May 10, 1932. J. C. CAMPBELL 1,857,138

VACUUM POWER HAMMER

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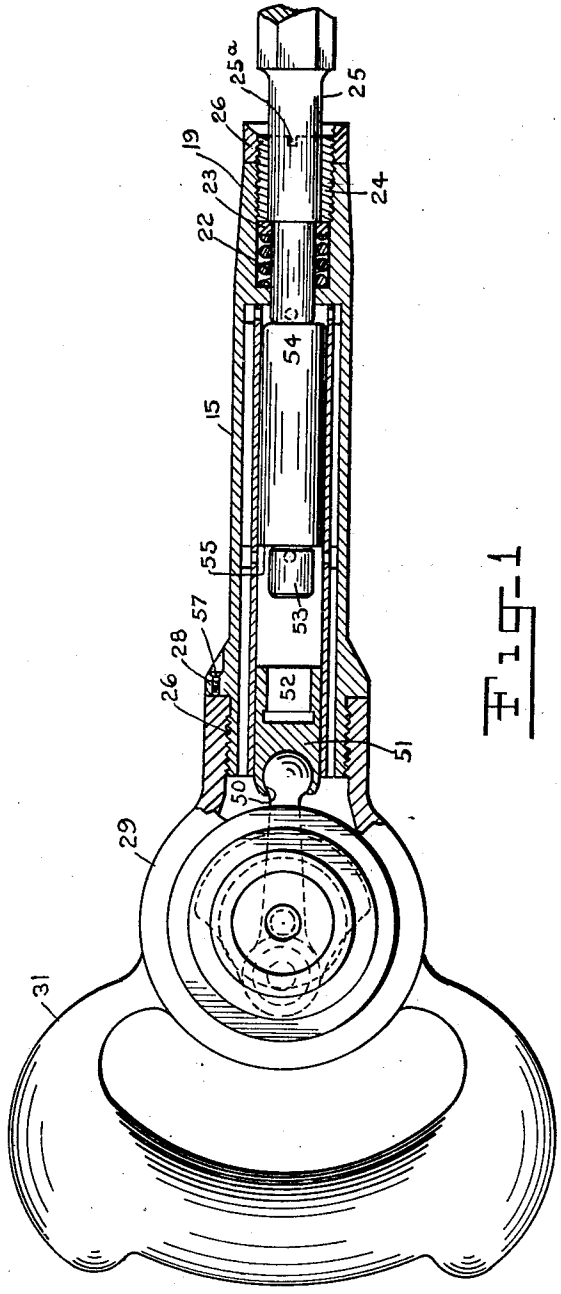


FIG. 1

Inventor
James C. Campbell.

By his Attorney
Clarence G. Campbell.

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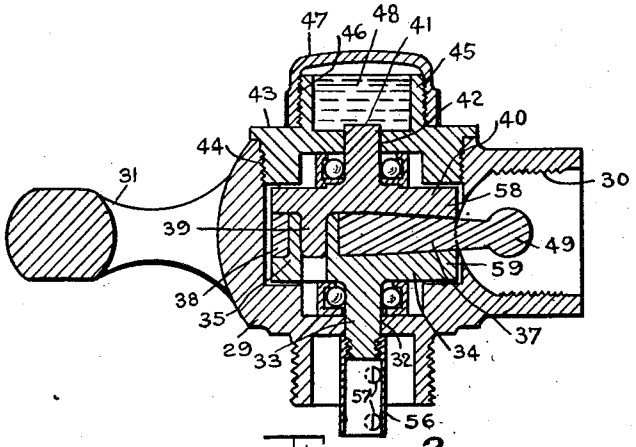


Fig. 2

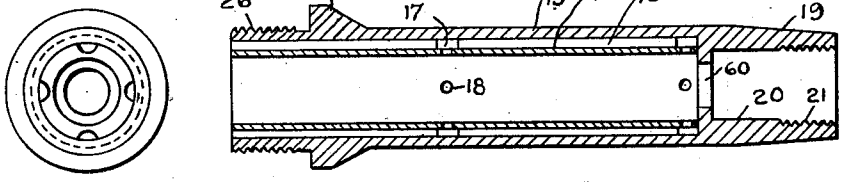
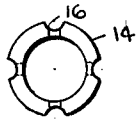
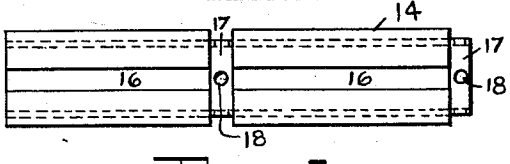


