Aug. 31, 1937. F. M. LEWIS 2,091,408

MECHANICAL HAMMER AND LIKE IMPACT TOOL

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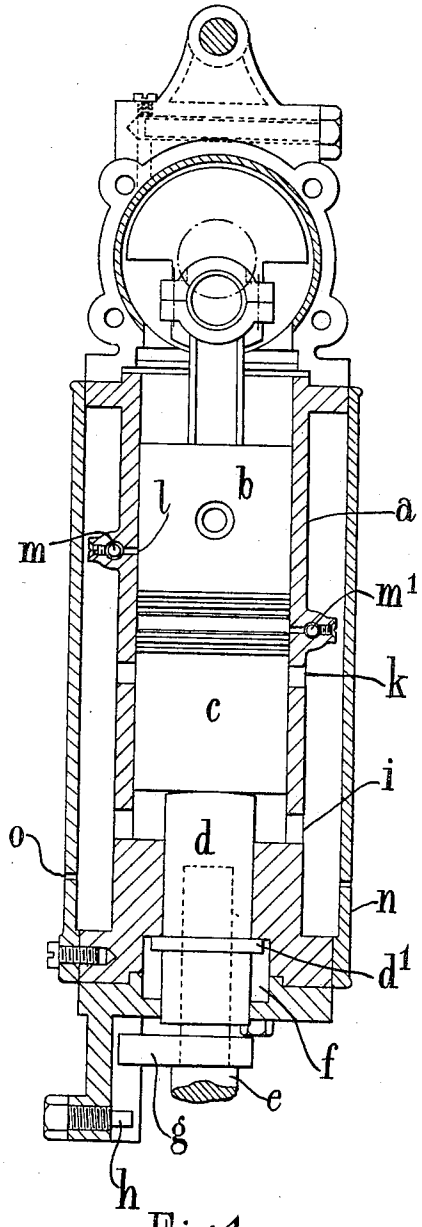


Fig.1.

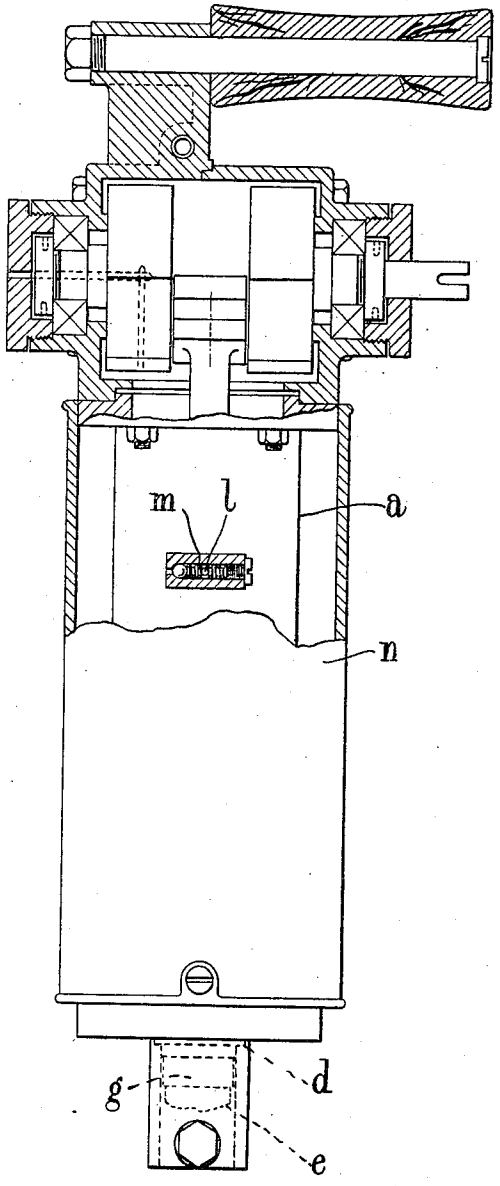


Fig.2.

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MECHANICAL HAMMER AND LIKE IMPACT TOOL

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2 Claims. (Cl. 125—34)

This invention relates to mechanical hammers, rock drills, caulking and riveting tools and like percussive tools or impact devices of the kind comprising in a single cylinder a mechanically operated main or working piston and a second piston linked to the first mentioned piston pneumatically to be actuated thereby and constituting the operative piston of the tool.

Impact devices of this character have before been proposed having one or more ports in the cylinder controlled by the operative piston in such a way as to be automatically closed when the tool carried by the operative piston is in contact with the work and to be opened when the pressure of the work on the tool is removed.

The object of the present invention is to devise improvements in the construction and arrangement of impact devices of the kind referred to which will render them more certain and powerful in operation, and the invention consists in an impact device of the kind referred to having a port in the cylinder controlled by the main piston and also by a non-return valve through which inhalation of air into the space between the pistons may take place so as to ensure that there shall always be an air cushion between the pistons.

