

July 4, 1933.

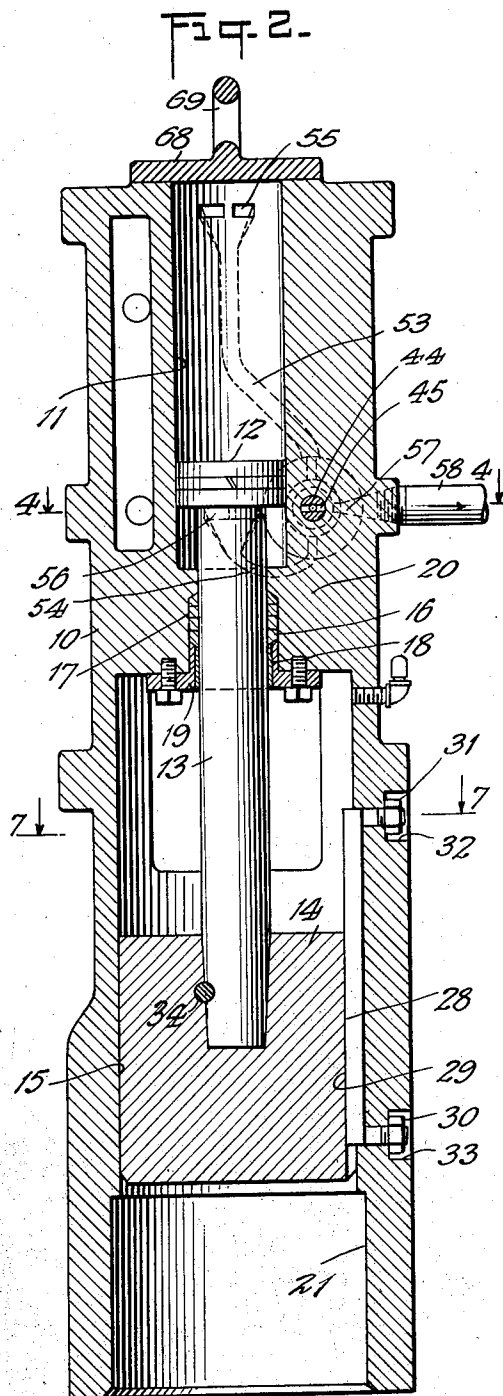
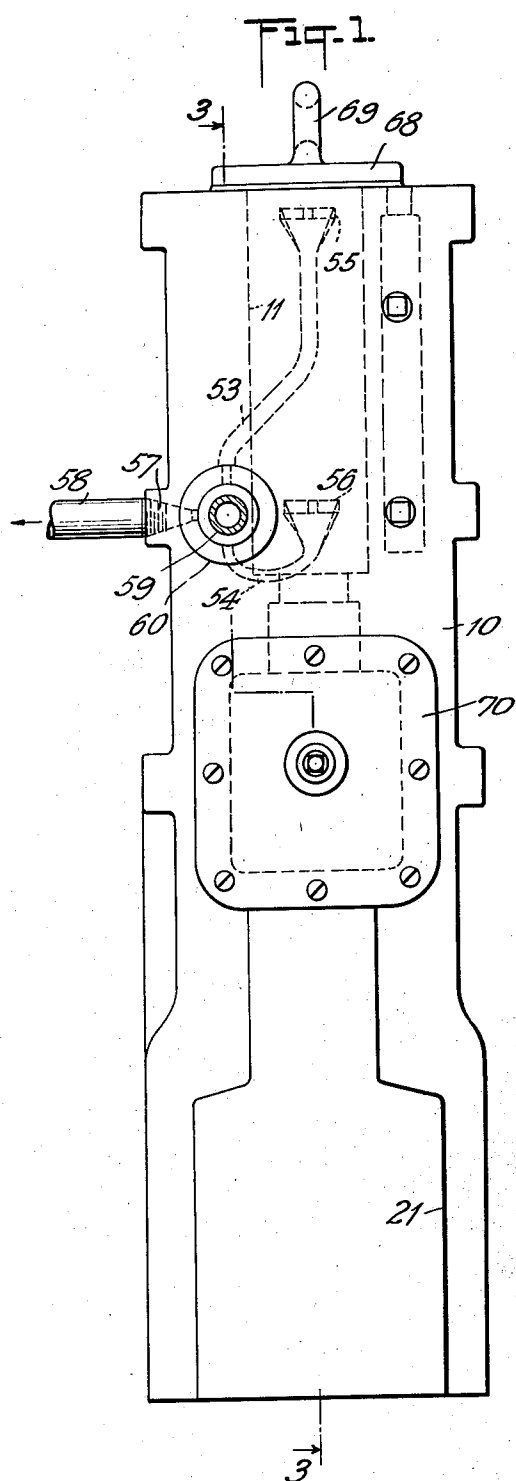
M. SCHALSCHA

