A. PARFITT.

FLUID PRESSURE RAM.

APPLICATION FILED AUG. 9, 1902.

913,970.

Patented Mar. 2, 1909.

2 SHEETS—SHEET 1.

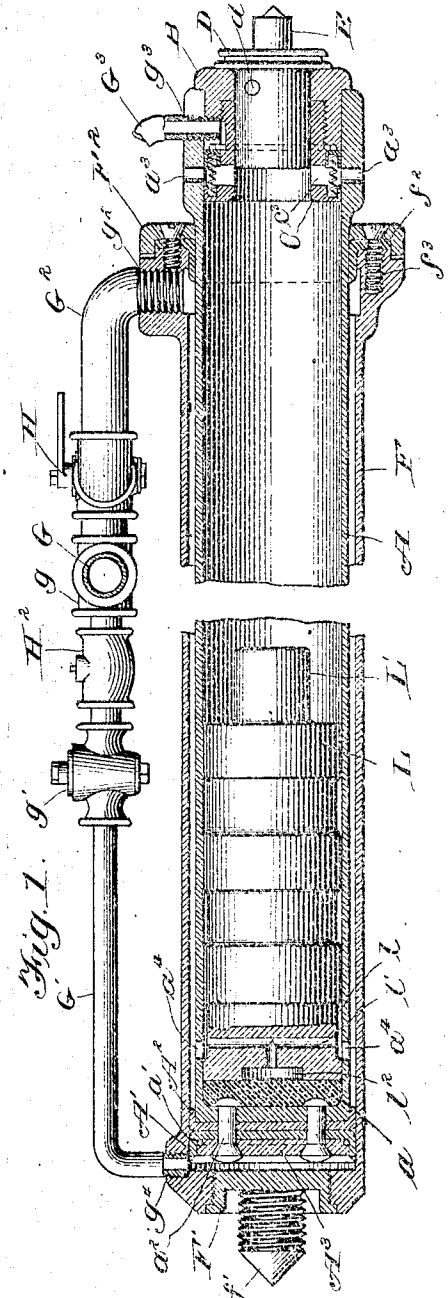


Fig. 1.

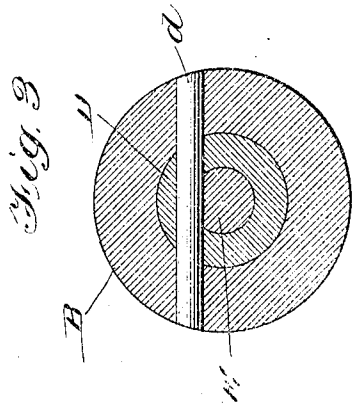


Fig. 3

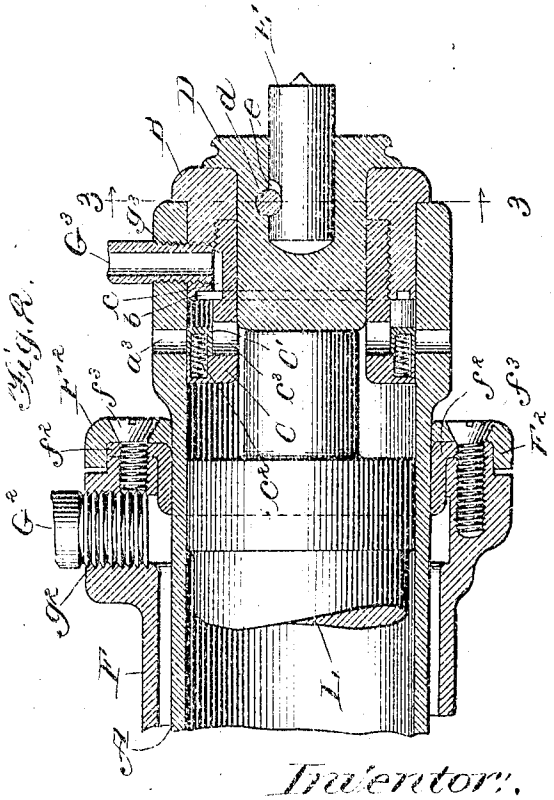


Fig. 2.

