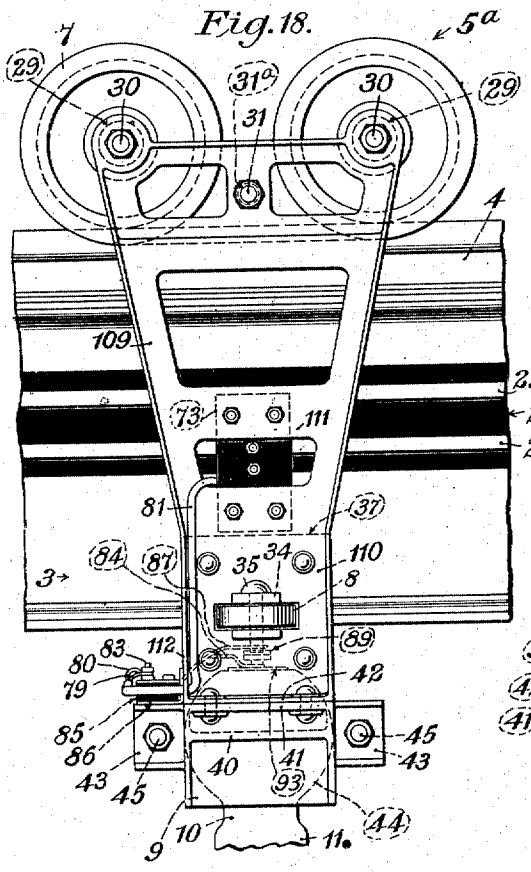


Fig. 19.

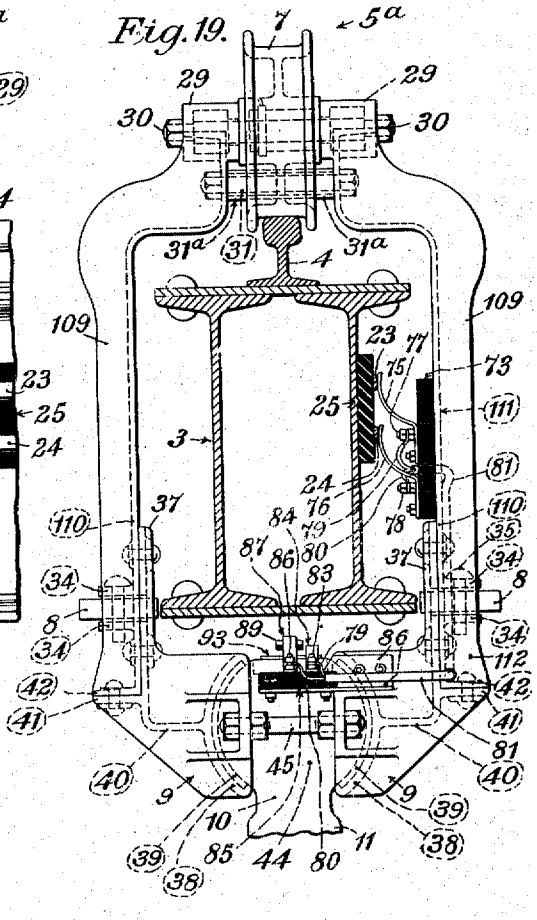


Fig. 15.

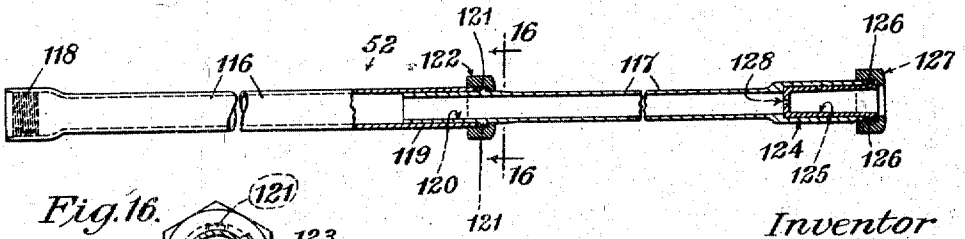
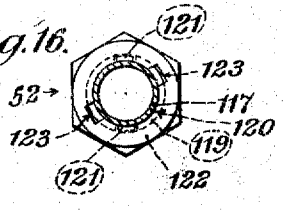


Fig. 16.



Inventor

Frederick A. Stevenson

By T. H. Gibbs

Attorney

UNITED STATES PATENT OFFICE.

FREDERICK A. STEVENSON, OF DETROIT, MICHIGAN, ASSIGNOR TO AMERICAN CAR AND FOUNDRY COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF NEW JERSEY.

SIDE REAMING-MACHINE.

1,256,073. Specification of Letters Patent. Patented Feb. 12, 1918.

Application filed March 4, 1916. Serial No. 82,119.

To all whom it may concern:

Be it known that I, FREDERICK A. STEVENSON, residing at Detroit, Michigan, and being a citizen of the United States, have invented certain new and useful Improvements in Side Reaming-Machines, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and to use the same, reference being had to the accompanying drawings, which illustrate the preferred form of the invention, though it is to be understood that the invention is not limited to the exact details of construction shown and described, except as required by the scope of the claims, as it is obvious that various modifications thereof will occur to persons skilled in the art.

In said drawings:

Figure 1 is a side elevation of such a car building track as is present in the Detroit shops of the American Car & Foundry Company, and shows my portable reaming machine supported from the overhead structure.

Fig. 2 is a transverse section through Fig. 1, showing the reaming machine operating upon work in full lines, and in dot and dash lines showing its position just before such operation.

Fig. 3 is a side elevation of the upper portion of the reaming machine, mounted upon the overhead structure, and is viewed from within the track, some of the parts being shown in section.

Fig. 4 is a side elevation of the lower portion of the reaming machine, viewed from without the building track, and as the operator faces it.

Fig. 5 is a transverse section through the overhead structure of the building track and shows the upper part of the reaming machine in end elevation.

Fig. 6 shows the lower portion of the reaming machine viewed in the same direction as the parts of Fig. 5.

Fig. 7 is a transverse section through the overhead car building structure, showing the electrical connections to the upper part of the reaming machine, most of the parts of the upper portion of the reaming machine being in section.