1,917,066

PILE HAMMER

Filed April 2, 1929

3 Sheets-Sheet 1



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 BY
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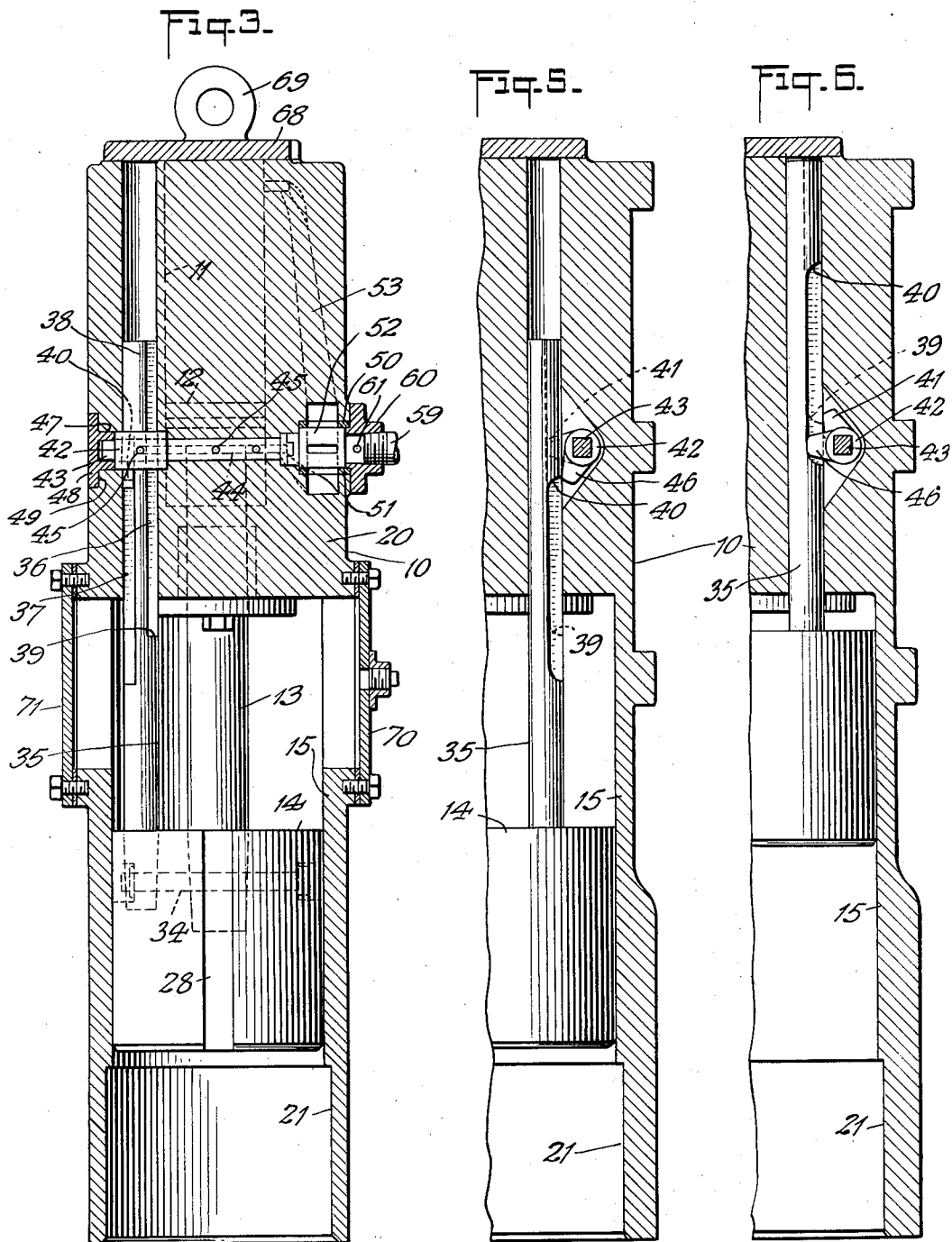
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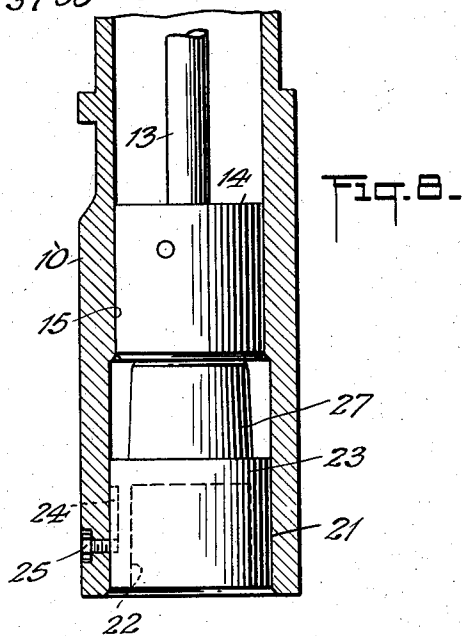