Fig. 4

Fig. 3





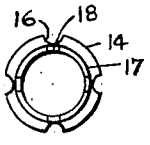
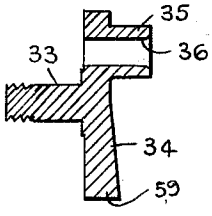


Fig. 6

Fig. 5

Fig. 7



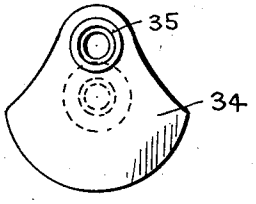


Fig. 9

Fig. 8

Inventor
James C. Campbell.
By his Attorney
Clarence G. Campbell.

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VACUUM POWER HAMMER

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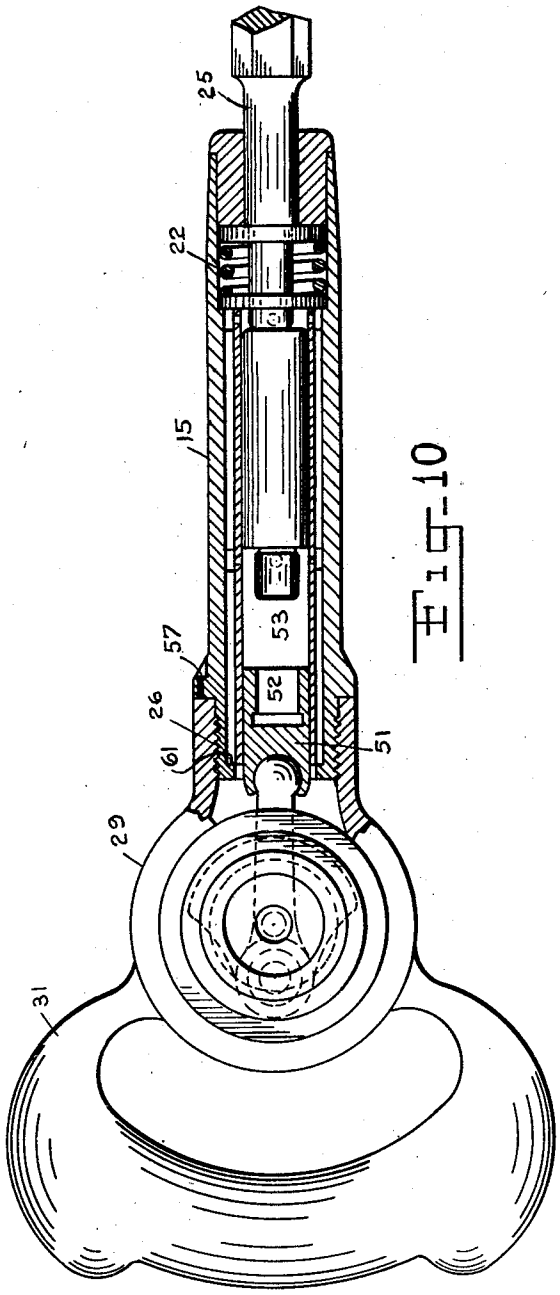


Fig-10

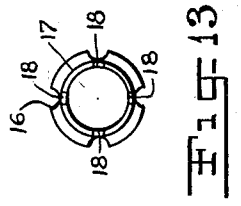


Fig-13

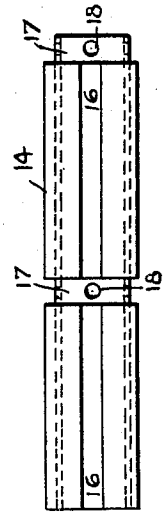


Fig-11

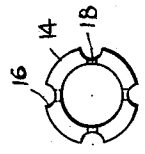


Fig-12

Inventor

James C. Campbell.

By his Attorney

Clarence G. Campbell.

Patented May 10, 1932 1,857,138

UNITED STATES PATENT OFFICE

JAMES C. CAMPBELL, OF NEW YORK, N. Y., ASSIGNOR TO PORTABLE AIR HAMMER COMPANY, INC., A CORPORATION OF NEW YORK

VACUUM POWER HAMMER

Application filed February 15, 1928. Serial No. 254,364.