Witnesses:

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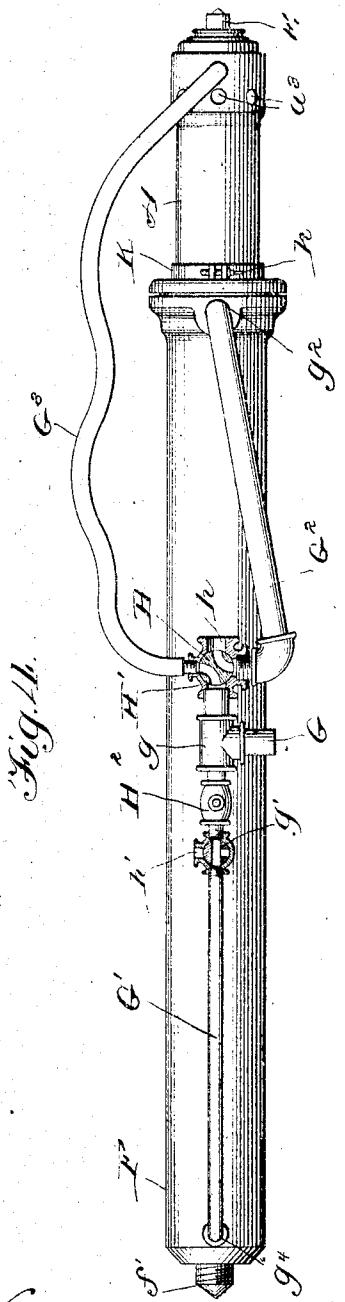


Fig. 4.

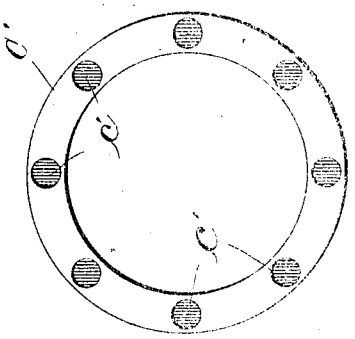


Fig. 6.

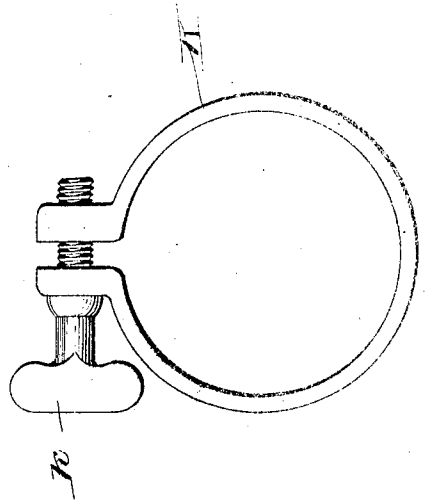


Fig. 5.

Witnesses:

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UNITED STATES PATENT OFFICE.

ALFRED PARFITT, OF TOPEKA, KANSAS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE PITTSBURG PNEUMATIC COMPANY, OF CANTON, OHIO, A CORPORATION OF NEW JERSEY.

FLUID-PRESSURE RAM.

No. 913,970. Specification of Letters Patent. Patented March 2, 1909.

Application filed August 9, 1902. Serial No. 119,001.

To all whom it may concern:

Be it known that I, ALFRED PARFITT, a citizen of the United States, residing at Topeka, county of Shawnee, State of Kansas, have invented a certain new and useful Improvement in Fluid-Pressure Rams, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates in general to fluid pressure operated tools, and more particularly to that type of such tools which are adapted to deliver a single powerful blow at each operation.

In the use of ramming and punching tools for various purposes, as for instance in driving stay bolts out of boilers, it is desirable that the cylinder of the tool should be securely supported with the punch against the stay bolt and thereby render the full force of the blow effective by preventing any recoil of the cylinder.

The object of my invention is to provide a fluid pressure operated tool of the character referred to the cylinder of which may be readily supported between the opposite walls or surfaces or between any fixed support and the object to be rammed so that the recoil of the blow delivered on the object may be resisted by the opposite surface or other fixed support.