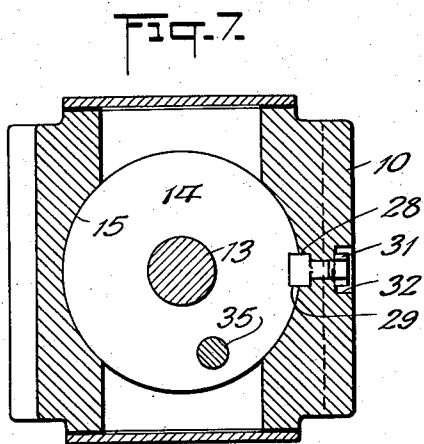
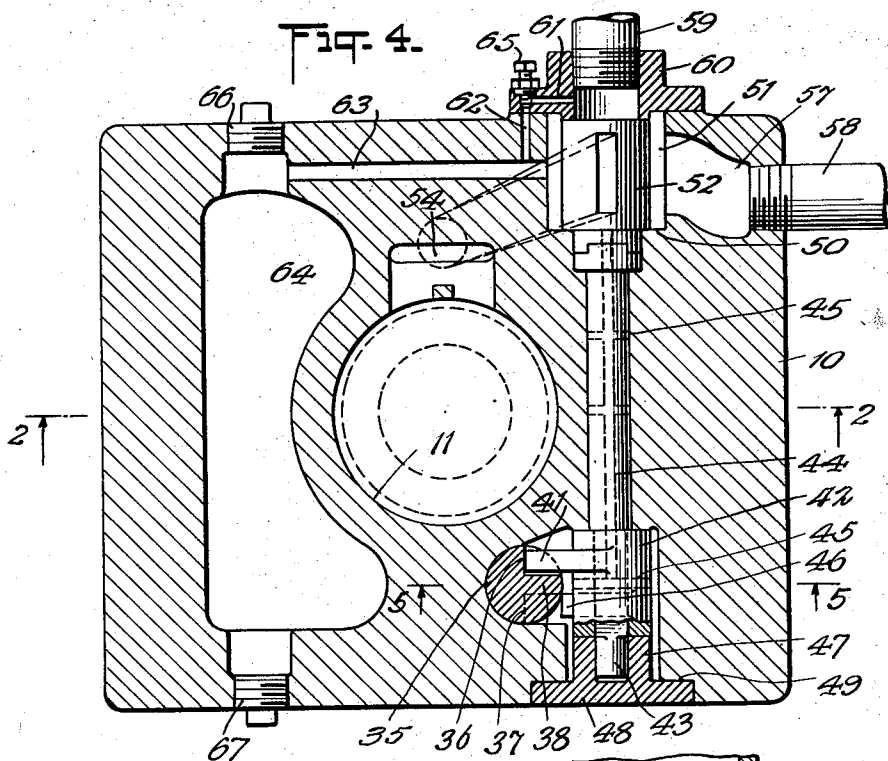
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UNITED STATES PATENT OFFICE

MAX SCHALSCHA, OF SUMMIT, NEW JERSEY

PILE HAMMER

Application filed April 2, 1929. Serial No. 351,881.

