No. 664,596. Patented Dec. 25, 1900.

J. J. TYNAN & H. C. MOSTILLER.

PNEUMATIC RIVETING APPARATUS.

(Application filed Nov. 6, 1899.)

(No Model.) 2 Sheets—Sheet 1.

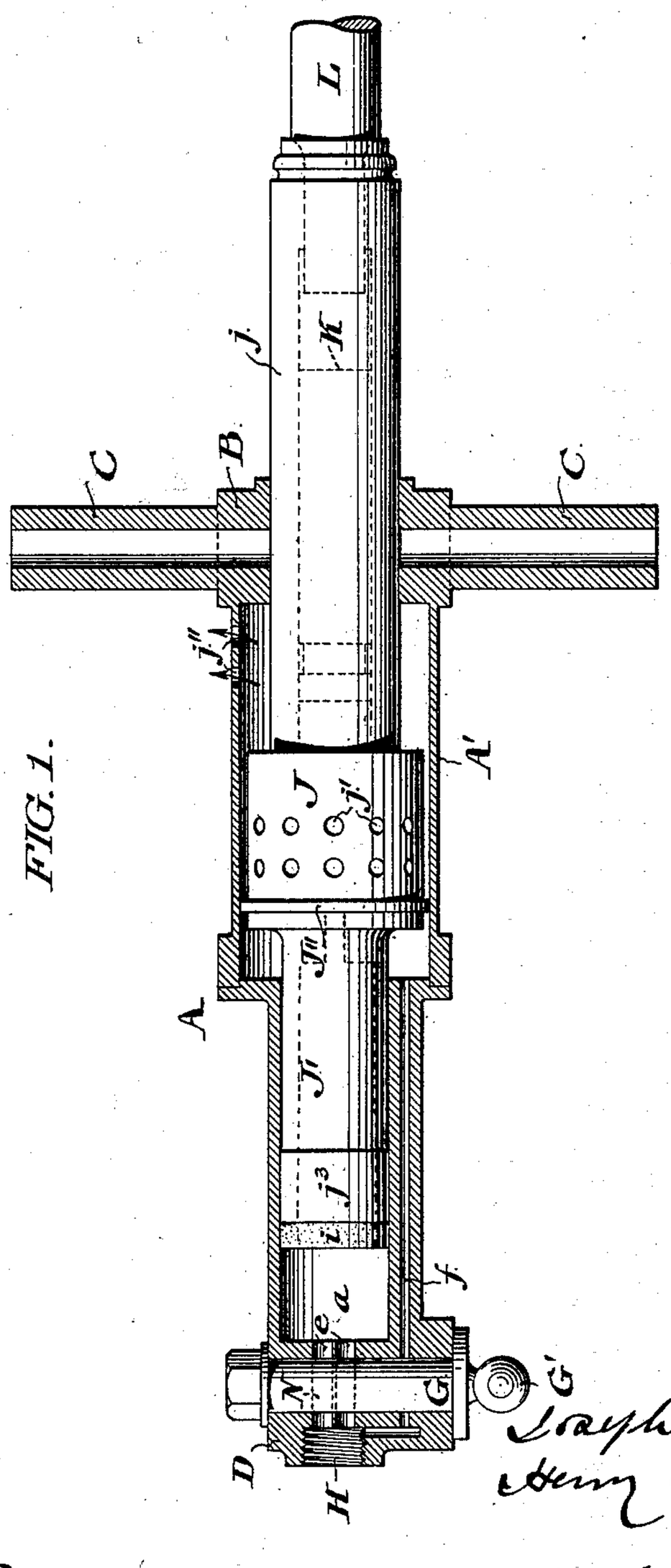

FIG. 1.