Fig. 8 is a plan view, showing the contact fingers supported by one of the socket castings engaging the electrical contacting devices in the upper part of the ball casting.

Fig. 9 is a section through the counterweight, a considerable intermediate portion being broken out.

Fig. 10 is a side elevation of the upper part of the counterweight.

Fig. 11 is a plan thereof.

Fig. 12 is another view of the upper part of the counterweight, the direction of vision being at right angles to that of Fig. 10.

Fig. 13 is a horizontal section, taken on line 13—13 of Fig. 6 and illustrates the pipe post, the stirrup adapted to ride upon the lower portion thereof, the counterweight, an electrical conduit within the pipe post and means for permitting angular displacement of the reamer motor and the reaming bit carried thereby.

Fig. 14 is a fragmentary vertical sectional view, substantially on line 14—14 of Fig. 13, showing the key of Fig. 13, and its associated parts.

Fig. 15 is a sectional elevational view of the reamer spindle, a portion being shown in elevation.

Fig. 16 is a section taken on line 16—16 of Fig. 15.

Fig. 17 is an electrical diagram, showing the connections to the reamer motor.

Fig. 18 is a side elevation of a modified form of trolley, and corresponds to the right hand side of said trolley as shown in Fig. 19; and

Fig. 19 is a transverse section through the overhead girder and shows the modified form of trolley in end elevation, the right hand side thereof being that which faces the center of the building track.

The present invention relates to reaming machines and is especially adapted to performing work of devices of this kind as they are used to ream holes in a horizontal direction, through the sides of work.

Heretofore it has been customary to use hand reamers, and, as these hand reamers weigh upwardly from 100 lbs. it is extremely difficult to hold them in a horizontal position to ream holes in the side of work, requiring the use of at least two operators, and in some instances possibly a make-shift support.

An object of the present invention is to

utilize an overhead girder of an already present car building structure to support the reaming machine from, relieving the operator from the necessity of sustaining the weight, or any part thereof, of the reaming device, permitting him to devote his entire attention to the work in hand.

Another object is to cause the reaming machine to be portable, that it may travel along the overhead girder referred to to any position holes may be located in, in the work. It is further contemplated to incorporate in the reaming machine an ability for its reaming bit to reach holes included in a considerable zone, without the necessity of moving the reaming machine as a whole to reach such holes.

A feature of value is the ability of the reaming machine to be so operated that it will itself exert a feeding pressure for carrying the reamer bit through the hole being reamed, and provision is made for carrying the reamer motor, together with the bit operated thereby, to varying altitudes to reach any of a series of vertically arranged holes, or any independent hole.

A feature of merit is the suspension of the reamer motor at such a distance above the floor line that it is continuously kept away from dirt, which, in ordinary hand reamers that are customarily laid upon the floor, is consequently working into the reamer casings and necessitating frequent repairs.

The reaming machine has been designed so that when the operator ceases to use it, the reamer bit, which is found located at the end of a more or less lengthy reamer spindle, is automatically carried up and out of the way, preventing accidental injury to such reamer spindle and bit, and clearing the space between the reaming machine and the work of obstruction, when the reaming machine is not in use.

Novel arrangements have been created for carrying electrical current to and through the reaming machine to the reamer motor, and other advantageous features disclosed hereinafter are, of course, to be regarded as coming within the scope of this invention.

A good understanding of the general arrangement and use of my improved portable reaming machine may be had from inspection of Fig. 1, in which 1 indicates the rails of what is known in a car building shop as the building track. On each side of the building track, there are customarily a series of longitudinally spaced columns 2, one such column being shown in Fig. 1, and supported upon the columns 2 on each side of the track are overhead girders 3, mounted upon the top of one of which is a rail 4.

The arrangement here illustrated is substantially like one in service in the Detroit shops of the American Car & Foundry Company, but it is to be understood that another rail 4 may be mounted upon the girder supported by the row of columns 2 on the opposite side of the building track, and another reaming device, pointing in the opposite direction and toward the work, may be mounted upon the last mentioned girder 3. Also where the length of the overhead girders 3 is great enough between columns 2, more than one reaming device may be mounted upon each girder 3.

In Fig. 1, a transporting device, shown as a trolley 5, comprising side frames 6, trolley wheels 7, mounted in the upper portions thereof, guide wheels 8, mounted in the lower portion of the trolley and adapted to bear against girder 3, and socket castings 9, is shown to be suspended from girder 3 with its wheels 7 resting upon the rail 4. Seated in and held by the socket castings 9, is a ball casting 10 having a depending cylindrical portion 11, a pipe post 12 being screwed into cylindrical portion 11 of the ball casting, and extending downwardly toward the floor and terminating at an appropriate distance therefrom, to have its lower end positioned at a height substantially in accordance with the altitudes various pieces of work will occupy.

Mounted to slide upon the lower portion of the pipe post 12 is stirrup 13, preferably of aluminum, or other metal or alloy having a low specific gravity, which stirrup with post 12 and ball casting 10 forms an oscillatory motor support, the stirrup forming the immediate motor-support, and on the lower portion of the cylindrical part 11 of the ball casting 10 are outstanding lugs or arms 14, adapted to support idler sheaves 15. Cables 16, or like devices, are secured to the upper part of the aluminum stirrup 13, and extend up to and over the idler sheaves 15 and into the interior of the pipe post 12, being there secured to a counterweight to be later described.

Mounted in the lower portion of the stirrup 13, and so as to be rockable therein, is a reamer motor 17 from which projects a reamer spindle carrying a reamer bit directed toward the work. Due to the capability of reamer motor 17 to be rocked, the reamer extension and the bit carried thereby may be oscillated so that said reamer bit will reach holes at different altitudes. Spanning the downwardly projecting legs 18 of the reamer stirrup 13, is a grab handle 19, the reamer legs at their upper portions merging with a sleeve 20 of the stirrup.

