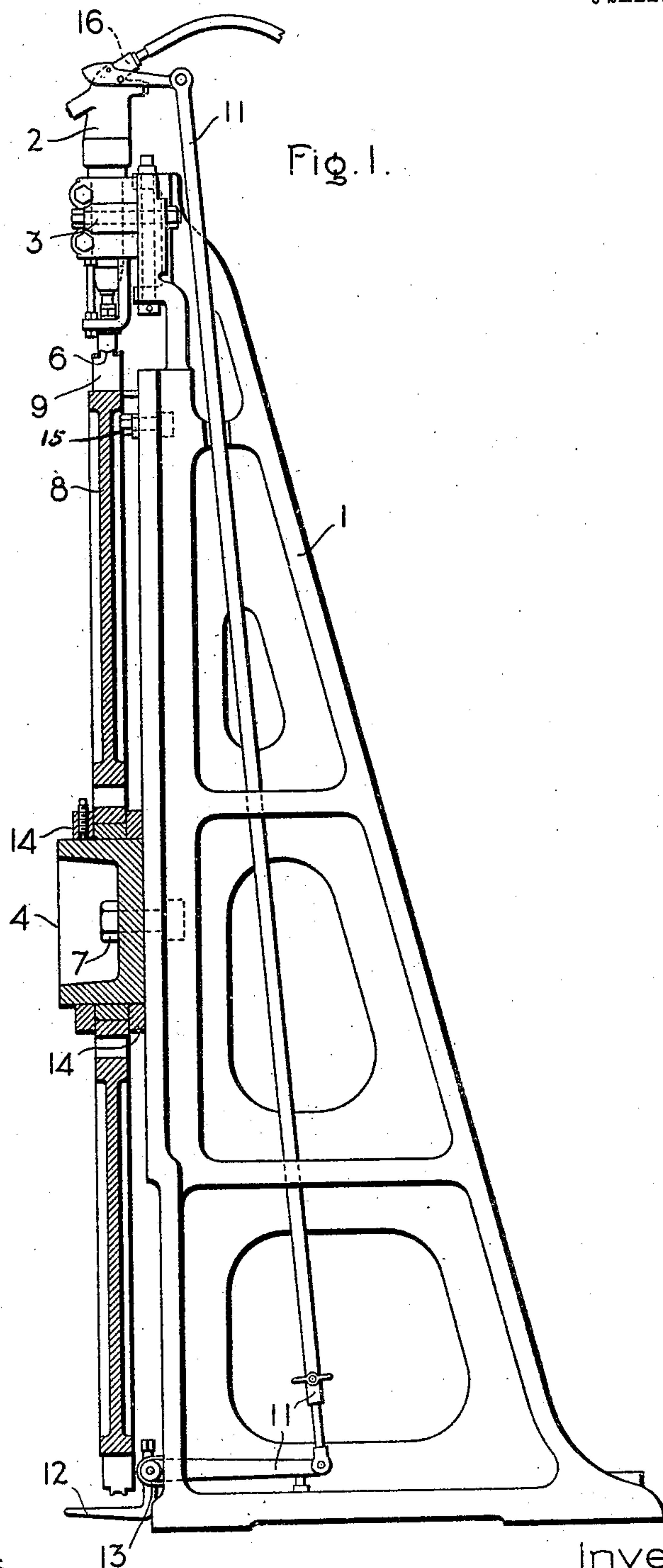


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MACHINE FOR RIVETING BUCKET COVERS FOR TURBINES.  
APPLICATION FILED MAY 6, 1904.

917,100.

Patented Apr. 6, 1909.