Further features of the invention will be apparent from the description given hereafter.

The accompanying drawing illustrates one mode of carrying out the invention.

Figure 1 is a longitudinal sectional elevation of one convenient form of mechanical hammer in accordance with the invention and

Figure 2 is a side view of Figure 1 partly in section and partly in elevation.

In carrying my invention into effect in one convenient manner I form my improved apparatus with a cylinder *a* of suitable size and shape in which is a main or working piston *b* operated from a prime mover by flexible shafting or otherwise or operated by a portable prime mover forming part of the tool itself, it being thought unnecessary to indicate any particular means of operation in the drawing since any suitable source of power and any convenient form of connection may be employed.

The cylinder *a* also contains a floating piston *c* which may be termed the operative piston, and which is adapted to co-operate with an anvil *d* holding the chisel *e* or other tool and which is allowed a limited amount of movement, the anvil, for example, being formed with a shoulder d^1 working in a recess *f* at the base of the main cylinder.

Furthermore, the chisel or other tool may be provided with a collar or the like *g* adapted to co-operate with a stop *h* so that the chisel or other tool is prevented from falling away from the device.

The cylinder *a* is provided with two sets of ports *i k* respectively, such ports being spaced apart as shewn and such that when the operative piston *c* is in its free or neutral position the ports *k* which may be termed the neutral ports, are just above the upper end of the piston *c*. In addition the main cylinder is provided with a port *l* controlled by the working piston *b* and also by a non-return valve *m* permitting of the ingress of air into the cylinder while preventing its egress therefrom. The clearance between the working piston *b* when at the bottom of its stroke and the operative piston *c* when in its working position as shewn in Figure 1 (that is when pushed upwards by the anvil when the tool is pressed into contact with the work) is relatively small.

The whole arrangement may be in an outer casing *n* designed to protect the ports and valve from the entry of dirt or foreign matter, the casing being provided with one or more small openings *o* to permit of the entry of air into the annular space between the casing and cylinder.

The operation of the device is as follows:—

Normally with the piston *c* in its lowermost position the ports *k* will be open and in consequence when power is applied to the device to move the working piston *b* such movement will not cause any movement of the operative piston and the tool will thus be in neutral. So soon, however, as the tool is pressed into contact with the work the anvil moves into the position shewn in Figure 1, so that the neutral ports are closed by the operative piston and thereupon upward movement of the working cylinder *b* causes the operative piston also to move upwards, there being, however, a lag between the two movements so that when the working piston is at the top of its stroke, the non-return valve *m* is open and slight inhalation of air takes place due to the reduction in pressure in the space between the two pistons. When the working piston starts to descend it meets the operative piston still ascending and these movements continue until the clearance between the pistons becomes small when the pressure between the pistons rises to an amount sufficient to give the operative piston a downward movement which is designed to take place when the working piston *b* is moving at its greatest speed, that is, when the crank is at right angles. The operative piston now travels

more quickly than the working piston and delivers its blow upon the anvil.

The purpose of the non-return valve *m* is to ensure that there shall always be an air cushion between the two pistons so that if any air leakage takes place the pistons will not come into contact with one another.

An arrangement such as above described operates quite satisfactorily so long as the piston *b* allows a certain amount of leakage to take place from the space between the pistons, but it is found in practice that if the piston does not permit of such leakage, the pressure between the pistons will eventually rise to such an extent that the hammer will cease to function. In such cases, therefore, it is necessary to provide a further valve m^1 which may be similar to the valve *m* except that it opens under pressure instead of under suction and when the operative piston is in its lowest position. Thus at the bottom of the stroke the valve m^1 opens and allows the air between the pistons to reach about atmospheric pressure. At the top of the stroke the valve *m* opens and allows air to be admitted to make up leakage and to allow the blow to be delivered without any (or much) negative force to be given to the operative piston, the ideal being that the blow is delivered when the crank is at right angles and that the pressure between the pistons should be at about atmospheric pressure when the blow is delivered. On the further movement of the main or working piston, the pressure is relieved by the opening of the valve m^1.

I claim:

1. An impact device of the kind referred to comprising a cylinder, a power-driven piston in said cylinder, a second piston linked pneumatically to the first mentioned piston and constituting the operative piston of the tool, said cylinder having two sets of ports, one situated at the lower end and another set situated just above the operative piston when the latter is in its inoperative position and constituting the neutral ports of the tool, said cylinder further having a port controlled by the working piston and also by a non-return valve through which inhalation of air into the space between the pistons may take place, and a non-return valve controlling a further port in said cylinder to relieve the pressure between the pistons when the operative piston is at the bottom of its stroke.

2. An impact device comprising the combination of claim 1 and having also an outer casing enclosing the main cylinder and non-return valves and furnished with one or more small openings to permit of the entry of air into the annular space between the casing and cylinder.

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