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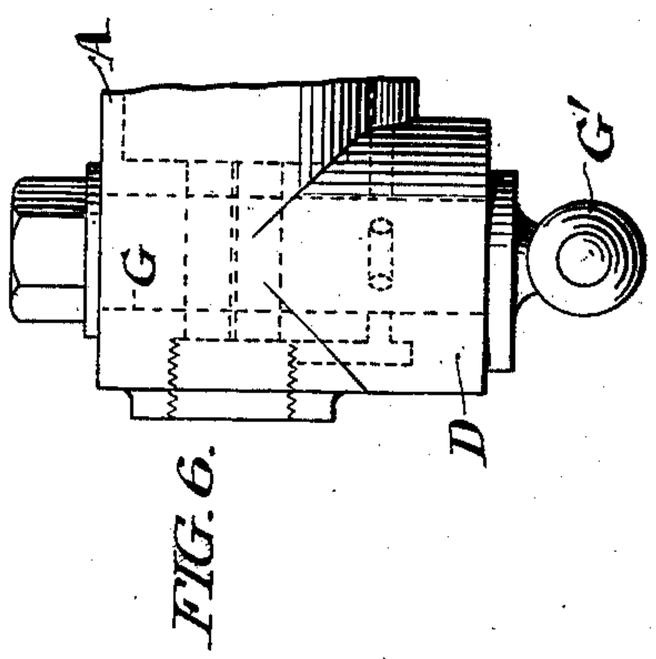

FIG. 6.

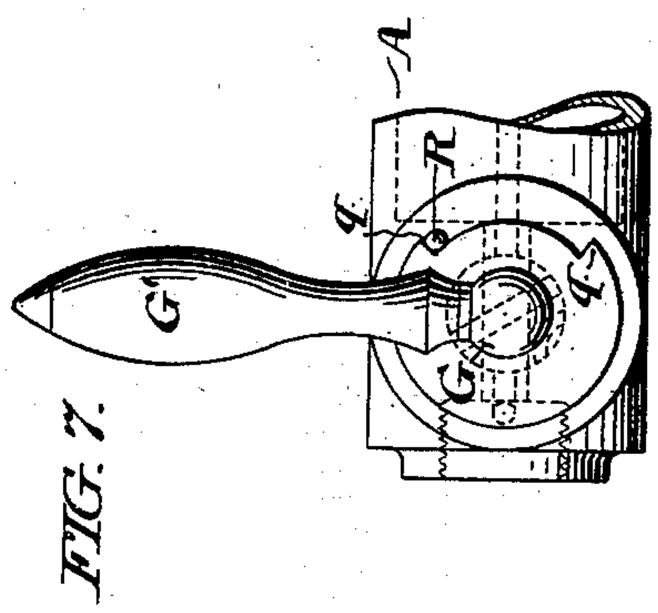

FIG. 7.

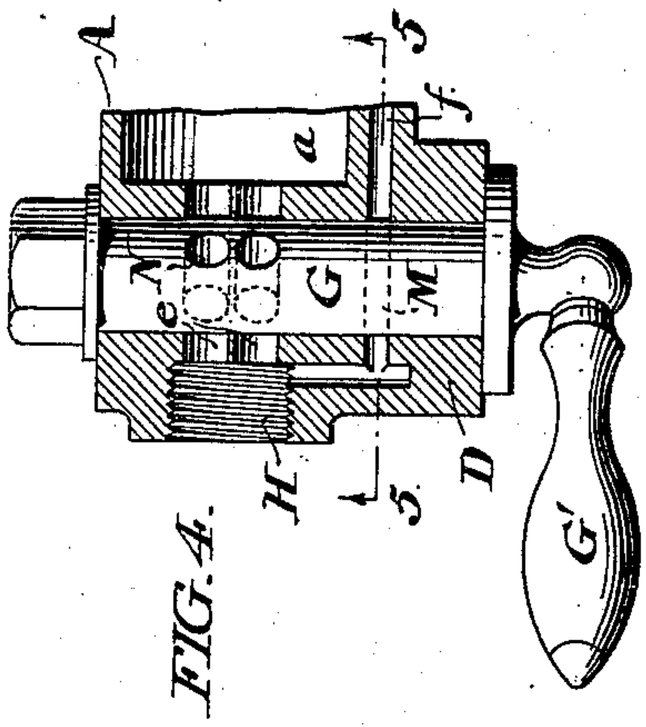

FIG. 4.