3 SHEETS—SHEET 1.



Witnesses.  
*Harry M. Tilden*  
*Edward Williams, Jr.*

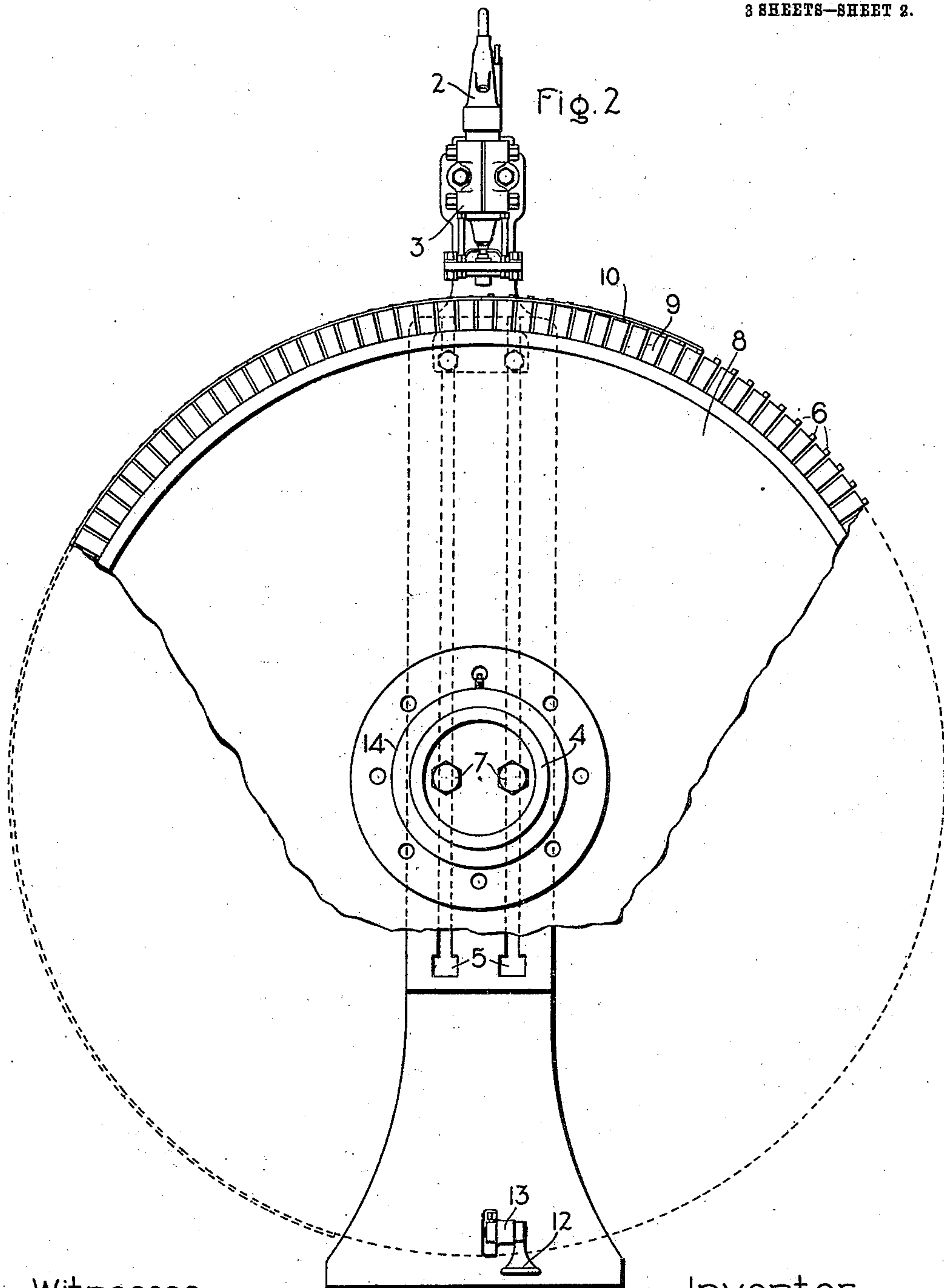
Inventor  
Casper C.M. Mortensen.  
by *Albert B. Sam* Att'y.

