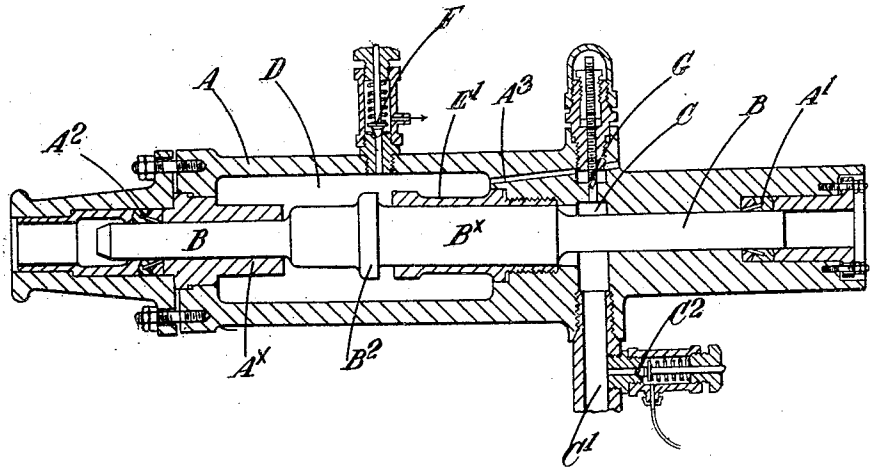
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PERCUSSION TOOL FOR WAVE TRANSMISSION APPARATUS

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UNITED STATES PATENT OFFICE

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PERCUSSION TOOL FOR WAVE-TRANSMISSION APPARATUS

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This invention relates to percussion tools for operation by compressional liquid wave-transmission mechanism. In the spring suspension of tools of this kind it is necessary to obtain resonance between the reciprocating mass and the resilient element. As is well known, in any spring suspension of a mass, if any predetermined natural period of oscillation is to be obtained, the resiliency or capacity of the spring suspension must bear a definite relation to the reciprocating mass which is supported and the greater the mass the more rigid must be the resilient support. For substantial masses and high periodicity of oscillation the yield of the spring suspension for a given force must be small and the compressibility of a volume of liquid is sufficient, in the case of a considerable reciprocating mass, to bring the natural period of the suspension sufficiently low to correspond to the periodicity of the wave transmission, so that resonance is established for this periodicity. The use of liquid as a resilient body in a percussion tool of the above type has already been proposed either in the form of a single body or column of liquid or two bodies or columns on opposite sides of a dividing wall belonging to the body of the tool, the percussion or striking device or rod extending through the said liquid.

According to the present invention the percussion rod is formed with a rearward extension or portion which passes through the working chamber and which is made of smaller diameter than the portion of the rod in front of the said rearward portion so as to provide a shoulder or area upon which the operating liquid in the said working chamber operates. The said rearward portion of the rod passes through a gland to the atmosphere.

In order that the said invention may be clearly understood and readily carried into effect, the same will now be more fully described with reference to the accompanying drawing which is an axial section showing a form of percussion tool constructed according to this invention.

A is the body or casing of the tool, B is the percussion rod which is arranged centrally within the body A and passes through glands A^1, A^2 at the rear and forward ends of the tool body, C is the working chamber to which the operating wave-transmission liquid is admitted by means of a pipe C^1 and D is the aforesaid chamber containing a single body of liquid (herein termed the liquid spring chamber) situated in the forward part of the tool body in front of the working chamber C.

The middle portion B^x of the rod B is situated in a bushing E^1 and is made of larger diameter than the rear portion of the rod to provide an area for the operating liquid in the working chamber C to act upon; the required area for the liquid in the chamber D to act upon in order to move the rod rearwards is provided by making the front portion of the rod, which is situated in a bushing A^x, of smaller diameter than the middle portion as shown. A collar B^2 is provided for limiting the rearward movements of the rod B, and the forward movements are limited by the shoulder between the larger diameter portion and the smaller diameter front portion of the rod, the said collar and shoulder coming against the bushings E^1 and A^x respectively.

As the middle portion B^x of the rod must be free to slide readily in the bushing E^1 and there are during each oscillation considerable differences of pressure between the liquid spring chamber D and the working chamber C receiving the operating wave-transmission liquid, leakage is liable to occur from the working chamber into the liquid spring chamber and to prevent an undesirable accumulation of pressure in the latter chamber we may provide as shown a relief valve F which opens at a predetermined pressure. The said relief valve F would be set to open at about the mean pressure in the working chamber C. This relief valve forms the subject of our British Patent No. 293088 and may be replaced by any of the equivalent devices mentioned in the specification of that patent. The pipe C^1 may be provided, as shown, with a spring controlled relief valve C^2 similar to the relief valve F. A screw-down valve G

may also be provided for controlling the flow of liquid from the working chamber C to the liquid spring chamber D through a passage A^3 in the tool body. This valve is opened when the tool is to be started working so as to enable the chamber D to be filled with liquid and is closed during normal working; it can, however, be partly opened to any desired extent during working so as to vary the force of the blow of the percussion rod B.

What we claim and desire to secure by Letters Patent of the United States is:—

1. In a percussion tool for operation by compressional liquid wave-transmission mechanism, the combination with the percussion rod and the working chamber for said rod, of a chamber which contains a body of liquid serving as the resilient element on which, in conjunction with said rod, resonance depends, one portion of said rod being disposed in the latter chamber and having an area on which said liquid acts to move the rod rearwardly, and a rearward portion of said rod passing through said working chamber and made of such diameter as to provide a shoulder between it and the portion of the rod in front thereof, the operating liquid acting upon the area represented by the said shoulder.

2. In a percussion tool for operation by compressional liquid wave-transmission mechanism, the combination with the elements claimed in claim 1, of a gland through which the rear portion of the percussion rod passes to the atmosphere.

3. In a percussion tool for operation by compressional liquid wave-transmission mechanism, the combination with the elements claimed in claim 1, of a relief valve for the body of liquid, this valve being set to open automatically at a predetermined pressure during the operation of the tool.

4. In a percussion tool for operation by compressional liquid wave-transmission mechanism, the combination with the elements claimed in claim 1, of a gland through which the rear portion of the percussion rod passes to the atmosphere and a relief valve for the body of liquid this valve being set to open automatically at a predetermined pressure during the operation of the tool.

5. In a percussion tool for operation by compressional liquid wave-transmission mechanism, the combination with the elements claimed in claim 1, of a conduit between the working chamber and the chamber containing the body of liquid and an adjustable valve controlling this conduit.

6. In a percussion tool for operation by compressional liquid wave-transmission mechanism, the combination with the elements claimed in claim 1, of a gland through which the rear portion of the percussion rod passes to the atmosphere, a conduit between the working chamber and the chamber containing the body of liquid and an adjustable valve controlling this conduit.

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