M. SKLOVSKY & G. W. MIXTER.

RIVETING MACHINE.

APPLICATION FILED APR. 15, 1912.

1,116,747. Patented Nov. 10, 1914.

2 SHEETS—SHEET 1.

Fig. 1.

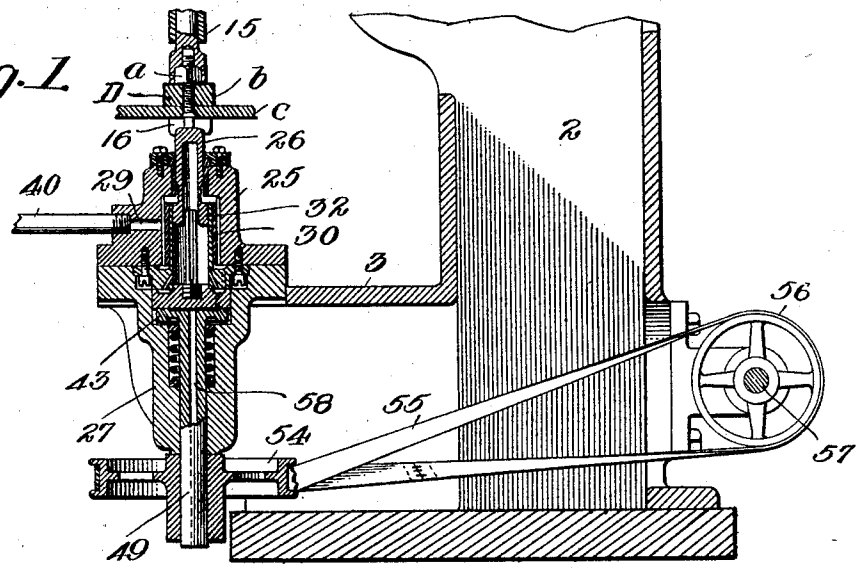
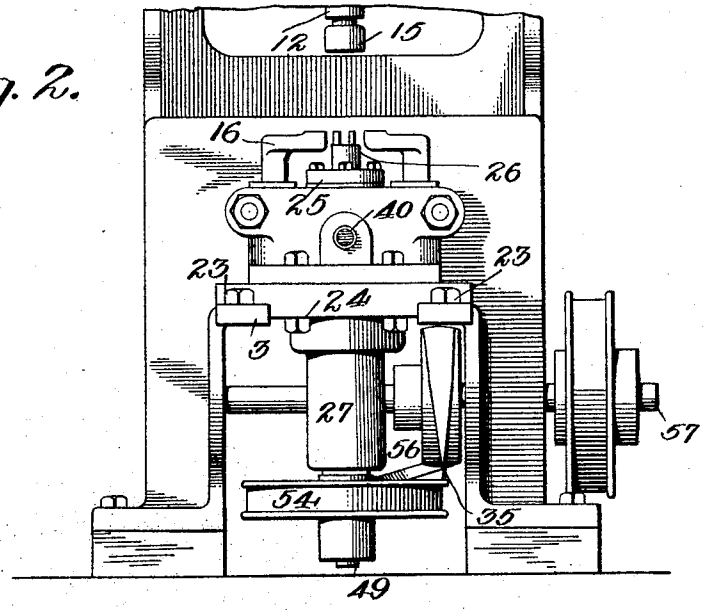


Fig. 2.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 3.

