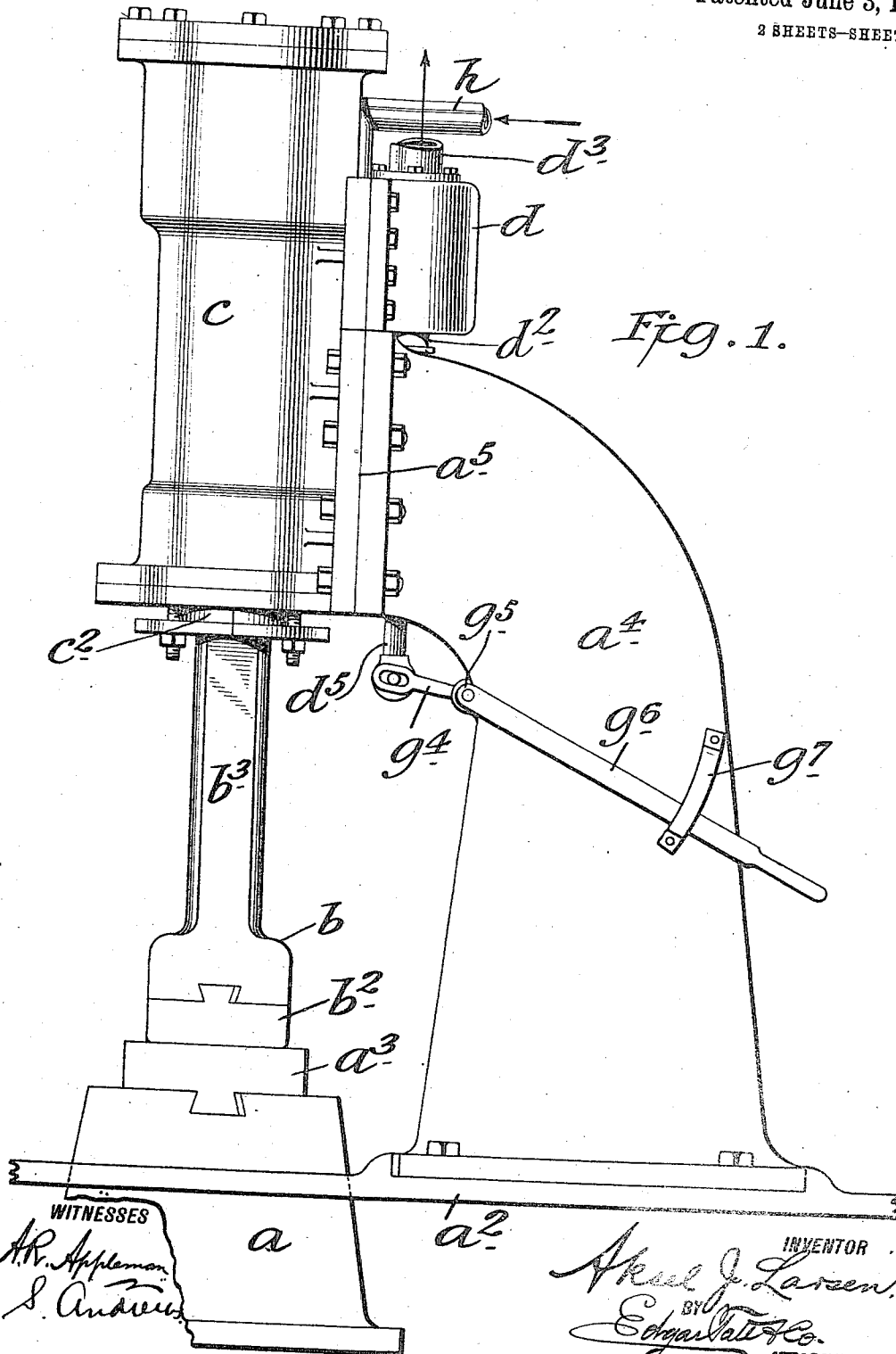


A. J. LARSEN.
STEAM HAMMER.
APPLICATION FILED AUG. 16, 1912.

1,063,360.

Patented June 3, 1913.
2 SHEETS—SHEET 1.