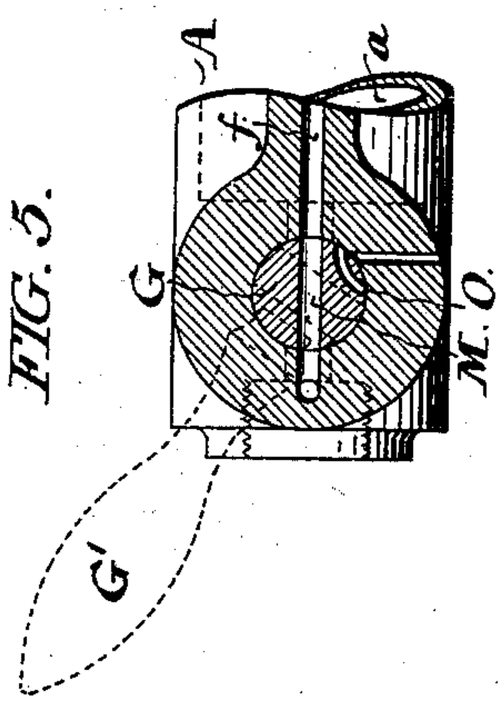

FIG. 5.

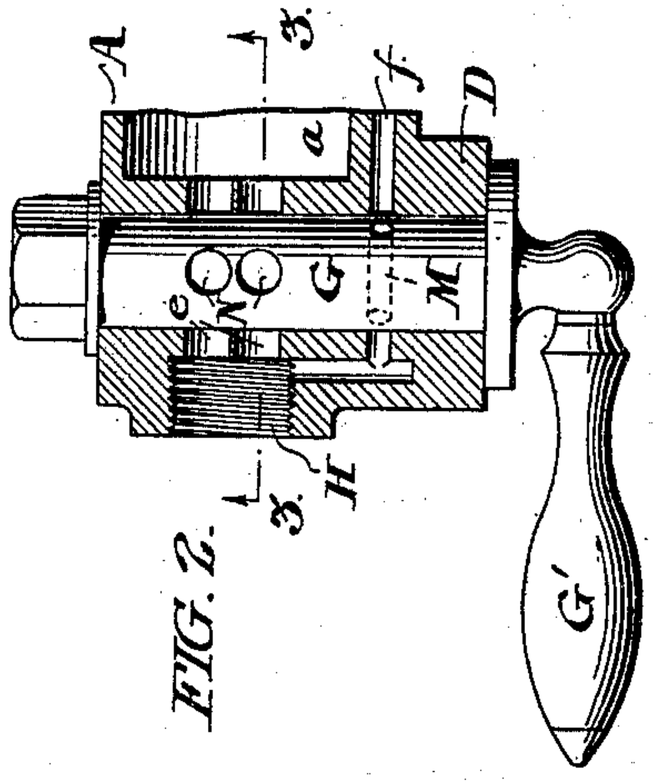

FIG. 2.

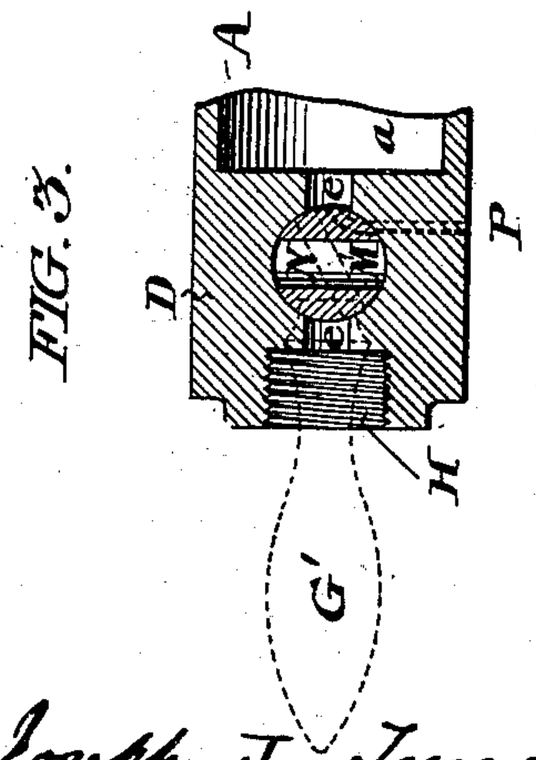

FIG. 3.