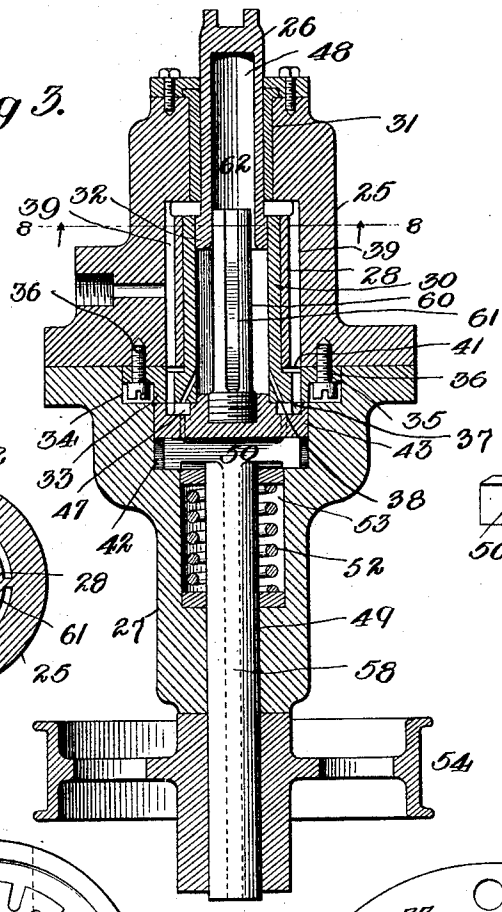


Fig. 8

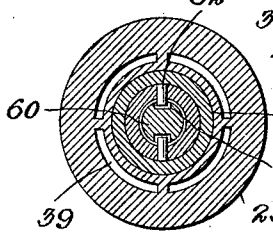


Fig. 7.

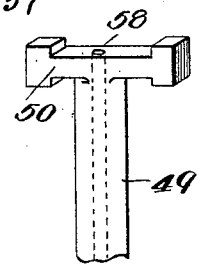


Fig. 4.

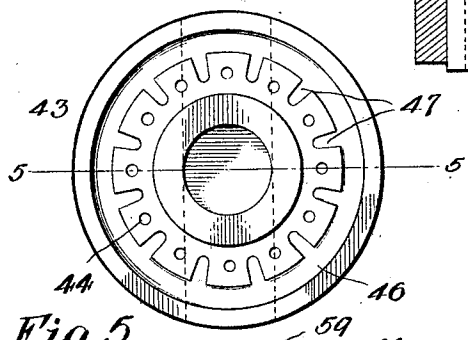


Fig. 6.

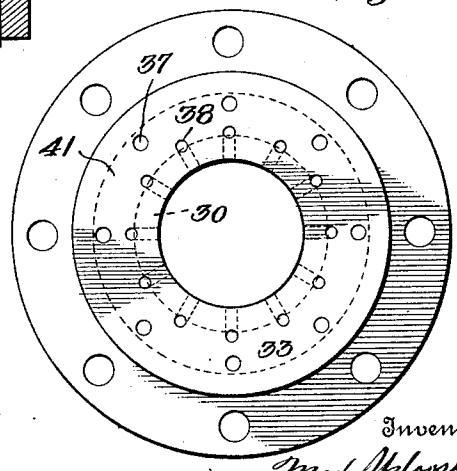
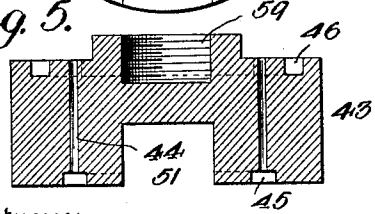


Fig. 5.



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UNITED STATES PATENT OFFICE.

MAX SKLOVSKY AND GEORGE W. MIXTER, OF MOLINE, ILLINOIS, ASSIGNORS TO DEERE & COMPANY, OF MOLINE, ILLINOIS, A CORPORATION OF ILLINOIS.

RIVETING-MACHINE.

1,116,747. Specification of Letters Patent. Patented Nov. 10, 1914.

Original application filed July 18, 1906, Serial No. 326,683. Divided and this application filed April 15, 1912. Serial No. 690,991.

To all whom it may concern:

Be it known that we, MAX SKLOVSKY and GEORGE W. MIXTER, citizens of the United States, residing at Moline, in the county of Rock Island and State of Illinois, have invented certain new and useful Improvements in Riveting-Machines, of which the following is a specification, reference being had therein to the accompanying drawing.

Our invention relates to riveting machines and is especially adapted for upsetting the head of a bolt or rivet which is provided with a nut at its other end.