When it is desired to operate upon work, such as the diagrammatically represented underframe 21, mounted upon work-receiving trucks 22, and the reaming machine is not in juxtaposition to the longitudinal location of a hole to be reamed, the operator

taking hold of grab handle 19 walks toward the location of such hole, and the trolley 5, easily responding to the pull exerted by his hand, moves in the same direction, causing the reaming machine to travel with the operator to the desired location. Said trolley 5 contains current-collecting devices (not shown in Fig. 1), which continuously engage contact strips 23 and 24 mounted upon an insulating strip 25, which is secured to girder 3 throughout a greater length of the girder than the longest possible required travel of the trolley 5. Electric wires, being secured to said contact strips 23 and 24, extend through a pipe conduit 26 to a main switch 27, mounted upon one of the columns 2, and electrical conductors extend from said switch 27, there being fuses interposed between the switch and the last mentioned conductors, to the bottom of said column 2 and from thence to a source of electrical energy.

As the operator brings the reaming machine to rest in juxtaposition to the place where the reaming operation or operations are to be performed, he slides the stirrup 13, whose sleeve 20 surrounds pipe post 12, up or down upon pipe post 12 to bring the reamer motor to approximately the proper height, and oscillating the suspended parts of the reaming machine to bring the pipe post 12 into the inclined position, shown in dot and dash lines in Fig. 2, directs the reamer bit 28 to the hole to be reamed.

Due to the angularity given to pipe post 12, as shown in Fig. 2 in dot and dash lines, pressure is created by gravity which is adapted to feed the reamer bit 28 through the work, relieving the operator of considerable physical effort to attain this, and giving him freedom to devote his attention to the refinements of the reaming operation.

After the hole being treated is reamed, the operator withdraws the reamer bit from the hole by another oscillation of pipe post 12, the reamer spindle moves to its out of use position automatically and the operator moving the trolley to different locations from time to time, as it is necessary to move from one reaming zone to another, continues the reaming operations.

Referring to Figs. 3, 5, 9, 10, 11 and 12, the upper part of the reaming machine will now be described more in detail. The upper corners of the trolley side frame 6 have formed, preferably integral therewith, bearings 29, those at the opposite ends of the trolley frame 5 each supporting an axle 30, upon each of which is mounted one pair of the trolley wheels 7, said axles 30 also acting as tie bolts for uniting the upper corners of the trolley side frames 6. Said side frames 6 are also secured together by tie bolts 31 in their upper portions and by tie bolts 32 at their lower corners, said tie bolts 31 being within tubular spacers 31ª adapted to space side frames 6 apart.

As shown in Fig. 5, the inwardly projecting portions of bearings 29 may be of varying lengths to position trolley wheels 7 in alinement with rails 4, when the latter are not centrally disposed upon girder 3, but said bearings may be uniformly dimensioned when said rails 4 are disposed upon the transverse center line of the girder 3, and trolley wheels 7 may be of the roller bearing type to cause the trolley 5 to move practically without friction. Trolley side frames 6 may be shaped to in general conform to the top and sides of girder 3, without carrying this formation to any unnecessary degree, as indicated in Fig. 5, and said frames 6 extend over and below the exposed side faces of girder 3, their bottom tie bolts 32 passing underneath said girder.

Excessive weight in the trolley side frames 6 may be avoided by introducing apertures, as shown in Fig. 3, and if desired, the side frames may be reinforced by ribs 33. Trolley guide wheels 8 in the lower portion of the trolley side frame 6 are positioned between supporting ears 34, extending outwardly from the outer surfaces of the trolley side frames 6, pins 35 extending through the supporting ears 34 and guide wheels 8 and acting as axles therefor, said guide wheels 8 passing through apertures in the web of said frame 6 and being in alinement with the lower flanges and bottom cover plate of the girder 3 with which they are adapted to contact as the trolley 5 is moved along rail 4.

In each trolley side frame 6, the lowermost weight-reducing apertures are positioned sufficiently above the bottom of said trolley side frames to leave a substantial vertical wall portion 36, and it is from this portion that the supporting ears 34, for the guide wheels 8 extend and in which are the apertures for the passage of said guide wheels 8 therethrough toward the bottom flanges and bottom cover plate of girder 3. The vertical wall portions 36 of the trolley side frames 6 each also forms an attachment surface for an upstanding extension 37 of one of a pair of socket castings 9, said extension 37 being bolted to said vertical wall portion 36 of the trolley side frame.

To be observed best in Figs. 3, 5, 7 and 8, each socket casting 9 further comprises a segmental spheric portion 38, shaped to retain a Babbitt or other anti-friction metal lining 39, a horizontal web 40, an attachment flange 41 adapted to lie against the bottom flange 42 of one of the trolley side frames 6 and outstanding wings 43. In its assembled condition the reaming machine his a spheroidal head 44 in the ball casting

10, which head is held between the socket castings 9 and in contact with the Babbitt linings 39, bolts 45 passing through wings 43 on the opposite sides of said socket castings 9 and being tightened sufficiently to permit said spheroidal head 44 of the ball casting 10 to turn within the socket castings and form therewith a universal joint.

The cylindrical portion 11 of the ball casting 10 is preferably internally screw threaded to receive the upper end of pipe post 12 and is diametrically slotted to permit the passage of the perimetrical portions of the idler sheaves 15, which sheaves are mounted upon pins 46 supported in the lugs, arms or ears 14 extending from ball casting 10, to pass within said pipe post 12.

The cables 16, which are secured at their lower ends to the stirrup 13, as best shown in Fig. 4, may in reality be a single cable, one end being secured to said stirrup 13, as shown in Fig. 4, and extending upwardly to and over one idler sheave 15, and into the interior of pipe post 12, thence running downwardly through the semi-cylindrical or other shaped groove or slot or a hole 47, to and under a sheave 48, located in a pocket 49, in a counterweight 50, said sheave being mounted upon a short pin or shaft 51, the latter being supported in a hole drilled in the said counterweight 50 to lie on either side of said pocket 49. After passing under sheave 48, cable 16 runs upwardly through another semi-cylindrical or other formed groove or slot or a hole 47 in the upper part of counterweight 50, to and through the apertures in the pipe post and cylindrical portion 11 of ball casting 10 for the diametrically opposed idler sheave 15, over the latter and downwardly to the upper end of stirrup 13, to which it is secured, as shown in Fig. 4.