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*Harry H. Tilden*  
*Edward Williams Jr.*

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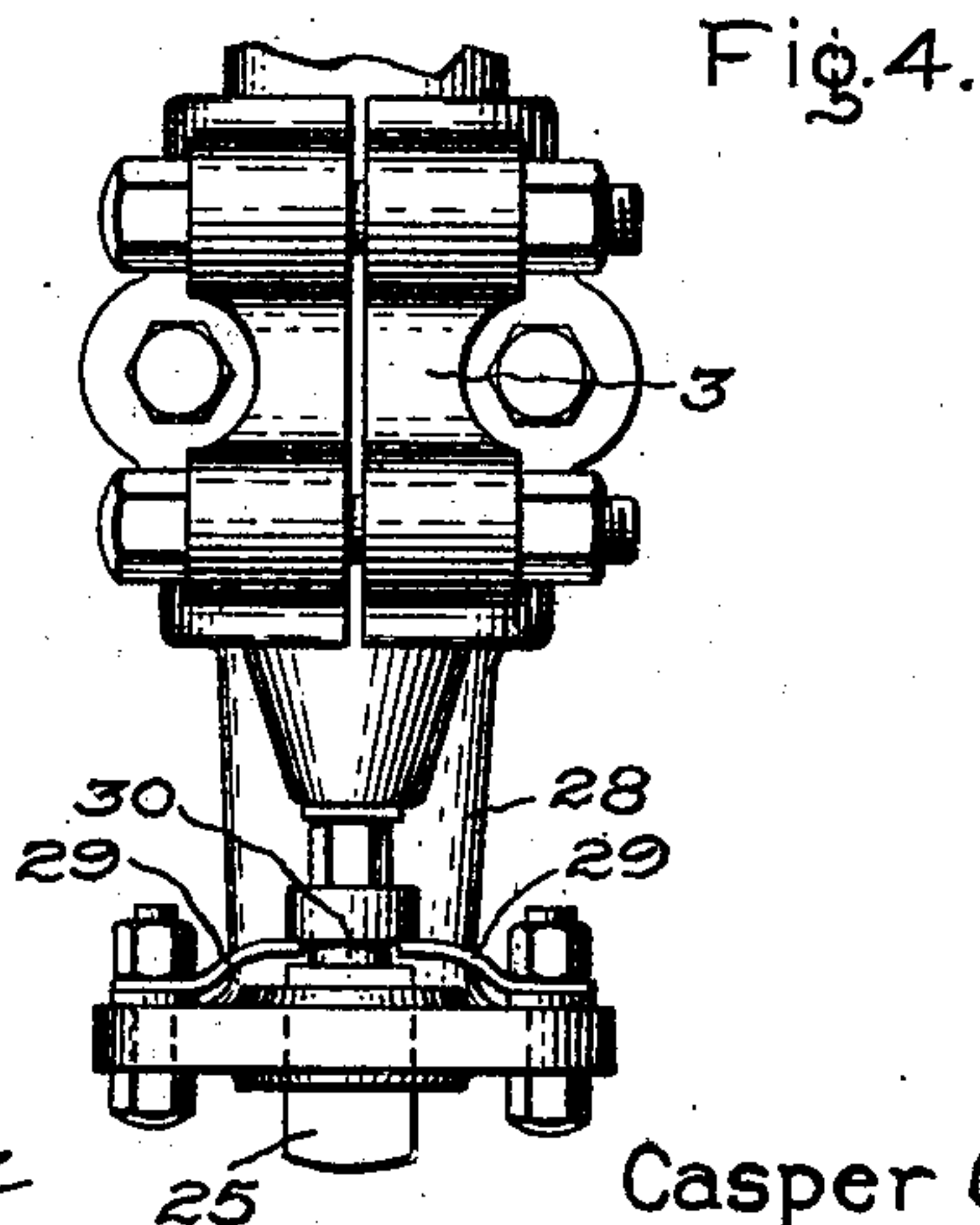
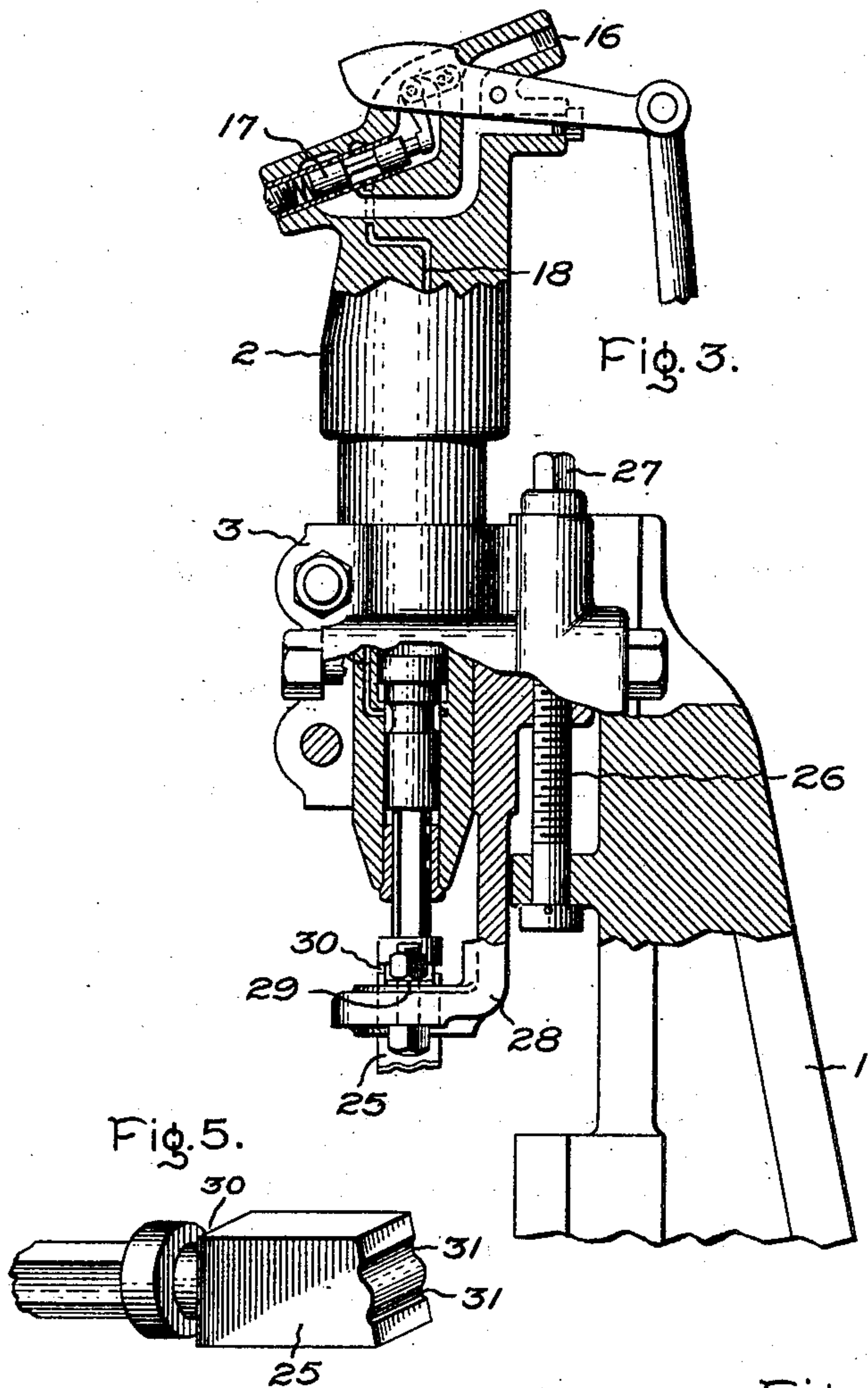
Casper C.M. Mortensen  
 by *Albert B. Davis*  
 Atty