Witnesses:
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UNITED STATES PATENT OFFICE.

JOSEPH J. TYNAN AND HENRY C. MOSTILLER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE PNEUMATIC TOOL IMPROVEMENT COMPANY, OF SAME PLACE AND CAMDEN, NEW JERSEY.

PNEUMATIC RIVETING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 664,596, dated December 25, 1900.

Application filed November 6, 1899. Serial No. 735,899. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH J. TYNAN and HENRY C. MOSTILLER, citizens of the United States, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Pneumatic Riveting Apparatus, of which the following is a specification.

Our improvements relate to a well known class of pneumatically operated riveting machines, in which, in the tubular bore of a main casing, is mounted free for longitudinal movement a protruding tubular hammer carrier embodying a hammer race, in which in turn is mounted for very rapid reciprocation a hammer which in its movement acts against a rivet tool which, in the operation of riveting, encounters and upsets the metal of a rivet or other body.

The presence of the protruding hammer carrier dispenses with the necessity for carrying the main casing of the machine into close proximity with the metal to be operated upon, and, therefore, of removing it from proximity to said metal each time one rivet tool is to be replaced by another; dispenses with the necessity of carrying the main casing of the machine forward as the rivet operated upon is beaten down, to maintain the rivet tool in position to operate against the rivet; and enables, furthermore, the employment of the apparatus to upset rivets in spaces between projecting girders and in other restricted areas in which the main frame of the machine could not be entered, and in which, therefore, but for the additional range of movement afforded by the hammer carrier, the apparatus could not be employed.

In apparatus of this class as heretofore constructed, the hammer has been mounted in the tubular interior of the hammer carrier, and by virtue of suitable air spaces and ports and port controlling devices, with which the hammer carrier has been provided, the compressed air entering through the lower or rear end of the main casing and through the open lower or rear end of the hammer carrier, has, when turned on, operated to occasion the very rapid reciprocation of the hammer and the extension or protrusion of the hammer carrier, said two movements taking place practically contemporaneously.

In apparatus of this character, especially of large size, difficulty has been encountered, in the rapid movement of the machine from one rivet to another, in so setting the apparatus that when the hammer carrier carries the rivet tool against the rivet said tool will, under the actuation of the hammer, strike the rivet fairly on its end, the frequent result having been that when the hammer carrier has risen to the limit of its stroke the rivet tool has beaten against the metal in the vicinity of the rivet, and, its strokes being made very rapidly, effected a very considerable battering of said metal before the operator could adjust the main casing on its bearings to cause the rivet tool to strike the rivet alone.

It is the object of our invention to provide a pneumatically operated riveting machine of the general class indicated, in which the hammer carrier on the one hand, and the hammer on the other, shall be subject to independent control.

When these two elements are independently controlled the rivet tool may be caused to strike the rivet fair and the consequent battering of the surface adjacent thereto be avoided.

In our improved construction, the hammer carrier with the hammer and rivet tool at rest within it, may be caused to protrude to the limit of its movement, in which position the rivet tool will be brought within a very minute distance of the rivet to be operated upon; it can then be instantly seen by the operator whether or not the rivet tool is in position to strike a fair blow, so that, if not, the machine can be adjusted to bring it into such position. After this has been done the hammer can be thrown into operation to, through the rivet tool, upset the end of the rivet and such upsetting will be accomplished without any uncertainty or unnecessary battering of the adjacent metal plates.