This invention relates to improvements in pile hammers and has for its main object the provision of a simple, compact, rugged one-piece hammer frame with the operating parts

5 fully enclosed so that the hammer may be used for submarine work without interfering with the effectiveness thereof.

A further object resides in the provision of an improved oiling system and control.

10 A still further object consists in automatic means for cutting off the power when the work is not beneath the ram.

Another object is to provide a construction in which the operating parts are readily accessible for replacement and repair and with

15 a minimum waste of time on the part of the operator.

Further and more specific objects, features, and advantages will more clearly appear from the detailed description given below when taken in connection with the accom-

20 panying drawings which form part of the specification and illustrate one embodiment of the invention, and in which,

25 Fig. 1 is a front elevation of the improved hammer;

Fig. 2 is a vertical longitudinal section taken on the line 2—2 of Fig. 4;

30 Fig. 3 is a similar section taken on the line 3—3 of Fig. 1;

Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 2;

Fig. 5 is a vertical section taken on the line 5—5 of Fig. 4;

35 Fig. 6 is a similar view taken with the parts in a different position;

Fig. 7 is a horizontal section taken on the line 7—7 of Fig. 2; and,

40 Fig. 8 is a partial section of the lower end of the hammer especially fitted for submarine work.

The present preferred form of the invention is shown in the attached drawings and comprises a casting 10 made in one piece and

45 forming the frame or body of the hammer within which the ram and its associated parts operate. By casting the body in one piece there is avoided the inevitable racking of the frame when it is made in sections bolted

50 together. This working loose of the section-

al frame has previously cost much loss of time due to stops required to tighten up the connecting bolts. Furthermore the cost of manufacture is reduced and the manufacturing simplified by having only one piece to

55 cast rather than several. Also the machining of the ram and piston cylinders can be more accurately and easily alined when formed in one casting than when they are disposed in separate castings.

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In the top of the frame casting 10 there is disposed the cylinder 11, properly machined, within which slides the piston 12. A piston rod 13 connects the piston 12 with a ram

65 sliding in a lower larger cylinder 15 which is machined and disposed at the bottom of the frame 10. Intervening the piston cylinder 11 and the ram cylinder 15, the frame casting is solid except for the passage 16 in which the piston rod 13 slides. In this pas-

70 sage 16 packing 17 is disposed and held in place by the usual packing gland 19, in which is inserted a bronze bushing 18, suitably fastened to the lower face of the solid partition

75 20 of the frame disposed between the cylinders 11 and 15. The solidity of this portion not only adds to the effective weight of the hammer but also enhances the compactness and ruggedness of the ensemble, an object

80 which is greatly desired.

The extreme lower end of the frame has an enlarged bore 21 into which projects the tops of the piles or other work to be driven with any suitable and usual buffer plates disposed therebetween if desired and necessary. As

85 shown in Fig. 8, this lower end receives a cup-shaped casting 22 with its base 23 uppermost to close the ram cylinder to the outside and with the cup portion adapted to receive the work. This closure plate 22 has one or more

90 slots 24 in its side walls into which project the ends of bolts 25 disposed in the bottom walls of the frame 10 to permit the closure plate 22 a limited movement but to prevent

95 excessive movement thereof. A striker portion 27 is formed on top of the closure plate 22 and acts as a contact member for the ram to strike on its power stroke and transmit the blow through the closure plate 22 to the top

100 of the work. Because the closure plate 22 fits

rather snugly in the lower end of the frame, this end is practically closed so that the hammer may be used beneath the surface of water or other liquid to advantage and with effectiveness equal to that achieved when the hammer is used above water.

In its reciprocal vertical movement, the ram is kept from turning by means of a guide bar 28 which lies in a slot 29 in the side wall of the ram and the ends of which project through the walls of the frame and are threadably engaged by nuts 30 and 31 lying in recesses 32 and 33 in the outer surface of the frame 10.