A further object of my invention is to provide a fluid pressure operated device of the character described which will be simple in construction, comparatively inexpensive in manufacture and efficient in operation.

The embodiment of my invention herein disclosed, generally described, comprises an outer cylinder surrounding and movable relatively to the cylinder within which the reciprocating piston is located, and means for admitting fluid pressure between the adjacent ends of the two cylinders thereby moving the same relatively a sufficient distance for the tool to extend between the fixed support and the object upon which the blow is to be delivered.

My invention will be more fully described hereinafter with reference to the accompanying drawings in which the same is illustrated as embodied in a convenient and practical form, and in which—

Figure 1 is a central longitudinal section of my invention; Fig. 2 a view on an enlarged scale of the mechanism shown at the right of Fig. 1; Fig. 3 a sectional view taken on line 3—3 Fig. 2; Fig. 4 a plan view of my invention, the two cylinders being shown as having been moved relatively; Fig. 5 an elevational view of a clamp adapted to surround the inner cylinder; and Fig. 6 an elevational view on an enlarged scale of the annular piston valve.

Similar reference characters are used in the several figures of the drawings to designate similar parts.

Reference letter A indicates a cylinder within which a piston L is adapted to reciprocate. One end of the cylinder A is provided within the same with a buffer a to receive the return blow of the piston. A flanged washer a^2 is located on the exterior surface of the end of the cylinder. A cup shaped leather packing A′ is secured to the end of the cylinder with the flange thereof extending in an opposite direction from the flange of the washer A^2. A spring ring a' is employed to force outwardly the packing A′. A washer A^3 is surrounded by the flange on the packing A′. Rivets a^2 extend through the end of the cylinder, the washer A^2, the packing A′ and the washer A^3 and secure the same rigidly together.

Located in the opposite end of the cylinder A is a ferrule B provided with a circular groove b on the edge thereof facing the interior of the cylinder. A bushing C engages the interior surface of the end of the cylinder A adjacent to the ferrule B and overlaps the latter with which it is in screw threaded engagement. An annular chamber is formed between the bushing C, the end of the ferrule B and the surrounding portion of the cylinder A. Within the annular chamber just described is located an annular piston valve C′. The opposing surfaces of the piston valve C′ and the bushing C are provided with alined recesses in which are seated expansion springs c^2 normally retaining the annular piston valve at the end of the valve chamber adjacent to the ferrule B. The ends of the cylinder A and the bushing C are provided with registering openings a^3 and c^3 respectively, the communication between which is controlled by the annular piston valve C′.

Surrounding the cylinder A and of a somewhat greater interior diameter than the ex-

terior diameter thereof is a cylinder F. The interior surface of the outer cylinder is closely engaged by the flanged washer A^2 and cup shaped packing A'. The end of the outer cylinder adjacent to the closed end of the interior cylinder is provided with a screw threaded cap F' which has formed integrally therewith a pointed projection f'. The end of the outer cylinder F opposite the cap F' is provided with a flanged ring F^2 between which and the end of the cylinder F is clamped a packing ring f^2 preferably of leather which closely engages the exterior surface of the inner cylinder A.

A conduit G' extends through the outer cylinder adjacent to the end thereof at which the cap F' is located and communicates with the interior of the outer cylinder. A second conduit G^2 extends through the outer cylinder F at the opposite end thereof and is in screw threaded engagement therewith, as shown at g^2. A supply conduit G is connected by means of a T-coupling g with both of the conduits G' and G^2.

Located in the conduit G' is a three-way valve g' by means of which the closed end of the outer cylinder may be placed in communication either with the supply conduit G or an exhaust port h'. A check valve H^2 is preferably located in the conduit G' between the supply conduit G and the three-way valve g'. A four-way valve H controls the supply and exhaust of pressure through the conduit G^2 to the opposite end of the outer cylinder F.

Communicating with the valve casing H' in which the four-way valve H is located is a conduit G^3 preferably made of flexible hose which extends from a point opposite to the point of connection between the conduit G^2 and the valve casing H' to a section of pipe g^3 inserted through registering openings in the end of the cylinder A and the ferrule B. An exhaust port h is formed in the valve casing H at a point directly opposite the pipe section leading from the T-coupling g.