Whenever stirrup 13 is moved upwardly or downwardly there is a responsive travel in an opposite direction of the counterweight 50 within pipe post 12, and when stirrup 13 is brought to rest the mass of the counterweight is such that stirrup 13 and the parts it carries, such as the reamer motor 17, reamer spindle 52 and reamer bit 28, remain stationary.

The reamer motor, the reamer spindle and bit usually are composed of metals having relatively high specific gravity, and to make the counterweight 50 of like material would require a counterweight of excessive length, necessitating an overlong pipe post 12 to receive it, the result being that the stirrup 13 mounted to slide upon the lower end of the pipe-post would either be positioned too low for some types of work, or the stirrup would be properly positioned and the pipe post would extend in an obstructive way too close to the floor line. And, therefore, the reamer stirrup 13 is preferably composed of aluminum or other light specific gravity metal and the counterweight is composed of a metal having a higher specific gravity than the metal for the reamer spindle and reamer bit, such as lead, this compensation in the character of the metals allowing the reamer motor to be placed at a proper and most convenient height and the pipe post to be of proper length.

Co-extensive with its length, the counterweight 50 also contains another and somewhat wider substantially semi-cylindrical groove 113, shaped to fit about a pipe conduit 53, secured to the internal wall of pipe post 12, as by screws, and which furnishes a passage for electrical conductors to the reamer motor. The pipe conduit 53 being secured to said pipe post, remains stationary, and the counterweight 50 embraces it and slides over the exterior of the major portion thereof. Further reference will be made to the pipe conduit hereinafter in connection with the electrical wiring of the reaming machine.

The counterweight 50 is conveniently inserted through the bottom of pipe post 12 which is internally screw threaded to receive a closing plug 54 at its bottom, said closing plug being apertured for the passage from the lower end of the pipe conduit 53 of a cable containing the wires, running to the reamer motor 17, said pipe conduit terminating shortly before reaching the closing plug 54.

Referring to Figs. 1, 2, 4, 5 and 13, the detailed construction of the lower portion of the reaming machine may be clearly understood. The stirrup 13 in both its depending leg portions 18 and the upper portion 55 which merges with the stirrup sleeve 20 is shown to be of I-shaped cross section, though it may have other form. The outer flanges of the depending legs 18 run upwardly becoming horizontal at the top of the stirrup sleeve and in this position are merged with stirrup sleeve 20, the web portion of the upper part of the stirrup 13 being perforated as at 56 directly under the horizontal flange portions and at each side of stirrup sleeve 20 to form pockets to receive means for attaching the ends of the cable 16, which ends extend through holes in the horizontal flange portions referred to and which holes open into said receiving-apertures 56. The securing means may be either knots or clamps adapted to occupy such pocket-forming apertures.

It is desirable that stirrup 13 be adapted to swivel an appropriate amount about pipe post 12, so that the reamer bit, which is carried by the reamer spindle secured to the reamer motor, may swing horizontally in front of the work within limits from one hole to be reamed to another. To make this possible a slot 57 is present in the lower

part of pipe post 12, and is of a length equal to or slightly exceeding the greatest vertical travel it may be desired to give to stirrup 13. In stirrup sleeve 20, in its upper portion is another slot 58 of sufficient height to receive a key 59. The inner edge of said key 59 fits within long slot 57 in the lower part of pipe post 12, to have a sliding fit therein, and that portion of key 59 which extends outside of pipe post 12 is wider than the part having the sliding fit therein and may have angularly disposed sides, the part extending outside of pipe post 12 occupying slot 58 which, as may be seen best in Fig. 13, is considerably wider than the part of key 59 extending into it. Because of the difference in the width of that part of key 59 which extends outside of pipe post 12 and into slot 58 of stirrup sleeve 20, and the width of said slot 58, the stirrup 20 may revolve about pipe post 12 an amount equal to the lost play between key 59 and the edges of slot 58. In so turning, the stirrup 13 also gives an equivalent horizontal turning of reamer motor 17, and as the reamer spindle 52 is of considerable length the reamer bit 28 carried at the end thereof will travel across the face of the work in a horizontal curved path for a very appreciable distance, and said reamer bit may be vertically adjusted, as previously described, by the oscillation of reamer motor 17.

Key 59 is retained in place by a cover plate 60 secured to stirrup sleeve 20, as by screws, and plate 60 covers slot 58 in said stirrup sleeve. At their lower ends, each depending arm 18 of stirrup 13 is provided with a bearing 61 adapted to receive fulcrum pins 62 which have reduced inwardly projecting ends 63 adapted to pass through elongated slots 64 in a fulcrum bracket 65. Fulcrum bracket 65 preferably comprises a pair of similar parts, each part having a clamp portion 66, attachment arms 67 and an intermediate portion 68 connecting the clamp and bracket arm portions, and containing one of slots 64 for a fulcrum pin 62. Each half of the fulcrum bracket forms a yoke, the clamp portions of both half portions of the fulcrum bracket surrounding a portion of the reamer motor, which motor portion is usually a cylindrical neck, and are secured together by bolts or other fastening means clamping the fulcrum bracket about the cylindrical portion of the motor. The attachment arms 67 of each half of the fulcrum bracket are secured by other bolts to other parts of the reamer motor, such as flanges 114, giving great rigidity to the fulcrum bracket when assembled. The reduced ends of fulcrum pins 62 carried in bearings 61 at the bottom of stirrup 13, project through the slots in the fulcrum bracket, are threaded and are firmly secured to said bracket by suitable nuts, holding the reamer motor and the parts carried by it in pivotal connection between the depending arms 18 of stirrup 13.

The fulcrum bracket as a whole is attached to the reamer motor 17 at such a point that the fulcrum pins 62 will not be entirely coincident with the center of gravity of the reamer motor and the parts it carries. Due to the elongated slots 64, a fine adjustment of this relationship can be made and when established there will always be a tendency for the handle end of the reamer motor to swing downwardly and carry up the reamer spindle and bit to an approximately vertical position, unless the operator restrains this tendency by keeping hold of the reamer motor handle 69. Thus, whenever the reaming machine is not in use, the reamer spindle and bit will be up in an unobstructing position. And a counterbalance 72 is also secured to the handle 69 of the reamer motor 17, to assist and insure the positive swinging of the reamer motor about the fulcrum pins 62. See Figs. 4 and 6.