The lower end of the piston rod 13 is tapered and fits in a similarly shaped bore in the top of the ram 14 and is held therein by a suitable key 34. A round valve rod 35 is similarly fitted into the top of the ram and is a solid forging thus increasing its ruggedness. This valve rod along one side is provided with longitudinally extending grooves 36 and 37 spaced apart and having a rib 38 therebetween. In the groove 36 there is disposed an upwardly turned shoulder 39 and in the groove 37 there is disposed a downwardly turned shoulder 40. These shoulders are disposed along different vertical levels in their respective grooves. As will be noted from Figs. 3, 4, 5, 6, the shoulder 39 in the groove 36, when the ram is in its lower position, is disposed below a valve rocking arm 41 projecting into the groove 36. As the ram moves upwardly the shoulder 39 knocks this arm 41 out of the way and in so doing turns the block 42 to which the arm 41 is connected. This block 42 is pinned or otherwise fastened to a spindle 43 (see Fig. 4) extending along across the frame and provided with a bore 44 throughout its entire length and lateral passages 45 for purposes of lubrication as will be hereinafter explained.

The position of the valve spindle and the arm 41 for the lower position of the ram is shown in Fig. 5. As the ram moves upwardly the arm 41 is moved out of groove 36 and as this occurs another arm 46 on the same block 42 is moved into the groove 37. Then, when the ram descends, the shoulder 40 in the groove 37 descends, being above the arm 46 in the position shown in Fig. 6, and hits the arm 46 and again rocks the block 42, and moves the arm 41 into position again. The rod 35, the grooves 36 and 37, the shoulders 39 and 40 are all formed integrally in one casting so that they cannot lose their relative position and they can be manufactured relatively cheaply.

The end of the valve spindle shown in the lower portion of Fig. 4 is borne in a bearing bushing 47 mounted on a cap 48 seated and fastened in a recess 49 in the wall of the frame 10. At the other end of the spindle 43 there is formed in the frame a chamber or valve chest 50 within which is fastened a ported

bushing 51. Within the bushing 51 there is disposed on and movable with the upper end of the spindle 43. As shown in Fig. 2 the valve chamber connects with passages 53 and 54 leading to ports 55 and 56 in the wall of the piston cylinder 11. The valve chamber also connects with an exhaust passage 57 to which an exhaust pipe 58 is connected.

The power fluid is led to the interior of the valve 52, which is hollow, from an inlet pipe 59 fastened to a cap plate 60 fastened against the adjacent face of the frame 10. In the plate 60 there is formed an oil passage 61 leading at one end to the inlet passage for the power fluid and at the other end to a passage 62 in the wall of the frame 10. This passage 62 connects to the end of a passage 63 leading to the bottom of an oil reservoir 64. This reservoir is of a capacity to hold a large supply of oil and the relation of it to the passages above mentioned is such that the oil will flow by gravity to the cap plate 60. The injector action of the power fluid acting on the end of the oil passage 61 will draw in the oil therewith and carry it to the various power fluid ports and passages and also through the valve spindle bores so that all the moving parts are thoroughly lubricated. In order to control the flow of the oil I have provided an adjustable valve stem screw 65 as shown in Fig. 4 acting as a needle valve in order that the amount of oil flowing can be regulated. Filling and cleaning plugs 66 and 67 are provided for the oil reservoir.

The top of the piston cylinder is closed by a cylinder cover 68 which can be readily removed for any purpose when desired. This cover is provided with a lifting loop 69. Intermediate the ram frame 10 there are disposed, on opposite sides of the frame, cover plates 70 and 71 bolted thereto. This permits ready inspection and adjustment of the gland and of the ram and the piston rod and the valve rod and their connections when desired.

Referring to Fig. 2, the piston 12 is in the lowermost of its normal working positions where it is just about to receive an upward impulse from the power fluid entering the port 56. It will be noted however that there is sufficient space in the cylinder 11 below the port 56 to receive the piston 12 and when the ram 14 is not resting on any work and the power is off, the piston and ram descend until the piston rests in this portion of its cylinder and the port 56 is above the top of the piston. Consequently, in this position of the piston 12 no matter how much power is applied there can be no reciprocation of the piston 12. This arrangement therefore provides an automatic cut-off position when there is no work beneath the hammer. When the ram is in this position and is lowered on to some work, then as the work enters the lower bore

21 it lifts the ram and with it the piston until the piston gets above the port 56 at which time it will start to operate providing the power is on at the time.