Located within the opening in the ferrule B but extending within the opening in the bushing C is a chuck or punch holder D. A punch E is inserted in a socket formed in the chuck D. The punch and chuck or punch holder may be connected together by any suitable means, as for instance a pin d extending through the holder and partially surrounded by a groove e formed in the punch E.

K indicates a clamping ring the outwardly extending ends of which are engaged by a set screw k to secure the clamp around the exterior surface of the projecting portion of the cylinder A.

The operation of my invention is as follows: The conduit G is connected with a source of motive fluid supply by means of a flexible pipe so that the tool may be located at the desired place of use. The tool is held between a fixed support and the object upon which a blow is to be delivered and the three-way cock is then turned so as to permit fluid pressure to pass through the conduit G' to the space between the adjacent ends of the outer cylinder F and the inner cylinder A. The cup shaped packing A' prevents the fluid pressure passing between the cylinders and hence the inner cylinder is moved outwardly with respect to the outer cylinder, thereby separating the point of projection f' and the punch E a distance equal to the space between the fixed support and the object to be worked upon. The check valve H^2 retains the pressure between the cylinders, thereby maintaining the same in the distended relation to which they have been adjusted. The four-way valve H is then turned in position to connect the conduit G^2 with the supply conduit, thereby permitting fluid under pressure to pass into the space between the outer surface of the inner cylinder A and the inner surface of the outer cylinder F. The fluid pressure then passes through ports a^4 formed through the inner cylinder adjacent to the closed end thereof thence into the annular groove l formed in the outer surface of the piston L, thence into the passages l' to the chamber l^2 formed in the end of the piston L. The fluid pressure consequently impels the piston towards the end of the inner cylinder in which is located the punch holder. The forward end of the piston is reduced, as shown at L', so that the same is of a less diameter than the opening through the bushing C. The reduced portion L' of the piston consequently delivers a blow upon the punch holder D which is communicated to the punch E to perform the desired function. During the movement of the piston just described the space within the forward end of the cylinder is in communication with the atmosphere through the ports c^3 in the bushing C and the ports a^3 through the end of the cylinder.

After the piston has delivered its blow the four-way valve is turned to the position shown in Fig. 4 when the space between the surfaces of the cylinders is placed in communication with the exhaust port h and the conduit G^3 is placed in communication with the supply conduit. Fluid pressure then flows through the conduit G^3 into the pipe section g^3 thence through the groove c formed in the surface of the bushing C adjacent to the inner end of the pipe section g^3, thence into the annular groove b where it is exerted upon the annular piston valve C' forcing the same into the position shown in Fig. 2 in which it closes the exhaust ports a^3 leading through the end of the inner cylinder A. The ports c^3 through the bushing C are however of a diameter greater than

the width of the annular piston valve and hence such ports c^3 are placed in communication with the circular valve chamber within which the piston valve is located, thereby permitting fluid pressure to pass into the front end of the inner cylinder A and force the piston rearwardly to its initial position shown in Fig. 1. If it is necessary to deliver a second blow the four-way valve may be turned so as to connect the conduit G^3 with the exhaust port h, thereby permitting the fluid pressure behind the annular piston valve C' to escape so that the tension of the spring c^2 will force the valve from the position shown in Fig. 2 to that shown in Fig. 1, thereby placing the front end of the inner cylinder in communication with the atmosphere through the ports c^3 through the bushing and the ports a^3 through the end of the cylinder.

When the tool has performed the object desired the three-way cock g' is turned so that the conduit G' is placed in communication with the atmosphere, thereby exhausting the pressure between the closed ends of the cylinders and permitting the same to telescope one within the other. The tool may then be located in position to operate upon another object, as for instance another rivet or stay bolt when the three-way cock g' is again manipulated to permit the passage of fluid pressure into the space between the closed ends of the cylinders to separate the same the requisite distance. The four-way cock may then be again manipulated in the manner above described.

When it is desired to retain the cylinders in an adjusted relation the clamp K may be placed around the inner cylinder A in contact with the end of the outer cylinder and there secured by means of the set screw k. The clamp may be readily removed or located at a different point on the cylinder when desired.