In the preferred embodiment of our invention illustrated in the accompanying drawings and herein described, we set forth the

independent control as accomplished in connection with independent air passages, one of which affords access for air to effect the reciprocation of the hammer and the other of which affords access for air to effect the protrusion of the hammer carrier, both of said air passages, however, being preferably controlled by a single controlling valve plug.

In the accompanying drawings we show, and herein we describe, a good form of a convenient embodiment of our invention, the particular subject-matter claimed as novel being hereinafter definitely specified.

In the accompanying drawings,

Figure 1 is a view, partly in central section and partly in elevation, of an apparatus embodying a preferred form of our improvements, the portion of the main casing nearest the eye being supposed removed to exhibit the interior construction.

Figure 2 is a central longitudinal section of the lower end of the main casing, the controlling valve plug being shown in elevation, said plug being illustrated as in the position it occupies when the machine is at rest.

Figure 3 is a sectional elevation on the line 3—3 of Figure 2, with the parts in the position shown in said Figure 2.

Figure 4 is a view similar to Figure 2, illustrating the valve plug, however, in the position it occupies in giving the lead to the air through the carrier air inlet.

Figure 5 is a sectional elevation on the line 5—5 of Figure 4, the parts being in the same position illustrated in said Figure 4.

Figure 6 is a view in side elevation, illustrating the exterior of the lower portion of the main casing, the position of the controlling valve plug and inlets being illustrated in dotted lines, said plug being shown in this figure, as also in Figure 1, as set in position it occupies when the air is being conducted to the hammer.

Figure 7 is a view in side elevation of the parts shown in Figure 6, sight being taken toward the lower face of the parts as shown in Figure 6.

Similar letters of reference indicate corresponding parts.

In the drawings,

A indicates the main casing or frame, being a tubular cylindrical structure embodying what we term the carrier chamber A′ and the guide chamber *a*, which last named chamber is in the form shown an axial continuation of the carrier chamber proper.

The carrier chamber and guide chamber are conveniently of circular section. The upper end of the carrier chamber is closed by a web B which embodies an axial aperture within which the hammer carrier snugly fits.

C are arms or trunnions extending out from the main casing, which are to be entered in suitable bearings in any convenient yoke or frame, for the support of the apparatus.

The lower end of the casing is closed by a web or block D, penetrated, however, by two hammer air inlets, as we term them, *e*, and a carrier air inlet, as we term it, *f*, all three of which inlets are intersected by a transversely extending valve seat in which is mounted a valve plug G which controls them.

The hammer air inlets *e* open into the rear or lower end of the guide chamber, and the carrier air inlet extends up through the wall of the guide chamber and opens through the rear end of the carrier chamber proper.

The outer ends of the hammer air inlets and carrier air inlet open into a threaded recess H in which may be engaged a threaded thimble or ring at the extremity of an air pressure supply pipe, not shown.

The hammer carrier consists in the form shown of a cylindrical body *j* disposed within the carrier chamber but protruding through an opening in the end plate or web B thereof, said carrier having the head J and an open tubular extension J′ which projects within the guide chamber.

The open lower or rear end of the carrier within the guide chamber is shown as provided with a cup leather packing or washer *i* mounted upon its lip, and secured in position in any convenient and usual manner. The washer precludes the entrance of the air which enters through the inlets *e*, between the wall of the carrier and the wall of the guide chamber.

Within the hollow interior of the carrier is mounted the hammer K, hereinbefore referred to, which, under air pressure admitted through the hammer air inlets *e*, and into the body of the hammer carrier through the rear end of said carrier (the opening through said rear end through which the air has access to the operative parts being indicated in dotted line in Figure 1) will be caused to reciprocate within its race-way in said carrier.

L is a rivet tool of any selected form mounted in the open upper end of the carrier, and adapted to be encountered by the hammer in the reciprocation of the latter, through which tool the impact of the hammer is transmitted to the rivet or other device operated upon.