Operation

In contemplating the actual operation of this improved pile hammer, the loop 69 will receive a cable to suspend the hammer in suitable guides over the work. It is then lowered until the head of the pile is entered in the bore 21 in contact with the cup-shaped plate 22 or directly in contact with the ram 14 as the case may be. The frame is then lowered until the ram is forced upward slightly in the cylinder 15 and the piston is thus forced upward until it is above the port 56. At this time if the power is on the ram commences to operate automatically otherwise the power is turned on and it commences to work.

If the form shown in Fig. 8 is employed, the ram strikes the contact portion 27 which fits over the top of the work, and moves slightly to prevent the force of the ram blow breaking the frame 10. This makes a tight construction and a rugged one since the frame is in one piece and all the parts are enclosed so that no water can get into the apparatus. Nevertheless through the manhole covers, access can be had to the interior of the ram cylinder to inspect and repair the parts when desired, and to the top of the piston cylinder 11 through the cover plate 68.

As the piston reciprocates, the valve rod 35, a one piece forging, operates to flip the rocker arm 42 through the arms 41 and 46, so that the valve spindle is oscillated to control the proper access of power fluid into the cylinder 11 and at the same time the oil for lubricating the various parts above mentioned is injected along with the fluid into the cylinder and the valve mechanism. The ample reservoir and the control of the oil flow enable a most efficient use of the oil to take place and operation can take place for a much longer time without attention to the oiling since this action takes place automatically.

The ram 14 is kept from turning by the guide bar 28 and thus the parts tend not to jam and are kept during operation in rigid and proper alinement. The parts are symmetrically designed and arranged so that a balanced action ensues both on account of the distribution of the weight of the parts as well as to their relation to each other and the axis of the ram action.

Thus there is provided a simple, compact, rugged device which is capable of effective action both above and below water and which will operate automatically and without attention for considerable periods and which will lubricate itself thoroughly for long stretches without replenishment. Balance of the weight and operating parts will result in

the most efficient use of the power to drive the work and tend to reduce the destructive vibrations usually caused by unbalanced parts.

While I have described my improvement in detail and with respect to a preferred form thereof, I do not desire to be limited to such details or form since many changes and modifications may be made and the invention embodied in other forms without departing from the spirit and scope of the invention in its broader aspects. Hence I desire to cover all modifications and forms coming within the language or scope of any one or more of the appended claims.

What I claim as new and desire to secure by Letters Patent, is:

1. In a pile hammer a one piece casting having aligned power and ram cylinders, a piston in one cylinder, a ram in the other, a piston rod connecting the piston and the ram, an integral intervening partition between said cylinders and bored to receive said piston rod, the thickness of the partition being substantially greater than that of the piston rod, removable means disposed on and projecting inwardly from the inner face of the ram cylinder, said ram having a groove to receive said means to guide the ram and prevent turning thereof during reciprocation thereof, an anvil plate disposed within the lower end of the ram cylinder having a cup shaped outer face, means for supporting the anvil plate within the cylinder while permitting slight reciprocation thereof to prevent turning, said anvil plate having a contact portion adjacent the ram.

2. In a pile hammer a one piece casting having aligned power and ram cylinders, a piston in one cylinder, a ram in the other, a piston rod connecting the piston and the ram, an integral intervening partition between said cylinders and bored to receive said piston rod, the thickness of the partition being substantially greater than that of the piston rod, an anvil plate disposed within the lower end of the ram cylinder having a cup-shaped outer face, means for supporting the anvil plate within the cylinder while permitting slight reciprocation thereof to prevent turning, said anvil plate having a contact portion adjacent the ram.

3. In a pile hammer a one piece casting having aligned power and ram cylinders with an integral intervening partition therebetween, a piston in one of said cylinders and a ram in the other with an interconnecting piston rod, said partition bored to receive said rod having a thickness substantially greater than the thickness of the piston rod and the piston, said ram having a vertical groove in its side walls, and a removable bar mounted vertically on the end wall of the ram cylinder to be received in said groove and

guide the ram while preventing turning, a cup-shaped anvil plate slidably disposed within the end of the casting adjacent the ram, a ram contact portion thereon, means
5 for slidably supporting the anvil plate in the casting, said means preventing turning of the anvil plate, said anvil plate fitting substantially snug within the casting, and re-

movable covers on the walls of the casting to permit inspection of the ram cylinder, and a removable cover at the end of the casting to permit inspection of the power cylinder.

In testimony that I claim the invention
above set forth, I affix my signature hereto. 70

MAX SCHALSCHA.

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