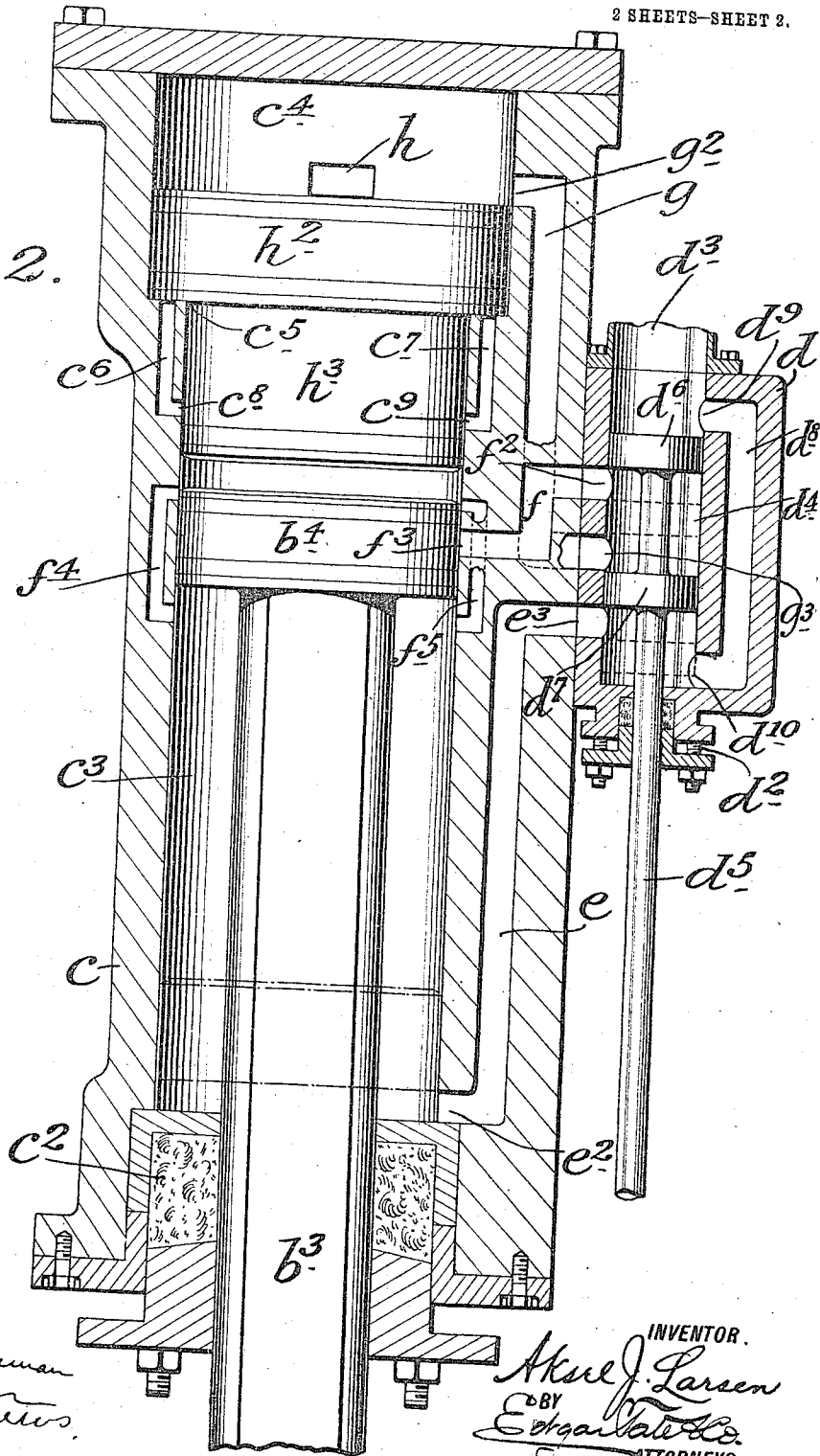


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2 SHEETS—SHEET 2.

Fig. 2.



WITNESSES

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STEAM-HAMMER.

1,063,360.

Specification of Letters Patent.

Patented June 3, 1913.

Application filed August 16, 1912. Serial No. 715,315.

To all whom it may concern:

Be it known that I, AKSEL J. LARSEN, a citizen of the United States, and residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Steam-Hammers, of which the following is a specification, such as will enable those skilled in the art to which it appertains to make and use the same.