The form of the hammer, the arrangement of the hammer race, the form and disposition of the valve passages, valves, and mechanism by which the air entering through the hammer air inlet and into the carrier occasions the operation of the hammer, form in themselves no part of our improvements and are, therefore, not herein illustrated and described, and any such known mechanism suitable for the purpose may, of course, be employed.

j′ are outlets through which the air entering through the hammer inlet ports and conducted to the interior of the hammer carrier, escapes after it has acted upon the hammer operating mechanism, into the upper or front portion of the carrier chamber, and *j″* are openings through which said air escapes from said chamber to the atmosphere.

In our improved construction, as illustrated,

the head of the carrier may be considered as a piston head, so to speak, within the lower or outer portion of the carrier chamber proper, that is to say, the side walls of the lower portion of the carrier chamber proper are imperforate, and the lower portion of the carrier head is either very accurately fitted within said chamber, or, as is preferable, and as is illustrated in Figure 1, is provided with a packing ring, J″, so that a tight closure is effected between the lower portion of said carrier head and the wall of the lower portion of said chamber, with the result that air under pressure entering the rear or lower end of said chamber expands between the rear wall or end of the chamber and the under face of the carrier head, and forces said carrier upward or toward the right in Figure 1, until the front end of the carrier head makes contact with the front end of the carrier chamber, unless, of course, the rivet tool encounters the rivet to be acted on before the carrier has so far progressed.

The rear extension J′ of the carrier entered in the guide chamber, is conveniently provided with an enlarged belt or packing j^3 which snugly fits within said chamber and thus prevents the air, which enters through the carrier inlet port, from backing down through said guide chamber.

In the operation of our apparatus, therefore, before setting the hammer in motion, we afford access to the compressed air through the carrier inlet port, which air, operating against the carrier as described, occasions its forward or outward movement until it reaches the limit of its travel wherever that may be, the hammer and the rivet tool being also carried outward but remaining without independent movement for the time being.

After the hammer carrier has been thus forced outward, and the machine adjusted with reference to the rivet if necessary, we give the lead to the air through the hammer air inlet or inlets *e*, and thereupon said air, passing through the guide chamber and up through the extension J′ into the interior of the carrier occasions the reciprocation of the hammer in the usual manner.

When the contemplated operation has been completed we give the lead to the air in the space behind the carrier to the atmosphere.

Thereupon the carrier, when the apparatus is held with its rivet tool upward, as is very usual in performing riveting work on the hulls of vessels, will descend by gravity to its normal position in the lower part of the casing.

To accomplish this control of the air inlets we prefer to resort to the arrangement illustrated.

The outer ends of the hammer air inlets and carrier air inlet, which exist in a common plane, are in communication with a constant source of pressure, while the seat for the valve plug G, as described, intersects all the said inlets.

The valve plug G referred to is a cylindrical body, snugly fitted and secured in place within said seat, and provided with an operating handle G′.

Said valve plug is provided with two hammer air inlet ports or channels N N which in one position of the plug, to-wit, the position indicated in Figures 1 and 6, are in registry with and give the lead to the air through the hammer air inlets.

Said valve plug also embodies a carrier air inlet port or channel M which in a certain position of the plug, to-wit, the position shown in Figures 4 and 5, is in registry with and gives the lead to the air through the carrier air inlet.

Said valve plug is also provided with an exhaust port O which in a certain position of the parts, to-wit, the position illustrated in Figures 2 and 3, connects the inner branch of the carrier air inlet with an outlet passage P shown in Figure 3, to give the lead to the air from the region back of the carrier to the atmosphere.

The ports or channels M N O occupy such relationship with respect to each other, that when the parts are in the position illustrated in Figures 2 and 3, that being their normal position, the machine is out of operation.

When the handle G′ is moved in the appropriate direction, namely, to the right, the port M will be brought into registry with the carrier air inlet as shown in Figures 4 and 5, and air will enter the region in the carrier chamber back of the carrier head and cause the outward movement of the carrier as desired.

After the carrier has thus moved outward, and the machine has been given any further adjustment which may be necessary to make a fair stroke upon the rivet, the handle is still further moved to the right, and, thereupon, the port M is carried out of registry with the carrier air inlet and the ports N carried into registry with the hammer air inlets, whereupon the air entering through the hammer inlets will occasion the reciprocation of the hammer in the usual manner.