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3 SHEETS—SHEET 3.



Witnesses:

*Benjamin B. Hall*  
*J. J. Dore*

Inventor:

Casper C. M. Mortensen.

by *Albert H. Davis*  
Atty.



# UNITED STATES PATENT OFFICE.

CASPER C. M. MORTENSEN, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## MACHINE FOR RIVETING BUCKET-COVERS FOR TURBINES.

No. 917,100.

Specification of Letters Patent.

Patented April 6, 1909.

Application filed May 6, 1904. Serial No. 206,635.

*To all whom it may concern:*

Be it known that I, CASPER C. M. MORTENSEN, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Machines for Riveting Bucket-Covers for Turbines, of which the following is a specification.

My invention relates to a new and useful means for riveting bucket covers on elastic fluid turbine wheels.

Heretofore it has been customary to rivet the covers on turbine bucket wheels by hand, thus rendering the operation very tedious and expensive, and moreover the results are not always uniform. Actual manufacture shows that bucket wheel covers may be riveted in place by a machine made in accordance with my invention at least twenty times quicker than when done by the methods previously used. Therefore, a great saving of time, labor and floor-space is accomplished by the use of my present invention. And further, the riveting is practically uniform in all cases, while by the old method, the riveting varied, and was often unsatisfactory.

In the accompanying drawings, which illustrate one embodiment of my invention, Figure 1 is a side elevation of a machine for riveting covers on buckets of turbine wheels or intermediates; Fig. 2 is a front elevation showing the work, a wheel in the present instance, mounted in operative relation to the motor-driven hammer or riveting device; Fig. 3 is a partial section of the motor and its immediate support; Fig. 4 is a front elevation of the holder for the motor and guide for the hammer, together with the springs for holding the piston in an operative position; and Fig. 5 is a perspective view of the end of a riveting tool or hammer.

1 represents a frame of any desired configuration, and 2 is a pneumatic motor of any suitable well known design attached to the frame by the holder 3. Mounted on the face of the frame 1 is a work-holder 4 which is movable toward or away from the hammer, and which is secured by bolts 7 located in the parallel slots 5 in the face of the frame, Fig. 2. Rotatably mounted on the work-holder is the

turbine bucket wheel or intermediate 8, having buckets 9 with tenons 6 and covers 10, which are usually segmental in the case of wheels, and may be a single piece when used with intermediates. The tenons are usually of special shape, owing to the form of the bucket; two of the sides are curved, and two are straight. The central portion of the tenon is cut away slightly to reduce the stock and save time in riveting.

Secured to the frame 1 and motor 2 is a system of levers 11, which is operated by the treadle 12 at the base of the frame for putting the motor into operation. The treadle is journaled as at 13, and it is returned to its initial or "off" position by the weight of the system of levers 11, when the operator releases the pressure of his foot from the treadle.

In order that the wheel 8 may be held in line with the riveting device or hammer, collars 14 are mounted on the work-holder which act in conjunction with the abutment 15. The abutment is preferably adjustably secured at the upper end of the frame 1 by bolts engaging the slots 5, and prevents the wheel from being accidentally bent and thus moved out of line with the tool by the workman.

Referring to Fig. 3, 16 is the fluid-admitting orifice supplying fluid to the motor 2 from a source not shown. 17 is a spring-pressed valve which controls the supply of motive fluid to the motor and is operated through the system of levers 11. Depressing the treadle, opens the valve against the spring and allows the fluid to pass from the source to the main port 18 of the motor 2 which actuates the tool or hammer 25 in a well-known manner. The ends of the tenons extending through the holes in the cover have two small projections which are riveted over in opposite directions in order to secure the cover in place, and also to prevent the leakage of motive fluid around the tenon when the turbine is in operation. It is important that the cover be firmly held against the shoulders on the buckets adjacent to the tenons in order to prevent losses due to eddy currents as the steam impinges on the buckets. The riveting must be thoroughly done,



since the covers are subjected to enormous centrifugal strains, due to the rotation of the wheels when in service.

In order to properly rivet the tenons, the tool or hammer has a special formation on the end. Two parallel depressions 31 are provided, which have the same pitch distances as the projections or ridges on the tenons, and these depressions, having properly curved surfaces, force the metal of the tenons over the cover and thus secure it in place.