The objects of our invention are to provide a riveting machine with improved pneumatically actuated means for reciprocating the hammer, with improved valve mechanism and with improved means for rotating the hammer as it is reciprocated.

Other objects will appear from the following specification and claims.

In the accompanying drawings which form a part of this specification we have shown a machine embodying our invention adapted for upsetting the head of a bolt. Means are shown for simultaneously turning the bolt as the head is riveted, but we do not herein claim broadly the combination of riveting means and of nut tightening means, as this is claimed in our copending application for combined metal working machines, Serial No. 326,683, filed July 18, 1906, of which this application constitutes a division.

Our present invention relates solely to the riveting mechanism which may be used in the manner illustrated in the drawings or in any desired way.

Of the drawings, Figure 1 is a vertical sectional view of a machine embodying our improvements. Fig. 2 is a front view of the machine. Fig. 3 is a central vertical section of the riveting machine drawn on a larger scale than the views thus far described. Fig. 4 is a top plan view of the valve device of the hammer or riveting mechanism. Fig. 5 is a central vertical section taken on the line 5—5 of Fig. 4. Fig. 6 is a bottom plan view of the cylinder in which the hammer or riveting tool reciprocates. Fig. 7 is a detached view of the shaft that operates the valve of the hammer or riveting mechanism. Fig. 8 is a transverse section on the line 8—8 of Fig. 3.

In the drawings, the riveting machine is shown as secured in place by suitable clamping or holding means 23 upon a platform or frame part 3.

We have represented the machine as being used to upset the head of a bolt *b* having a nut *a*, the bolt and nut serving to hold together two parts such as a metal plate C, which may be a plow-share, and a wooden beam D.

15 is a wrench in engagement with the nut *a* and, if desired, torque may be applied to the wrench by power or by hand to hold it tight while the head of the bolt is being upset.

16 is a support for the parts to be riveted together.

The frame or casing of the riveting tool or mechanism consists essentially of two parts secured together by bolts 24, or otherwise, the upper part 25 being constructed to receive and support the reciprocating hammer or upsetting tool 26, and the lower part 27 to receive and support the movable element of the valve mechanism.

The upper member 25 of the casing of the pneumatic riveting tool is formed with a central axially-disposed chamber 28, in which is secured a cylinder 30 that constitutes the working cylinder of the riveting tool or engine. The hammer or tool 26 is mounted in a sleeve or bushing 31 secured in the upper portion of the member 25 and by which it is guided and directed in its movements. It is provided at its inner end with a head or piston 32 that fits the cylinder 30 and moves therein, its opposite ends or faces being alternately acted upon by the motor fluid to cause its rapid reciprocations in the manner presently to be described. The stem of the reciprocating tool or hammer is of relatively large diameter and is preferably hollow, as indicated at 48, in order that the effective areas of the opposite faces of the piston, against which the motor fluid alternately acts, may be widely different, that on the upper side of the piston being the relatively small annular face surrounding the

large stem, while the opposite surface against which the motor fluid acts to force the tool outward to strike the blow, is of an area practically equal to the cross-area of the piston head.

The cylinder 30 is preferably provided at its lower or inner end with a head 33 occupying a recess or chamber 34 in the upper end of the casing member 27. This head is formed with an outward-extending flange 35, perforated at suitable intervals to permit the passage of the screws or bolts 36 which serve to securely unite the cylinder and its head with the upper member of the pneumatic hammer casing. Through the head 33 there are formed two sets of apertures 37, 38, which are preferably arranged concentric with the axis of the cylinder 30. The apertures 37 of one set communicate with chambers or ducts 39 for the motor fluid formed in the body of the upper casing member 25, while the apertures or ducts 38 of the other set communicate with the interior of the cylinder 30.

The motor fluid for operating the pneumatic hammer is conducted thereto through a pipe 40, and passage 29, the latter communicating with one of the motor fluid chambers 39. The chambers 39 communicate with each other at their upper and lower ends—they being separated merely for structural purposes—so that the motor fluid can freely act upon the head or piston of the riveting tool 26. In the upper face of the head 33 there is formed an annular groove or channel 41 that serves as a communication between the several ducts or apertures 37 as well as between the lower ends of the several chambers 39.