After the hammer has reciprocated for the required period the handle is moved to the left, shutting off air through the hammer air inlet, carrying the port M past but not stopping in registry with the carrier air inlet, and, in the continued movement of the handle, carrying the exhaust port O into registry with the inner branch of the carrier air inlet passage and the outlet passage P, and coming to rest in such position, to allow the escape of the air from behind the carrier head.

It will be understood that in the described operation, after the air has entered through the carrier air inlet to occasion the protrusion of the carrier, and is then cut off, said carrier will be maintained in its protruded position by the air within the carrier chamber behind the head of the carrier, and by the force of the air entering through the hammer air inlets and operating against the hammer,

which air last referred to, operating against the hammer, will also, as the rivet operated upon is beaten down, occasion the further protrusion of the hammer carrier to hold the rivet tool against the rivet.

Preferably we provide the operating handle with a disk Q, Figure 7, on which are formed a pair of shoulders *q* which by their encounter against a fixed pin R limit the movement of the valve plug to the range described.

Of course, if desired, any suitable mechanism may be employed for positively returning the hammer carrier to the base of the casing after a rivet has been operated upon.

Having thus described our invention, we claim—

1. In a riveting machine or similar instrument, in combination, a main casing, a hammer carrier mounted free for longitudinal movement in said casing, a hammer carried by and mounted free for reciprocation in said hammer carrier, and means for introducing a volume of air between the casing and the hammer carrier to occasion the concerted movement of said carrier and hammer and for introducing an independent volume of air within the carrier to occasion the independent movement of the hammer, substantially as set forth.

2. In a riveting machine or similar instrument, in combination, a main casing, a hammer carrier mounted free for longitudinal movement in said casing, a hammer carried by said carrier and adapted to have movement of reciprocation in relation to said hammer carrier, means for introducing air under pressure to the interior of the casing to act against the carrier to occasion the conjoint movement of the carrier and hammer, and means, for introducing air under pressure through a separate channel to the interior of the carrier to act against the hammer, substantially as set forth.

3. In a riveting machine or similar device, a casing, a hammer carrier mounted free for longitudinal movement therein, a hammer mounted free for reciprocation in said carrier but traveling with the carrier in the longitudinal movements of the latter, a hammer air inlet, an independent carrier air inlet, and means for controlling the said inlets, substantially as set forth.

4. In a riveting machine or similar device, in combination, a main casing embodying a carrier chamber and a guide chamber formed as an axial continuation thereof, a carrier mounted in said carrier chamber and extending into the guide chamber, and also extending through a suitable opening in the front or upper end of the carrier chamber, a hammer mounted wholly in said carrier, a hammer air inlet which opens into the guide chamber, a carrier air inlet which opens into the carrier chamber, and means for independently controlling said inlets, substantially as set forth.

5. In a riveting machine or similar device, a main casing embodying a carrier chamber and a guide chamber formed as an axial extension thereof, the lower portion of the wall of said carrier chamber being imperforate, a carrier mounted in said carrier chamber and extending into the guide-chamber, a tight joint being formed between the side of the carrier and the wall of the carrier chamber and a tight joint being formed between the wall of the extension of the carrier and the wall of the guide chamber, a hammer mounted for reciprocation within the carrier, and carried by said carrier, means for introducing compressed air within the lower end of the guide chamber, and independent means for introducing compressed air within the lower end of the carrier chamber, substantially as set forth.

6. In a riveting apparatus or similar device, a main casing embodying a carrier chamber the lower side wall of which is imperforate, a hammer carrier mounted in said carrier chamber and free to reciprocate therein and protruding through an opening in one end thereof, a packing disposed between said carrier and the wall of the carrier chamber, a guide chamber formed as an extension of said carrier chamber, an open ended tube or projection forming part of the carrier and extending within the guide chamber, a hammer mounted and contained in a suitable race in the interior of the carrier, a compressed air inlet opening into the lower end of the guide chamber, an independent air inlet opening into the lower portion of the carrier chamber, and means for controlling said inlets, substantially as set forth.