This invention relates to an improvement in a vacuum power hammer and the novelty consists in the adaptation and arrangement of parts as will be more fully hereinafter pointed out.

Vacuum power hammers require real precision both in the manufacture of the parts and in the assembling of the same. Many of the patents in this art cover devices which are either difficult to manufacture with precision or are impossible of precise assembly or both.

My device overcomes both of these weaknesses which are fatal to volume production and does so in a practical and efficient manner thereby furnishing a device which is practical and insures exact precision both in manufacture and assembling.

My device is also adapted to easy and ready separation of the inner and outer cylinders so as to permit of proper cleaning and lubrication of the otherwise inaccessible interior parts whereby more efficient and continuous operation is secured and the danger of injury to the interior through failure to clean is eliminated.

Referring to the drawings Figure 1 is a top plan view of my device with the central portion shown in section, and with part of the driving mechanism removed.

Figure 2 is a vertical section through the driving mechanism and housing.

Figure 3 is a longitudinal section of the cylinders as shown in Figure 1.

Figure 4 is an end view of the cylinders looking in at the left hand end of Figure 3.

Figure 5 is a side view of the inner cylinder.

Figure 6 is an end view of Figure 5 looking in at the left hand end.

Figure 7 is an end view of Figure 5 looking in at the right hand end.

Figure 8 is a side view of a driving plate and eccentric.

Figure 9 is a vertical section of the same through the center.

Figure 10 is a top plan view of a second form of my device with the central portion shown in section.

Figure 11 is a side view of the inner cylinder as shown in Figure 10.

Figure 12 is an end view of Figure 11 looking in from the left hand end.

Figure 13 is an end view of Figure 11 looking in from the right hand end.

In the drawings 14 is an inner cylinder adapted to fit an outer cylinder 15 in a drive fit and has longitudinal cut outs 16 and circular cut outs 17 which connect said longitudinal cut outs 16 and said circular cut outs 17 have holes 18 running through to the inside of said cylinder 14.

The lower end of the outer cylinder 15 terminates in a tool holder 19 which has a cylindrical boring 20 terminating at its outer end in an internal threaded portion 21, in which is mounted a spring 22 and a flange ring 23, both the spring 22 and the flange ring being held under compressed tension by means of a threaded adjustment plug 24 adapted to screw into the threaded portion 21 to regulate the position of the tool 25, and the plug 24 has a key slot 25*a* for this purpose and a nut 26*a* locks the adjustment plug 24 in a fixed position. A circular boring 60 connects the boring 20 and the inside of inner cylinder 14.

The outer cylinder 15 has at its upper end an external threading 26 and also has a shoulder 27 formed by cutting out the threaded portion 26. In the shoulder 27 is a threaded boring 28. A driving mechanism housing 29 is internally threaded at 30 so as to engage the external threading 26 of the cylinder 15. The upper end of said housing terminates in a handle 31 of usual construction. The housing 29 has a ball bearing 32 which is adapted to receive a spindle 33 of a driving plate 34 which plate also has an eccentric projection 35 in which there is a circular cut out or bearing 36. The exterior of the eccentric 35 is also adapted to be used as a bearing over which a plunger connector arm 37 having a circular head 38 is adapted to be mounted. An eccentric pin 39 of a driven plate 40 is adapted to fit into the bearing 36 of the eccentric projection 35 thereby holding the plunger connector 36 in position on the eccentric projection 35 so that the circular head

38 will rotate freely thereon. The driven plate 40 also has a spindle 41 which is adapted to fit into and rotate freely in a ball bearing 42 of a removable circular plate 43 which is externally threaded so as to engage the internal threading 44 of the housing 29 with a left hand thread so that it will tend to tighten as the device vibrates in operation. The removable plate 43 has a circular sub-housing 45 which is externally threaded at 46 so that it is adapted to receive the internally threaded cap 47. The circular sub-housing 45 is adapted to contain suitable grease for lubricating the device, indicated at 48. The lower end of the plunger arm 37 terminates in a ball 49 which is adapted to fit a socket 50 of a plunger 51, which plunger is adapted to slide on the inside of the inner cylinder 14. Lower portions of the driving plate 34 and driven plate 40 are designated as 58 and 59, respectively, and are both thickened substantially and therefore adapted to act as counter-balances to the connector arm 37 and plunger 51. The plunger 51 has an air pocket 52 which is adapted to receive the head 53 of a tappet or hammer 54, which head 53 is of smaller diameter than the hammer 54 and forms therewith a shoulder 55 adapted to register just below the upper circular cut out 17 in the inner cylinder 14 when the hammer 54 is in the lower position.