The object of this invention is to provide a steam hammer or similar device or apparatus in which the force of the blow delivered by the hammer is increased without increasing the amount of steam employed, and without changing the external form of the apparatus to any considerable extent, a further object being to provide a steam hammer device of the class described in which the upward movement of the piston within the cylinder and by which the hammer is carried is cushioned by compressed steam when the limit of said movement is reached, and in which a supplemental floating or unattached piston is employed in connection with which the main or first named piston operates, and which adds to the force of the downward movement of said main piston, at the beginning thereof, said supplemental or floating piston being also cushioned in both its upward and downward movements, the effect of the cushion produced by its upward movement being to increase the force of its downward movement and the force of the hammer, and the effect of the cushion formed in its downward movement being to prevent shock when the limit of said movement is reached; and with these and other objects in view the invention consists in a device or apparatus of the class specified, constructed as hereinafter described and claimed.

The invention is fully disclosed in the following specification, of which the accompanying drawing forms a part, in which the separate parts of my invention are designated by suitable reference characters in each of the views, and in which:—

Figure 1 is a side elevation of a steam hammer involving my invention; and Fig. 2 a central vertical section showing the steam cylinder of the hammer and showing one form of my improvement.

In the drawing forming part of this specification, I have shown a steam hammer of the usual general form and comprising, in

its construction, a base block *a* which is slightly tapered or conical in form and which passes vertically through a horizontal support *a*² and the top of which is provided with the usual die *a*³ on which the hammer *b* works, and said hammer is provided with a detachable bottom member *b*² which may be replaced by a new bottom part whenever desired. The hammer *b* is provided with a piston rod *b*³ which is vertically movable through the bottom portion of the cylinder *c*, and said cylinder is supported in the usual manner by an upright arm or standard *a*⁴ secured to the support *a* and also secured to the cylinder *c*, as shown at *a*⁵. The cylinder *c* is provided at the bottom thereof with a stuffing box *c*² through which the rod *b*³ of the hammer *b* is movable, and said cylinder is also provided with the usual piston chamber *c*³ and the rod *b*³ with the usual piston *b*⁴ movable vertically in said chamber, and all these parts with the exception of the cylinder *c* are of the usual form and construction.

At one side of the cylinder *c* and directly over the standard or arm *a*⁴ by which it is supported is the valve box *d* provided at its lower end with a stuffing box *d*², and at its upper end with an exhaust pipe *d*³, and said box is provided with a central vertical chamber *d*⁴ and movable through the stuffing box *d*² is a valve rod *d*⁵ provided within the valve box with two valves *d*⁶ and *d*⁷, and in the outer side of the valve box is a by-pass *d*⁸ which communicates both with the upper and lower ends of the chamber *d*⁴, as shown at *d*⁹ and *d*¹⁰.

The lower end portion of the cylinder *c* is provided with a steam passage *e* which communicates with the bottom of the piston chamber *c*³, as shown at *e*², and with the bottom portion of the valve chamber *d*⁴, and the valve box *d* through a port or passage *e*³, and another steam passage *f* communicates with the top portion of the valve chamber *d*⁴ through a port or passage *f*² and with the top portion of the piston chamber *c*³ at *f*³.

When the hammer is not in operation the piston *b*⁴ of the rod *b*³ of the hammer *b* is in the position shown in dotted lines in Figs. 2 and 3, and the position of said piston, shown in full lines in Fig. 2, is the position it assumes just after the beginning of its downward movement, and in the opposite sides of the cylinder and in transverse positions corresponding with the position of the

steam passage f where it communicates with the cylinder chamber c^3 are by-passes f^4 and f^5 which communicate with the piston chamber c^2 , both above and below the piston b^4 when said piston is in the position shown in Fig. 2. The top of the cylinder c is enlarged and the top of the piston chamber c^3 is correspondingly enlarged as shown at c^4 , and at the bottom of the enlarged chamber is an annular shoulder c^5 and by-passes c^6 and c^7 are formed in the walls of the top portion of the bottom part of the piston chamber c^3 .

A steam passage g communicates with the chamber c^4 centrally of one side wall thereof, as shown at g^2 , and extends longitudinally and downwardly through the side wall of the cylinder c adjacent to the valve box d and communicates with the said valve box, or the chamber d^4 centrally thereof at g^3 .

A crank g^4 is supported in connection with the standard or arm a^4 at g^5 and one arm thereof is connected with the lower end of the valve rod d^5 , and secured to the other arm of said crank is a hand lever g^6 which passes through a keeper g^7 secured to one side of the standard or arm a^4 and which limits the upward and downward movement of the lever g^6 , and the valve rod g^5 is operated by said lever in the usual manner, and as will be readily understood, and the ports or passages f^2 , e^3 and g^3 which communicate with the valve box d , or the chamber d^4 therein, are controlled by the valves d^6 and d^7 , in the usual manner.