It will be noted that the holder 3 for the motor and hammer has a screw 26 mounted in the head of the frame. This screw is provided with a head 27 by which it is turned so as to raise and lower the holder, whereby the tool or hammer is adjusted to the work. The holder is secured in adjusted position by suitable bolts. Formed integral with the holder and depending therefrom is a guide-arm 28 for guiding the tool and preventing it from turning. On this arm are mounted two inwardly-projecting springs 29 which engage in the recess 30 of the tool and exert an upward pressure, which maintains the piston in an initial position, where at least one inlet port is uncovered, so that when the valve 17 is opened fluid acts to move the piston. In other words, by this arrangement the piston is held in such a position that the motor is always in an operative condition when fluid is admitted. It is a well known fact that certain types of pneumatic motors will not operate unless the tool is pressed against the work to be machined; that is to say, if the tool is not pressed against the work, the initial air-admitting port is covered, thereby preventing the passage of fluid to the motor. By the use of the springs 29, the same effect is obtained and the motor will operate continuously when the motive fluid is supplied, and this without effort on the part of the workman. The holder and its several parts, including the springs 29, are clearly shown in Fig. 4.

The operation of the machine is as follows: The work 8 is mounted to turn on the work-holder 4, which is adjustable to suit the diameter of the wheel or work to be operated upon. After the work is clamped in place by the collars 14, the motor 2 may be adjusted, if necessary, toward the work for a closer adjustment. When the adjustment is properly made and the parts clamped, the operator places a cover or cover-section 10 on the buckets, which has holes punched therein for the reception of the bucket tenons 6, after which fluid is admitted to the motor. After the tenon is riveted over, the operator revolves the work in order to bring the next tenon to be riveted directly under the tool. The treadle is again depressed, which operates the system of levers 11 for opening the spring-pressed valve 17; thus allowing mo-

tive fluid to pass to port 18, causing the tool 25 to rapidly reciprocate and rivet the tenon.

If the radial depth of the work is less than that shown, the work-holder can be enlarged or a separate piece or support provided, which is carried by the work-holder and clamped to the work. This arrangement would be employed for riveting the tenons on cast metal buckets and on intermediate buckets. The main consideration is to provide a work-holder of such character that it will hold the work rigidly in place during the act of riveting, yet permit the work to be readily shifted to bring the successive tenons into line with the hammer.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus is only illustrative, and that the invention can be carried out by other means.

What I claim as new, and desire to secure by Letters Patent of the United States, is,—

1. A machine for riveting bucket tenons comprising a frame, a motor, a holder for the motor supported by the frame and longitudinally adjustable thereon, a riveting tool operated by the motor, a guide for the tool secured to and movable with the holder, and a means for controlling the operation of the motor.

2. A machine for riveting bucket tenons comprising a frame, a riveting tool or hammer mounted thereon, a motor having a piston for actuating the tool, a guide for the tool, springs mounted on the guide in working relation with the tool for returning the piston to its initial or operative position, a work-holder for supporting the work in operative relation to the tool, and a means for controlling the motor.

3. A machine for riveting bucket tenons comprising a frame, a fluid actuated motor, a holder for the motor supported by the frame and longitudinally adjustable thereon, means for clamping the motor in its holder, a projection on the holder, an adjusting screw which passes through the projection and is itself supported by the frame, means for securing the holder in adjusted position on the frame, a riveting tool operated by the motor, a guide for the tool which is carried by the holder, a valve for regulating the admission of fluid to the motor, and manually actuated means for moving the valve.

4. A machine for riveting bucket tenons comprising a frame, a fluid actuated motor on the frame, a riveting tool mounted in and actuated by the motor, said tool projecting from the motor toward the work to be operated upon, a guide for the projecting end of the tool which is located beyond the end of



the motor, a work holder on the frame,  
means for adjusting the guide and work-  
holder with relation to each other, means in-  
cluding a valve for controlling the motor, and  
5 a spring device adjacent the guide which nor-  
mally tends to force the tool back when the  
motor cylinder is open to the exhaust.

In witness whereof I have hereunto set my  
hand this 4th day of May, 1904.

CASPER C. M. MORTENSEN.

Witnesses:

EDWARD WILLIAMS, Jr.,  
MARGARET E. WOOLLEY.