The spindle 33 terminates in an external threading 55, over which a flexible shaft, not shown, leading from a source of power, which also is not shown herein, is adapted to be fastened and retained in position by means of a coupling 56 in which are mounted flattened keys adapted to lock a flattened portion of the engaging flexible shaft.

In the threading 28 is mounted a screw 57 which engages the base of housing 29 and effects a locking when the housing 29 is screwed down onto the cylinder 15 at 27.

Several registering cut-outs 17 may be arranged so as to vary the amount of vacuum formed in the inside of the inner cylinder 14, which variation will vary the blow of the hammer 54 in direct ratio with the variation of the vacuum.

It will be quite apparent with the two cylinders 14 and 15 that the longitudinal cut-outs 16 and the circular cut-outs 17 can be cut on the outer surface of the inner cylinder 14 or on the inner surface of the outer cylinder 15 so that the operation of my device will be equally efficient.

The operation of my device is as follows:

The power is turned on from the source of power which is not shown, which thereby rotates the spindle 33, the driving plate 34 and through the eccentrics 35 and 39 rotates the driven plate 44 therewith, which carry the connecting arm 37 therewith, thereby raising and lowering the plunger 51 which is connected to said arm 37 through the ball 49 and socket 50. The tappet 54 is in its normal or lower position as shown in Figure 1, and the air is therefore maintained at atmospheric pressure on the inside of the cylinder 14 as it circulates freely from both ends of the device, through the tool holder 19 and the power housing end of the device, and circulating freely through the longitudinal cut-outs 16 and thence through the circular cut-outs 17 to the inside of the inner cylinder 14. As the operator then holds the handle 31 with one hand and directs the application of the tool 25 with the other hand and presses down to perform the proposed operation with the tool 25, the upper or handle end of the tool will project through the circular boring 60 so that the tool 25 pushes with it on the tappet or hammer 54, thereby raising the head 53 until it stops registering with the circular cut out 17, whereupon the sliding of the plunger 51 in the upward or backward movement will cause a vacuum on the inside of the inner cylinder 14 so the hammer 54 will slide up therein until the head 53 cushions in the air pocket 52 of the plunger 51, whereupon it will be pushed downwardly by the downward drive of the plunger 51 and the lower end or base of the hammer 54 will strike a blow on the upper or handle end of the tool 25. This operation will continue with the rapid blows of the hammer 54 on the tool 25 until the operator releases the pressure on the tool 25, whereupon the spring 22 will, through the pushing of the flange ring 23 against the shoulder of the tool 25, restore the tool to its normal position so that the upper end does not project against the lower end of the hammer 54, and the hammer 54 will slide down to its normal position where the head 53 registers with the cut out 17, whereby atmospheric pressure is again restored to the cylinder 14 thereby stopping the movement up and down of the hammer 54 in the cylinder 14.

In the device shown in Figures 10 to 13 the inner cylinder 14 may be driven into position in the outer cylinder 15 through the lower end of the outer cylinder 15, that is through the tool holder 19 and the outer cylinder 15 has an inner circular shoulder 61 against which the upper end of the inner cylinder 14 is adapted to rest and thereby limit its upward movement.

The construction of the adjustment plug 24 and the lock nut 26*a* shown in Figure 1 may be applied to the construction shown in Figure 10.

I claim:

In a vacuum power hammer the combination of a two piece cylinder comprising a tool holder at one end carrying a tool and embodying means for controlling the hammer blow by limiting the inward movement of said tool, a reciprocatory plunger in said cylinder having an air cushion pocket, means for actuating said plunger, and a reciprocatory

hammer having a head adapted to cushion in said air cushion pocket movable in said cylinder between said tool holder and said plunger, and said cylinder embodying means for producing a vacuum between the end of the hammer and the end of the plunger when said plunger is moving in a direction away from said tool holder and forcing said hammer against the end of said tool holder when the plunger moves in the opposite direction consisting of longitudinal grooves cut on the outer surface of the inner cylinder member and also having circular cut outs having through borings which borings are in alignment with said grooves adapted to maintain atmospheric pressure therein, means for interrupting the same between the hammer and plunger and means whereby said cylinder members may be assembled at the tool holder end of the outer member.

In testimony whereof I affix my signature.

JAMES C. CAMPBELL.