In the lower casing member 27 there is formed a second chamber 42 directly below the chamber 34, communicating therewith, and preferably of smaller diameter. In this latter chamber there is situated the valve 43 that controls the admission and exhaust of the motor fluid to and from the working cylinder 30. This valve is of cylindrical disk shape, fits within the recess on chamber 42 closely, and is held against the lower face of the head 33 containing the motor fluid ducts 37 and 38. Extending through the valve are the apertures 44, which preferably at their lower ends enter an annular groove or channel 45 formed in the face of the valve and serving as the means of communication between the several apertures or ducts. There are as many of these apertures or ducts as there are ducts or apertures 38 in the head 33, and they are so disposed that when the valve is in suitable position the ducts of one set register with those of the other. There is also formed a channel or groove 46 in the upper face of the valve, from which lead short radially-disposed ducts or channels 47 extending toward the center of the valve, each arranged midway between a pair of apertures 44, as clearly represented in Fig. 4.

The manner of operating the pneumatic hammer can now be stated. If the valve be adjusted to the position indicated in Fig. 3, that is with the radially-disposed ducts 47 opposite the lower open ends of the apertures 38, the motor fluid entering the chambers 39 passes therefrom through the ducts or apertures 37 into the channel 46 in the upper face of the valve and from there it passes through the ducts 47 to the apertures 38 by which it is led into the cylinder 30 below the piston or head of the hammer or riveting tool. This causes the latter to be forced upward into the position indicated in Figs. 1 and 3, that is into position to strike a blow. At the same time the motor fluid is acting upon the upper exposed face of the piston, but as the area of this is so much less than that of the opposite or lower face the effect is but slight and may be neglected. After the tool has been advanced to strike a blow the valve is adjusted to bring the upper ends of the apertures or ducts 44 therein opposite to the lower open ends of the ducts 38, and as the ducts 44 communicate with the exhaust the result is that the interior of the cylinder 30 is connected with the exhaust and at the same time cut off from the motor fluid supply. The hammer is retracted, its head 32 moving downward into the cylinder 30 by reason of the action of the motor fluid upon the annular upper face of the piston. It will be observed that the apertures or ducts 38 open into the cylinder 30 at some distance above its lower end, so that when the hammer is moved inward its piston closes the inner ports of the air ducts before the end of the piston head reaches the lower end of the cylinder, thereby forming an air cushion that prevents disastrous shocks to the apparatus. The piston is not packed and hence does not fit the cylinder air-tight, so that when the motor fluid pressure is admitted to the ducts 38 there is sufficient leakage past the piston to start its upward movement, slowly at first, but after the inner ports of the ducts 38 are uncovered, admitting the full force of the motor fluid to the inner end of the piston with increasing speed and force.

In order to effect the movement of the valve 43 we prefer to employ the following instrumentalities: 49 is a shaft mounted in the lower casing member 27 and provided at its upper end with a cross-head 50 that is adapted to engage with the valve, the latter being provided with a recess 51 in its lower face to receive such cross-head. The cross-head is held in close engagement with the valve, and the latter in turn tightly against the under face of the head 33, by a coiled

spring 52 situated in a recess 53 provided therefor in the casing member 27. A pulley 54 is mounted upon the shaft 49 and is connected by a belt 55 with another pulley 56 on a suitable driving shaft 57. Through this train of gearing the valve is rotated. A duct or passage 58 extends axially through the shaft 49 and constitutes the exhaust passage for the motor fluid. The course of the exhaust from the cylinder 30 is through the ducts 38 and 44 into the channel 45 which opens into the recess 42 in which extends the end of the shaft 49. From this chamber the spent motor fluid passes freely into the open through the duct 58.