The chamber c^4 in the top portion of the cylinder c is provided with a steam inlet port h which lies in horizontal alinement with the port or passage g^2 , and mounted in said chamber, is a vertically movable detached or floating piston h^2 having a downwardly directed neck h^3 movable in the top part of the piston chamber c^3 in which the piston b^4 is movable.

The operation is as follows: It will be understood, that when the apparatus is not in use, the piston b^4 is in its lowest position, as indicated in dotted lines in Fig. 2. If, now, it is intended to operate the device the lever g^6 is raised. This moves the valves d^6 and d^7 down into their dotted position in Fig. 2, and the valve d^7 passes below the port e^3 and steam rushes through the passage g into the valve box d and through the passage e into the bottom of the cylinder chamber c^3 below the piston b^4 . In this operation the valve d^6 moves into the dotted position below the port f^2 , and said port f^2 and the port g^3 remain open. The steam in the bottom of the piston chamber c^3 forces the piston b^4 upwardly and raises the hammer b , and when the piston b^4 passes the lower ends of the by-passes f^4 and f^5 the steam rushes through these passes into the space above said piston and this forms a cushion between the pistons b^4 and h^2 , and

the continuous upward movement of the piston b^4 operating on said cushion and on the neck h^3 of the piston h^2 , forces said piston upwardly, and the steam rushes through the by-passes c^6 and c^7 into the annular space below the piston h^2 which is formed by the neck of said piston. At this time the lever g^6 is forced downwardly and the valves d^6 and d^7 moved into the position shown in full lines in Fig. 2, and the steam is exhausted through the passages e and d^5 , and the hammer b starts on its downward movement, this movement being accelerated by the impact of the piston h^2 on the piston b^4 at the beginning of this movement, and the cushion in the top of the chamber c^4 . It will be understood that the effect or result of the downward movement on the piston b^4 of the hammer b is the same as in all devices of this class, and in the above downward movement of the piston h^2 an annular cushion is formed around the neck h^3 thereof and above the shoulder c^5 when the lower ends of the by-passes c^6 and c^7 are closed by the neck of said piston, and this prevents the piston h^2 from striking heavily on the annular shoulder c^5 . The above operation adds greatly to the force of the hammer in its downward movement, the weight of the piston h^2 and the effect of the cushion in the top of the chamber c^4 accomplishing this result, and this advantage is obtained without increasing the steam necessary to operate the hammer, or without adding to the steam or power employed in ordinary devices of this class.

As hereinbefore stated, my improvement relates only to the construction of the cylinder; the valve box d , the bottom portion of said cylinder and the method of operating the valves d^6 and d^7 being all as usual in this class of devices, and if desired, my improved cylinder, constructed and operating, as herein shown and described, may be applied to apparatus of this class now in use, and it will also be understood that my improvement is applicable to any kind or class of steam hammers and drop hammers, steam drops and similar apparatus now in use, and while I have shown the preferred form of my improved steam hammer apparatus, it will be understood that changes in, and modifications of the construction may be made, within the scope of the appended claim without departing from the spirit of my invention or sacrificing its advantages.

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

In an apparatus of the class described, a vertical cylinder having in the bottom portion thereof a main piston chamber and in the top portion thereof an enlarged supplemental piston chamber at the bottom of which is an annular shoulder, a vertically

movable hammer operating piston in the
main piston chamber, a supplemental ver-
tically movable unattached piston in the
supplemental piston chamber and provided
5 with a downwardly directed extension mov-
able in the main piston chamber, a steam
supply passage communicating with the top
portion of the supplemental piston chamber,
a second steam supply passage communicat-
10 ing with the top portion of the main piston
chamber, by-passes formed in the sides of
the main piston chamber and communicat-
ing therewith above and below the second

steam passage, and by-passes formed in the
sides of the top portion of the main piston 15
chamber and opening radially therein to be-
low said annular shoulder and opening up-
wardly through said annular shoulder.

In testimony that I claim the foregoing
as my invention I have signed my name in 20
presence of the subscribing witnesses this
15th day of August 1912.

AKSEL J. LARSEN.

Witnesses:

S. ANDREWS,

A. R. APPLEMAN.