From the foregoing description it will be observed that I have invented an improved fluid pressure operated tool for ramming or punching which is capable of being extended to a greater or less degree according to the distance between a fixed support and the object upon which the blow is to be delivered, thereby slightly retaining the tool against recoil and insuring the full force of the impact of the piston to be effective in performing the desired work.

It will be noticed that the passages l' leading to the chamber l^2 in the end of the piston are smaller in size than the ports a^4 consequently when the piston is in the position shown in Fig. 1, the flow of fluid pressure through the passages l' to the chamber l^2 imparts a comparatively slow initial movement to the piston, such movement being however accelerated by the opening of the ports a^4 when the same are uncovered by the end of the piston. By such means a violent recoil at the instant fluid pressure is admitted through the ports a^4 is avoided without however diminishing the force of the blow which is delivered by the piston.

It is obvious that when the tool is to be used in an inclined or in an upright position the piston L will return to the position indicated in Fig. 1 by gravity and hence the means for exposing the front end of the piston to fluid pressure to return the same to its initial position may be omitted.

While I have described more or less precisely the details of construction I do not wish to be understood as limiting myself thereto, as I contemplate changes in form, the proportion of parts, and the substitution of equivalents, as circumstances may suggest or render expedient, without departing from the spirit of my invention.

Having now fully described my invention what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a fluid pressure operated tool comprising a cylinder and a reciprocating piston therein having a piston head, of a second cylinder within which the first cylinder closely fits, a bearing projecting from the closed end of said second cylinder, a conduit leading from a fluid pressure supply, a branch conduit communicating with the space between the adjacent closed ends of the cylinders, a check valve in said branch conduit for retaining fluid pressure between the cylinders thereby forcing said bearing against a support and the front of the tool against the work, and a second branch conduit for supplying and exhausting fluid pressure to and from the first cylinder to drive the piston forward therein.

2. The combination with a fluid pressure operated tool comprising a cylinder and a reciprocating piston therein, of a second cylinder within which the first cylinder closely fits, a bearing projecting axially from the closed end of said second cylinder, a conduit leading from a fluid pressure supply, a branch conduit communicating with the space between the adjacent closed ends of the cylinder, a check valve in said branch conduit for retaining fluid pressure between the cylinders, thereby forcing said bearing against a support and the front end of said tool against the work, a second branch conduit communicating with said supply conduit, and a manually operated valve in said second branch conduit controlling the supply and exhaust of fluid pressure to and from the opposite ends of said first cylinder to reciprocate the piston therein.

3. The combination with a fluid pressure operated tool comprising a cylinder and a reciprocating piston thereon, of a second cylinder within which the first cylinder closely fits, a bearing projecting axially from said

second cylinder, a supply conduit leading from a source of fluid pressure, a branch conduit communicating with the space between the adjacent closed ends of the cylinders, a check valve in said branch conduit for retaining fluid pressure between the cylinders, and thereby forcing said bearing against a support and the front end of said tool against the work, a second branch conduit for supplying and exhausting fluid pressure to and from the first cylinder to drive the piston forward therein, a third branch conduit for supplying fluid pressure to the opposite end of said first cylinder to drive the piston therein rearwardly, and a manually operated valve for controlling the supply and exhaust of fluid pressure through said second and third branches.

4. The combination with a fluid pressure operated tool comprising a cylinder having a closed end, a reciprocable piston therein having a piston head and a punch at the end of the cylinder opposite to its closed end adapted to receive the impact of the piston, of a second cylinder within which the first cylinder closely fits having a closed end and an open end closely engaging the exterior surface of the inner cylinder, a conduit communicating with the space between the closed ends of said cylinders, means for controlling the flow of fluid pressure through said conduit to relatively move said cylinders and thereby force the end of said second cylinder into engagement with a fixed support and said punch into contact with the work, a second conduit communicating with the space between the outer cylindrical surface of the inner cylinder in advance of the piston head thereof and the inner surface of the outer cylinder, said inner cylinder having ports therethrough leading to the working end thereof, and means for controlling the flow of fluid pressure through said second conduit to the working end of the inner cylinder.