As best seen in Fig. 6 the cable which passes through and out of the lower end of the pipe conduit 53, runs to an electric switch 70 secured to and principally contained in the reamer motor handle 69, which switch is controlled by a trigger 71 located nearer the outer end of said handle 69.

Although in the course of operation, the trolley 5 is moved along the girder 3 from place to place, and though spheroidal head 44 is caused to partially revolve within socket castings 9 carried by trolley 5, electrical connections have been provided, which maintain uninterrupted electrical connection between the source of electrical energy and the reamer motor 17. Reference to Figs. 3, 5, 7 and 8 particularly, makes clear the character of these electrical connections.

It has already been pointed out that contact strips 23 and 24 are mounted upon an insulating strip 25 co-extensive with them, which insulating strip is secured to the inner face of girder 3, *i. e.*, that face directed toward the center of the building track. Mounted upon an insulating block 73, secured, as by bolts, to the web portion 74 of one trolley side frame 6, said web portion 74 being between the two lowermost weight-reducing apertures in said trolley frame, is a pair of spring contacts 75 and 76, well shown in Fig. 7, spring contact 75 being adapted to bear against the girder contact strip 23 and spring contact 76 being shown as bearing against contact strip 24, paralleling contact strip 23. Both spring contacts 75 and 76 are secured to insulating block 73 by means of bolts, one bolt 77 for contact 75 serving as a binding post, and a similar bolt 78 for spring contact 76 serving as a binding post for that spring contact. Said

spring contacts may be of other form and comprise differently constructed brushes or they may be contact rollers or trolley wheels.

An electrical conductor 79 is secured to binding post 77 and another conductor 80 is secured to binding post 78, both conductors 79 and 80 running to and entering a flexible conduit 81, said flexible conduit passing to the outer surface of trolley side frame 6, downwardly across the face thereof and through an aperture therein near the bottom flange 42 of trolley side frame 6, and through an aperture in the upstanding extension 37 of socket casting 9 on that side of the trolley, said flexible conduit being held in place in any suitable manner as by staples 82 passing through said trolley side frame. Emerging from flexible conduit 81, conductor 79 goes to a binding post 83 which together with a bolt secures a contact finger 84 to an insulating block 85, secured by other bolts to the horizontal web portion 40 of the socket casting 9, through the extension of which the flexible conduit 81 passes. The other conductor 80 inclosed by the flexible conduit 81 also emerges from the lower end of said flexible conduit and is secured to a binding post 86, which together with a bolt secures another contact finger 87 to said insulating block 85. Contact finger 87 extends to and over the center of the spheroidal head 44 and is provided with a teat 88 at its terminal, which teat bears on the concave upper surface of a central contact plate 89. Said concave contact plate 89 is held upon an upwardly projecting insulating pedestal 90 by means of a binding post 91, having an upper enlarged portion screwed into the center of said concave contact plate 89, the lower extremity of the smaller diametered part of said binding post passing through an insulating base 92, and being provided with nuts, by means of which central contact plate 89 is held in place, and an electrical connection is made to said lower end of binding post 91.

Insulating pedestal 90 is seated in a depression in the upper central portion of insulating base 92, being thereby so well positioned as to be the equivalent of an integral portion of insulating base 92. Preferably concentric with concave contact plate 89, but in a lower plane and upon the upper surface of insulating base 92, is a contact ring 93 secured in place by bolts 94 with countersunk heads and a binding post 95, similar to bolts 94, but longer and having an additional nut for the attachment of an electrical conductor. Insulating base 92 is in turn secured by screws 97 to an annular flange 96 in the upper part of spheroidal head 44 of ball casting 10, said flange 96 forming the bottom of a recess in the top of said head 44 in which recess insulating base 92 is set. Contact finger 84 parallels contact finger 87 throughout the major portion of its length, but as seen in Fig. 7 does not extend as high as contact finger 87 and is bent downwardly to make contact with contact ring 93.

Secured to binding post 91 is a conductor 98, and attached to binding post 95 is another conductor 99, both of which are inclosed in a cable 100 which passes through an aperture in a horizontal bar 115 connecting the walls of the spheroidal head 44, and runs to the upper end of pipe conduit 53, the conductors 98 and 99 within said cable passing through said pipe conduit 53, down through the pipe post, as shown in Fig. 6, and emerging from the bottom of said pipe conduit 53, and within the cable 100, run to switch 70 on the switch handle extending from the reamer motor 17.

Irrespective of any oscillation that pipe post 12 may be given, contact fingers 87 and 84 remain in permanent engagement with central contact plate 89 and contact ring 93, respectively.

Referring to Fig. 17, a clearer conception is to be had of the path of the electrical current traveling from the source of electrical energy to the reamer motor. When the main switch 27 is closed, and the operator manipulates trigger 71 to close switch 70, current flows from the positive side of the direct current generator 101, by conductor 102, through fuse 103, through one side of switch 27, and by conductor 104 to the contact strip 23, which is carried from the girder 3, and thence to spring contact 75, by conductor 79 to contact finger 84, to contact ring 93 and by conductor 99 to one terminal of switch 70, through said switch 70, and by conductor 105 to reamer motor 17, returning from said reamer motor by conductor 98 to contact plate 89, to contact finger 87, and by conductor 80 to spring contact 76, thence by contact strip 24, also carried from the girder 3, by conductor 106 through the other side of main switch 27, through fuse 107 and back to the generator 101. Reamer motor 17 thereupon operates, and the hole in the work may be properly reamed, said reamer motor becoming dead upon the reverse actuation of trigger 71, which opens switch 70 carried on the reamer motor handle.

A modified form of trolley is illustrated in Figs. 18 and 19 and constitutes the preferred form of trolley, and has the advantage of a narrower wheel base, the reduction of the number of tie bolts and guide wheels in the lower portion of the trolley, the bolts 45, which adjustably hold the socket castings 9 together, eliminating the lower tie bolts 32 used to tie the bottom por-

tions of the trolley side frames 6 of the previously described form of trolley 5. Also, another method of mounting the contact fingers 84 and 87 and the insulating block 85, to which they are attached, is disclosed.