7. In a riveting apparatus or similar device, a main casing embodying a carrier chamber the lower wall of which is imperforate, a carrier mounted in said chamber and free to reciprocate therein and protruding through an opening in one end thereof, a hammer mounted for reciprocation in said carrier, and participating in all movements of said carrier, a guide chamber formed as an extension of said carrier chamber, an open ended tube or projection extending from the body of the carrier to within the guide chamber, a rivet tool mounted in the protruding end of the hammer carrier, and means for supplying compressed air to the exterior of the body of the carrier and independently to the interior of the body of the carrier, substantially as set forth.

8. In a riveting apparatus or similar device, in combination, a main casing embodying a carrier chamber and a guide chamber formed as an extension thereof, a carrier mounted free for reciprocation therein, a hammer carried wholly by and mounted free for reciprocation within said carrier, a hammer air inlet formed in the normally closed lower end of the guide chamber in communication at its outer end with a constant source of supply of compressed air, a carrier air inlet extending along and through the wall of the guide cham-

ber, opening as to its inner end within the carrier chamber and as to its outer end in communication with a source of compressed air, a valve seat which intersects said hammer air inlet and said carrier air inlet, an exhaust passage which leads from said valve seat to the atmosphere, a valve plug mounted for rotation in said seat, and embodying a hammer air inlet port, an independent carrier air inlet port and an independent exhaust air port, substantially as set forth.

9. In a riveting machine or similar device, a main casing embodying a carrier chamber and a guide chamber in communication with each other, a carrier comprising a tubular body having an enlarged head and an axial extension, said carrier being mounted in said carrier chamber with its extension projecting into and snugly fitting within the guide chamber, and its upper end protruding from the casing, a hammer mounted for reciprocation in and carried by said carrier, a hammer air inlet port passing through the normally closed lower end of the guide chamber, a carrier air inlet port or passage extending from end to end of the wall of the guide chamber, and opening at its inner end within the carrier chamber, and means for controlling said inlet passages, substantially as set forth.

10. In a riveting machine or similar device, a main casing embodying a carrier chamber and a guide chamber in communication with each other, a carrier comprising a tubular body having an enlarged head and an axial extension, said carrier being mounted in said chamber, with its extension projecting into the guide chamber and its upper end protruding through a suitable opening in the upper end of the carrier chamber, a hammer mounted for reciprocation in said carrier, and participating in all movements of the carrier, a hammer air inlet port passing through the normally closed lower end of the guide chamber, a carrier air inlet or passage extending from end to end of the wall of the guide chamber, and opening at its inner end within the carrier chamber, a valve seat formed in the lower or outer end of the guide chamber and intersecting said inlet passages, an exhaust air passage leading from said seat to the atmosphere, a valve plug mounted in said seat provided with three independent ports extending in different directions through it, one of which ports in one position of the valve plug is in registry with the carrier air inlet, another of which ports in another position of the valve plug is in registry with the hammer air inlet, and another of which ports in another position of the valve plug connects the inner branch of the carrier air inlet with the exhaust air passage, substantially as set forth.

11. In a riveting machine, in combination, a main casing embodying a carrier chamber, a hammer carrier mounted free for reciprocation in said chamber, said hammer carrier bearing a piston-head relationship to the said carrier chamber, a hammer mounted free for reciprocation in said hammer carrier but carried by the carrier in all movements of the latter, means for introducing a volume of air between the lower end of the carrier chamber and the adjacent end of the hammer carrier to cause the travel of said carrier, and means for introducing an independent volume of air within the hammer carrier for the propulsion of the hammer, substantially as set forth.

In testimony that we claim the foregoing as our invention we have hereunto signed our names this 24th day of October, A. D. 1899.

JOS. J. TYNAN.
HENRY C. MOSTILLER.

In presence of—
F. NORMAN DIXON,
THOS. K. LANCASTER.