5. The combination with a fluid pressure operated tool comprising a cylinder having a closed end forming a piston head, a reciprocable piston therein and a punch at the end of the cylinder opposite to its closed end adapted to receive the impact of the piston, of a second cylinder within which the first cylinder closely fits having a closed end and an open end closely engaging the exterior surface of the inner cylinder, a conduit communicating with the space between the closed ends of said cylinders, means for controlling the flow of fluid pressure through said conduit to relatively move said cylinders, a second conduit communicating with the space between the outer cylindrical surface of the inner cylinder and the inner surface of the outer cylinder in advance of the piston head of the inner cylinder, said inner cylinder having ports therethrough leading to the working end thereof, a third conduit for fluid pressure communicating with the end of the inner cylinder adjacent to the punch for effecting the stroke of the piston away from the punch, and a four-way valve for alternately admitting fluid pressure to said second and third conduits.

6. The combination with a fluid pressure operated tool comprising a cylinder having a closed end, a reciprocable piston therein and a punch at the end of the cylinder opposite to its closed end adapted to receive the impact of the piston, of a second cylinder within which the first cylinder closely fits having a closed end and an open end closely engaging the exterior surface of the inner cylinder, a conduit communicating with the space between the closed ends of said cylinders, means for controlling the flow of fluid pressure through said conduit to relatively move said cylinders and thereby force the outer end of said second cylinder into engagement with a fixed support and said punch into contact with the work, conduits through which fluid pressure passes to the opposite ends of said inner cylinder, and a four-way valve controlling the admission and exhaust of pressure to the opposite ends of said inner cylinder.

7. In a fluid pressure operated tool, the combination with a cylinder having a normally open exhaust port leading from the front end thereof, of a reciprocating piston therein, conduits through which fluid pressure flows to the opposite sides of said piston, and a piston valve located within and in the path of the fluid pressure flowing to the forward end of the cylinder closing the exhaust port therefrom during the admission of pressure to the forward end of the cylinder.

8. In a fluid pressure operated tool, the combination with a cylinder having an exhaust port leading from the front end thereof, of a reciprocating piston therein, a punch adapted to receive the impact of the piston, conduits through which fluid pressure flows to the opposite sides of said piston, and an annular piston valve located within the cylinder concentric with relation to said punch and controlling the exhaust port from the forward end of the cylinder, said piston valve being located in the path of the fluid pressure passing to the forward end of the cylinder and actuated thereby to close said exhaust port.

9. The combination with a fluid pressure operated tool comprising a cylinder, a reciprocable piston therein and means for controlling the supply and exhaust of fluid pressure to said cylinder to reciprocate the piston therein, of a second cylinder within which the first cylinder closely fits, a conduit for fluid pressure extending through the outer cylinder to the space between the adjacent ends of the cylinders, a check valve located in said conduit opening towards said space, a

separate pipe for admitting fluid to reciprocate the piston and means for controlling the flow of fluid pressure through said conduit to relatively move said cylinders and thereby force the outer end of said second cylinder into engagement with a fixed support and the forward end of said tool against the work.

10. The combination with a fluid pressure operated tool comprising a cylinder having a closed end, a reciprocable piston therein, means for controlling the supply and exhaust of fluid pressure to said cylinder to reciprocate the piston and a punch at the end of the cylinder opposite to its closed end adapted to receive the impact of the piston, of a second cylinder within which the first cylinder closely fits having a closed end and an open end both closely engaging the exterior surface of the inner cylinder, a conduit communicating with the space between the closed ends of said cylinders, a check valve located in said conduit opening towards said space, a separate pipe for admitting fluid to reciprocate the piston, and a three-way valve controlling the admission and exhaust of fluid pressure through said conduit to and from the space between the closed ends of said cylinders and thereby force the outer end of said second cylinder into engagement with a fixed support and said punch to contact with the work.

In testimony whereof, I sign this specification in the presence of two witnesses.

ALFRED PARFITT.

Witnesses:
GEO. L. WILKINSON,
CLARA C. CUNNINGHAM.