The modified form of trolley 5ª comprises a pair of side frames 109, adapted to extend vertically outside of the outer faces of the outer and inner I-beams of the girder mounted upon the columns 2 of the overhead car building structure. As before, the side frames 109 extend above and below the girder 3, and the upper portion of each side frame 109 extends over the top of the girder and inwardly, after which it extends again upwardly and has at its upper corners trolley wheel bearings 29. Bearings 29 at the corresponding ends of the opposed trolley side frames 109 support axles 30, upon which are mounted the trolley wheels 7 which are adapted to run on rail 4, mounted upon the girder 3. Said trolley frames 109 are also provided with weight-reducing apertures, but these are differently arranged than those in the trolley side frames 6 of the first described form of trolley, there being below the lowermost weight-reducing aperture in each trolley frame 109, a web portion 110, in the lower part of which web portion is another aperture for the passage of a single guide wheel 8, mounted between supporting ears 34, through which passes pin 35 about which guide wheel 8 is adapted to rotate. Secured, as with rivets, to the inner face of web portion 110 of each trolley side frame 109, is the upstanding extension 37 of a socket casting 9, which casting is substantially like socket casting 9 of trolley 5 and has an attachment flange 41 adapted to lie against the underside of the bottom flange 42 of the trolley side frame 109, said flanges 41 and 42 preferably being riveted together, though they may be otherwise united. Tie bolt 31 connects the upper portions of trolley side frames 109, a tubular spacer 31ª surrounding the tie bolt and holding said side frames apart.

The spheroidal head 44 of the ball casting 10 is mounted between the internal concave faces of said socket castings 9, there being interposed between said spheroidal head and the concave faces of the socket castings the hereinbefore described Babbitt or other antifriction metal lining 39, this arrangement being quite similar to that shown in the first described form.

Above the lowermost weight-reducing aperture is another bar-like web portion 111, and on the inner side of one of the trolley side frames 109 is an insulating block 73, the upper part of which is secured to web portion 111 of said trolley side frame 109 and the lower part to the upper portion of the web division 110. Upon insulating block 73 are mounted spring contacts 75 and 76, like those in Fig. 7, which bear against contact strips 23 and 24, mounted upon the insulating strip 25 which is carried by the inner face of the girder 3. Spring contact 75 is provided with a binding post 77, in the form of a bolt, which also serves to hold said spring contact 75 to block 73, and spring contact 76 is provided with a similar binding post 78, and, as in Fig. 7, electrical conductors 79 and 80 are attached, respectively, to binding posts 77 and 78, running to and through the flexible conduit 81, shown in Fig. 7, which runs down the outer face of the vertical web or wall portion 110 to a point near bottom flange 42 of said trolley side frame 109, and passes through an aperture in the vertical flange 112 of said trolley side frame. After passing through the just mentioned aperture, flexible conduit 81 is directed toward the transverse center of the trolley 5ª, wires 79 and 80 emerging therefrom and running, respectively, to binding posts 83 and 86, which with their bolts secure contact fingers 84 and 87 to insulating block 85, which in the modified form is mounted upon a bracket 86, shown to comprise a sheet metal bracket, though any suitable type of support may be substituted for this bracket.

Contact fingers 84 and 87 in the latter form of trolley are disposed longitudinally of the trolley 5ª and also girder 3, finger 87 being like that shown in Figs. 7 and 8, and contacting with concave contact plate 89, mounted upon insulating pedestal 90, and contact finger 84 making electrical engagement with contact ring 93, mounted upon the upper face of the insulating base 92. The construction of the insulating base, its attachment to the spheroidal head 44 of the ball casting 10, the formation of said casting and the parts depending therefrom being the same as the corresponding parts shown in the first type of the portable reaming machine.

The same reamer spindle 52 may be used in either form of reaming machine, and, as shown in Figs. 15 and 16, may be a multiple-part spindle. Spindle parts 116 and 117 are preferably tubular, the motor spindle socket end 118 of spindle part 116 being adapted to be screwed upon or otherwise secured to the rotatable spindle of reamer motor 17, and the end of said part 116 remote from motor 17 serves as an extension socket 119 for the adjacent end 120 of reamer spindle part or extension 117, which is adapted to be telescoped within said extension socket.

The extension socket 119 of spindle part 116 is slotted to receive lugs 121 on the end 120 of spindle part 117, a nut 122 being threaded onto the exterior of socket end 119

of spindle part 116, retaining spindle parts 116 and 117 in interlocked and driving relation. Nut 122 is provided with slots 123, which, when spindle parts 116 and 117 are united, are normally out of register with lugs 121 on spindle part 117, but which may be alined with said lugs by a partial rotation of nut 122, whereupon spindle part 117 may be quickly and easily removed.

Spindle part 117 has at its other end another socket 124, adapted to receive an internally tapered sleeve 125, preferably having a Morse or other standard taper. The walls of socket 124 are slotted at their ends to receive lugs 126 on taper sleeve 125, and a nut 127 holds lugs 126 in the slots provided for them, retaining tapered sleeve 125 within socket 124. Reamer bit 28 (not shown in Figs. 15 and 16) is adapted to be held in a chuck (also not shown) which is of common form and has a tapered shank adapted to be inserted into tapered sleeve 125, which has a slot 128 to receive the tang usually present at the end of such chucks to insure a positive drive.

When a shorter spindle is required, spindle part 117 may be removed and tapered sleeve 125 may be inserted into socket 119 in spindle part 116, nut 122 then serving the same function as nut 127. Also other spindle parts may be added to lengthen the reamer spindle.

The portable reaming machine hereinbefore described is not complicated and being of rugged construction is unlikely to get out of order. The keeping of the reamer motor away from the floor does away with the practice of sending it to the repair shop, except at long intervals, it having been shown by actual practice that the hand reamers formerly used frequently had to be sent to said repair shop daily, necessitating a large reserve supply of such tools, which supply may, with the use of the herein disclosed reaming machine, be reduced to a negligible quantity. The reduction of necessary workmen to half that formerly required cheapens the cost of production and increases the capacity of the shop in which the present reaming machine or machines are installed. Moreover, the electrical arrangements are placed out of dangerous positions and being largely inclosed, removes the danger of the operator receiving an electric shock.