The valve 43 is provided at its upper side with a screw-threaded socket 59 into which is screwed a post 60 that extends upward axially through the cylinder 30. The post is provided with one or more longitudinal grooves 61 into which extend pins 62 rigidly secured to the hammer or reciprocating tool 26. As the post 60 is secured fast to the valve, and is connected, as described, with the hammer, it follows that while the latter is free to reciprocate it is caused to rotate with the valve, with the result that the striking end of the head of the hammer is presented to the rivet or work being acted upon at different angular relations at the moments of delivering successive blows.

As the shaft 57 may be constantly or intermittently driven as desired, we have not deemed it necessary to show the connections of the driving mechanism therefor.

In practice, the shaft 49 is caused to make about sixty revolutions per minute and, as there are twelve apertures 44 in the valve and a like number of apertures 38 in the head 33, it follows that there will be approximately seven hundred reciprocations of the hammer per minute when the parts are run at the speed stated.

What we claim is:

1. In a machine for riveting or upsetting the end of a bolt, the combination of a reciprocating tool, a piston carrying said tool, a cylinder in which the piston is mounted, a rotary valve for controlling the admission of the motor fluid for reciprocating the tool, and a connection between the valve and the tool whereby the latter is rotated with the valve, substantially as set forth.

2. In a riveting machine, the combination of a reciprocating tool, a piston carrying said tool, a cylinder in which the piston is mounted, valve-mechanism for controlling the admission and exhaust of motive fluid to and from said cylinder, and connecting means between the valve-mechanism and the tool, whereby the movement of the valve-mechanism rotates the tool, substantially as set forth.

3. In a riveting machine, the combination of a reciprocating tool, a piston carrying said tool, a cylinder in which the piston is mounted, a valve for controlling the admission and exhaust of motive fluid to and from said cylinder arranged at one end thereof, means for rotating said valve, and telescoping connections between the piston and valve whereby the rotation of the latter effects the rotation of the tool during its reciprocations, substantially as set forth.

4. In a riveting machine, the combination of a cylinder, a reciprocating tool having a piston operating in the said cylinder, permanently open ducts for supplying an elastic fluid pressure agent to one side of the piston to continually tend to move it in one direction, and means operable independently of the reciprocations of the tool for intermittently supplying an elastic fluid pressure agent to the other side of the piston to cause it to be successively moved first in one direction in opposition to the action of the elastic pressure agent on the first said side, and then in other direction under the influence of the pressure agent on the first said side.

5. In a riveting machine, the combination of a cylinder, a reciprocating tool having a piston operating in the said cylinder, the effective area of one side of the piston being greater than the effective area of the other side, a single fluid pressure agent supply means, permanently open ducts for connecting the said pressure agent supply means to the side of the piston having the smaller effective area, and means operable independently of the reciprocations of the tool for intermittently connecting the said pressure agent supply means to the side of the piston having the larger effective area whereby the piston is caused to move successively first in one direction under the influence of the pressure agent on the larger side in opposition to the pressure agent on the smaller side and then in the other direction under the influence of the pressure agent on the smaller side.

6. In a riveting machine, the combination of a cylinder, a reciprocating tool having a piston operating in the cylinder, a fluid pressure agent supply means, a plurality of pairs of ducts arranged in an annular series about the axis of the cylinder, one duct of each pair communicating at one end with the interior of the cylinder and the other duct of each pair communicating at one end with the said pressure agent supply means, and a rotary valve having parts arranged to successively connect the first said duct of each pair with the second said duct and with the atmosphere.

7. In a riveting machine, the combination of a cylinder, a reciprocating tool having a piston operating in the cylinder, a frame supporting the cylinder and having an an-

nular recess surrounding the cylinder, the recess being permanently connected at one end to the cylinder at one side of the piston, and means for intermittently connecting the recess with the interior of the cylinder at the opposite side of the piston at points in a plurality of circumferentially separated radial planes.

In testimony whereof we affix our signatures, in presence of two witnesses.

MAX SKLOVSKY.
GEORGE W. MIXTER.

Witnesses:
ALFRED P. WEBSTER,
LILLIAN V. SKOGH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."