While I have described my invention as constituting a reaming machine, it is quite obvious that it may with equal facility be employed as a machine for performing other operations, such as are done by drills, etc., it being only necessary to replace the reaming bit by the proper type of tool, which is usually of a well-known character and obtainable in the open market. Also special tools for unusual operations may be employed in my machine, and it is to be clearly understood that I do not intend to limit the character thereof, but to use it as a machine of any type that it is suitable to act as.

What I claim is:—

1. In combination in a machine of the class described, a transporting device having a non-rotatable body portion, a motor-support connected with said body portion, said support being adjustable as to its own length and adapted to be moved in more directions than said transporting device, a motor adapted to be moved independently of said support and a tool holding member adapted to be driven by said motor.

2. In combination in a machine of the class described, an overhead support, a motor-support adapted to swing comprising a pendent member hung from said overhead support and restrained from longitudinal travel and a motor-sustaining frame slidable along said pendent member and provided with spaced motor-mounting portions between which said pendent member is adapted to extend, a motor and a tool holding member adapted to be driven thereby, said motor being adapted to be moved to direct said tool holding member to predetermined positions.

3. In combination in a machine of the class described, means for supporting a motor, a motor, a tool holding member adapted to be operated by said motor, and means provided with a motor-control and being adapted to cause said motor to direct a tool held by said tool holding member to predetermined positions.

4. In combination in a machine of the class described, transporting means, a motor-supporting means connected therewith and adapted to transfer a motor to various altitudes and to positions in a plurality of different directions independently of said transporting means without vertical travel of said supporting means near said transporting means, a motor, and a tool holding member operably connected therewith.

5. In combination in a machine of the class described, an overhead support, an adjustable motor-supporting means hung therefrom, a motor rockably mounted in said supporting means, the supporting means having relatively adjustable parts between the points of suspension and motor-support, a tool holding member operably connected therewith, means for swiveling said motor in directions other than those in which it is rockable and means for causing said adjustable motor-supporting means to hold said motor at different altitudes.

6. In combination in a machine of the class described, an overhead support, a

motor-supporting means connected therewith, a motor mounted by said means, a tool holder adapted to be driven by said motor, a motor handle, a power-controlling device carried thereby and power-conveying means leading from said motor-supporting means to said device and therefrom to said motor, said handle, motor and tool being combined to be movable to direct a tool in a multiplicity of directions.

7. In combination in a machine of the class described, motor-supporting means forming an arm displaceable through different planes and resistive to flexure, a motor mounted therein, power-conveying means extending through said arm and to said motor, a tool holder adapted to be driven by said motor, a device movable with said motor and tool holder adapted to be moved to direct a tool held by the tool holder within a zone, and means for transferring said motor to different zones.

8. In combination in a machine of the class described, motor-supporting means resistive to flexure comprising a portion held against longitudinal travel and a motor-carrying portion, means projecting from one into the other of said portions permitting the motor-carrying portion to slide longitudinally of said other portion and to turn without longitudinal sliding independently of the latter, a tool holder and a motor mounted to direct a tool to predetermined positions in work.

9. In combination in a machine of the class described, a transporting device adapted to be moved along an overhead support, a work-reaching means connected therewith, a motor-support adjustably mounted on said work-reaching means to move with the same and also independently thereof to variously position a motor, a motor carried by said support, a tool holder adapted to be driven by said motor and a device for controlling the operation of the motor movable to responsively move said motor and tool holder to direct a tool held by said tool holder to predetermined positions in work.

10. In combination in a machine of the class described, an overhead runway, a transporting device adapted to be movable along the same, a work-reaching device suspended from said transporting device, a motor-support mounted thereon, an electric motor held by said motor-support, a tool holder operable therefrom, an electrical current-supply line near the runway and an interruptable electrical circuit movably connected across said supply line and running to said motor.

11. In combination in a machine of the class described, a suitably supported work-reaching post, a motor-support slidable thereon, a tool-driving electric motor carried by said support, a counterweight operably connected with the latter and slidable through said post, and electrical conductors to said motor passing through said counterweight.

12. In combination in a machine of the class described, a suitably supported tubular work-reaching post, a motor-support slidable thereon, a tool-driving motor carried by said support, electric conductors to said motor, a conduit for the conductors within said post and a counterweight operably connected with said motor support and also slidable within said post and provided with a passage for said conduit.

13. In combination in a machine of the class described, a motor-support, means for sustaining the same, a motor mounted in said support, a tool-holder remote from said motor, means connecting said motor and tool-holder and adapted to extend the latter toward distant work, and pivotal means so connecting said motor and motor-support as to cause the means connecting the tool-holder to the motor to automatically move to an unobstructive position outside of said motor-support to carry said tool-holder and a tool therein toward said sustaining means when the machine is out of use.

14. In combination in a machine of the class described, a trolley and oscillatory tool-operating means comprising a work-reaching device jointedly connected with said trolley, a motor-support, a motor carried thereby, said motor-support being slidable at will upon said device and having a passage through which said device is adapted to extend into juxtaposition to said motor, and a motor operated tool-carrying member, said operating means being adapted to feed a tool through work during an oscillation thereof.

15. In combination in a machine of the class described, a trolley through which an overhead support and a runway for the trolley are adapted to be threaded, anti-friction means for engagement between said trolley and portions of vertical faces of the overhead structure located away from the runway and between said trolley and runway, and tool-operating means suspended from said trolley comprising a motor-support, a motor mounted in said motor-support and adapted to be turned to direct a tool to predetermined points in work.

16. In combination in a machine of the class described, a trolley ridable along an overhead structure, a member rockably suspended from said trolley, an electric tool-driving motor, means supporting the same from said suspended member, and electrical operating means for said motor comprising a source of electrical energy, a current-supply line supported from the overhead struc-

ture, an electrical movement-permitting connection between said supply-line and trolley, an automatically adjustable electrical connection between said trolley and rockable member, a suitable circuit for said electrical operating means and means for interrupting said circuit at will.

17. In combination in a machine of the class described, a trolley, adapted to traverse an overhead runway and comprising a suitable frame, a running gear mounted therein and a socket-forming portion, and a tool-operating device comprising a member having a head rockably seated in said socket, a motor-support, a motor mounted in said motor-support, a tool-holding means adapted to be driven therefrom and means for operating said motor, said tool-operating device being adapted to be oscillated.

18. In combination in a machine of the class described, a trolley movable along a runway and comprising assembled frames, a running gear carried thereby, means maintaining a given relation between said frames and running gear, and members carried by said frames forming an adjustable socket, a rockable member having a head seated in said socket, means for adjusting the latter, a motor-support carried by said rockable member, a motor carried by said motor-support and a tool-holding device adapted to be driven thereby.

19. In combination in a machine of the class described, an overhead structure, exposed electrical conductors adapted to be carried by and insulated from said overhead structure, a runway extending with said overhead structure, a trolley ridable along said runway and provided with a side frame, electrical contacts supported by and insulated from the latter and adapted to movably engage said conductors, means suspended from said trolley and adapted to support a motor, a tool-driving motor, and an electrical circuit for operating said motor.

20. In combination in a machine of the class described, an overhead structure, a runway thereon, a trolley adapted to be moved along said runway and comprising spaced side frames, trolley wheels ridable along the runway and mounted in said side frames, socket-forming members secured to downwardly extending portions of said side frames and forming a socket below the overhead structure, means for carrying a tool-driving motor and provided with a head seated in said socket and means for adjusting said socket-forming members to said head.

21. In combination in a machine of the class described, a trolley adapted to be moved along an overhead structure, and comprising side frames, socket-forming members rigidly secured thereto, anti-friction means carried by said side frames adapted to engage the overhead structure, a tool-operating device and sustaining means therefor provided with a head adapted to be adjustably clamped between said socket-forming members.

22. In combination in a machine of the class described, a trolley comprising a frame, members opposingly secured thereto and provided with concave socket-forming walls, means adjustably connecting said opposing members and anti-friction linings in said concave walls, a device provided with a sphere-like head adjustably clamped between said socket-forming walls and in contact with said linings.

23. In combination in a machine of the class described, holding means provided with a socket, a member provided with a head rotatively and rockably seated in said socket, a motor, means for connecting said motor with said member, an electric tool-driving motor, suitable electrical contacts carried by said head and insulated therefrom and from each other, self-adjustable connection-making devices continuously engaging said contacts and mounted upon and insulated from said holding means and from each other and an electrical circuit for said motor including said contacts and connection-making devices.

24. In combination in a machine of the class described, a trolley provided with a socket, a member having a head rotatively seated in said socket, an electrical connection between said trolley and head comprising an insulating base seated in the latter, an insulating extension therefrom, a contact annulus secured to said base and a contact affixed to said extension and contact fingers continuously engaging said annulus and contact and supported and insulated from said trolley, a motor adapted to be moved with said headed member and a circuit for said motor including said electrical connection adapted to be energized.

25. In combination in a machine of the class described, a suitably supported tubular post, sheaves mounted to extend within the same, a motor-support slidable upon said post, a tool-driving motor carried by said motor-support, a counterweight slidable within said post, a sheave carried thereby and a flexible connection between said motor-support and counterweight running about said sheaves.

26. In combination in a machine of the class described, a suitably supported tubular post, sheaves mounted in relatively fixed positions to extend within the same, a motor-support slidable upon said post, a tool-driving motor carried by said motor-support, a counterweight provided with a pocket and passages and slidable within said post,

a sheave mounted in said counterweight pocket and flexible means connecting said motor-support and running about said sheaves and through said passages.

27. In combination in a machine of the class described, a suitably supported tubular post, a motor-support slidable thereon, a tool-driving motor mounted in said support, a conduit within and secured to said post, a slidable counterweight also within said post formed to embrace said conduit and to move along the same, means responsively connecting said motor-support and counterweight, a closure for said post and an electrical circuit for said motor having conductors passing through said conduit and closures to said motor.

28. In combination in a machine of the class described, a suitably supported post, a motor-support slidable thereon, a motor mounted in the latter, a tool-holder rigidly connected with said motor and adapted to be driven thereby and means operable without preliminary adjustment permitting and regulating curvilinear oscillation of said motor-support about said post to variously direct a tool held by said tool-holder.

29. In combination in a machine of the class described, a suitably supported post provided with a keyway, a movable motor-support, a motor carried thereby, a tool-holder rigidly connected with said motor, said motor-support having a sleeve slidable over said post and being provided with a slot, a key fitted into said keyway and extending into said slot and being movable with said sleeve, said key being held from relative rotary movement with said post there being lost motion between said key and slot to permit said motor-support to turn to variously direct said tool-holder.

30. In combination in a machine of the class described, a bifurcated motor-support, inwardly extending pivot devices carried thereby, a motor carried by said support through the medium of a frame co-acting with said pivot devices, a tool-holder connected with said motor and adapted to be driven thereby, said frame being secured to said motor and provided with slots, and means for retaining said pivot devices in said slots in any of a number of selective positions out of coincidence with the center of gravity of the motor and the parts carried thereby to permit said motor to raise said tool-holder.

31. In combination in a machine of the class described, a transporting device, a depending oscillatory motor-support having a portion rockably seated in said transporting device, a tool-driving electric motor carried by said support, separate electrical conductors on said device and motor-support extending toward the rockably seated portion of the latter, and a self-adjusting electrical connection between said conductors.

32. In combination in a machine of the class described, a transporting device, a depending oscillatory motor-support carried thereby comprising telescopic members having slots longer in one member than in the other, a key inserted through the exterior of the outer member, held in the slot of one member and slidable in the slot of the other, and a motor mounted in said motor-support.

33. In combination in a machine of the class described, a transporting device, an oscillatory motor-support comprising a tubular portion closed at its opposite ends, a motor-holding frame slidable thereon, a counterweight within said tubular portion, flexible means connecting said frame and counterweight, and a motor mounted in said frame.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

FREDERICK A. STEVENSON.

Witnesses:
ELIOT W. STUDER,
J. K. BANGS, Jr.