

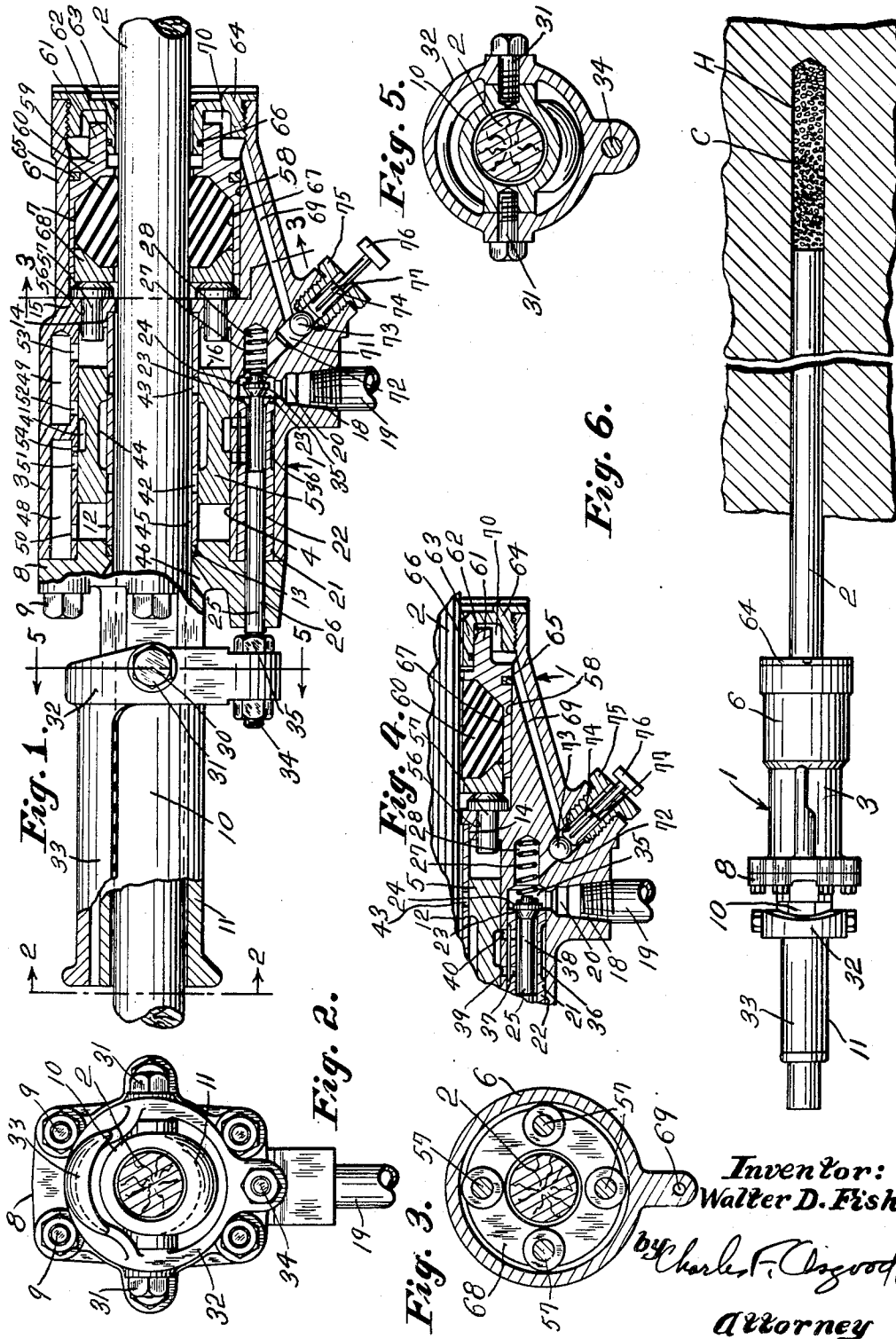
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W. D. FISH

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POWER HAMMER FOR MECHANICAL TAMPING

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Inventor:
Walter D. Fish

by Charles F. Osgood,
Attorney

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POWER HAMMER FOR MECHANICAL TAMPING

Walter D. Fish, Claremont, N. H., assignor to Joy Manufacturing Company, Pittsburgh, Pa., a corporation of Pennsylvania

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This invention relates to power hammers and more particularly to a power hammer adapted for association with a tamping stick for mechanically tamping powder or dynamite into a hole to be charged.

In a known method of tamping a blasting charge in a blast hole to be charged, a tamping stick or rod is inserted in a blast hole formed in the working face of the earth or rock strata to be blasted, such as the face of an underground mine or tunnel, and a power hammer is associated with the tamping stick for imparting a series of rapid, relatively light, blows or vibratory jars to the outer end of the tamping stick to effect mechanical tamping of the powder or dynamite charge in the hole. The present invention contemplates the provision of an improved power hammer designed for association with the tamping stick or rod whereby a series of vibratory jars may be imparted to the stick to effect rapid tamping of the blasting charge and with a minimum of effort and danger. The power hammer of the present invention is designed axially to receive and fit over the tamping stick and has a releasable connection with the stick whereby the hammer may impart vibratory jars to the stick at any desired point at which the hammer is located axially of the stick. The power hammer of the present invention embodies a releasable resilient gripping device or yieldable clamp whereby the hammer tool may grip the tamping stick and a hammer motor embodied in the tool may impart a series of rapid, relatively light, vibratory jars to the tamping stick through the resilient gripping device. The hammer tool of the present invention is designed so that the tamping stick passes axially through the tool and the resilient gripping device is fluid actuated and automatically grips the tamping stick at any desired point along its length whenever operating fluid is supplied to the tool.

An object of the present invention is to provide an improved power hammer for applying mechanical driving power to a tamping stick for tamping powder or dynamite into a hole that is to be charged. Another object is to provide an improved hammer tool for imparting a series of rapid, relatively light vibratory jars to a tamping stick. Yet another object is to provide an improved tamping tool for effecting tamping of a blasting charge. A further object is to provide an improved hammer tool designed axially to surround and receive a tamping stick and for gripping the latter whereby a mechanical driving force may be imparted to the tamping stick at the desired point along its length. A still further object is to provide an improved releasable resilient gripping device or yieldable clamp adapted to grip the exterior surface of a tamping stick for connecting a hammer tool to the stick whereby a series of hammer blows may be imparted to the stick through the gripping device or clamp. Still another object is to provide an improved hammer tool having novel features of construction. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawing there is shown for purposes of illustration one form which the invention may assume in practice.

In this drawing:

Fig. 1 is a view partially in central longitudinal section and partially in side elevation of a power hammer constructed in accordance with an illustrative embodiment of the invention, and showing a tamping stick associated therewith.

Fig. 2 is a cross section taken on line 2—2 of Fig. 1

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through the power hammer and tamping stick, looking toward the rear end of the power hammer.

Fig. 3 is a cross section taken on line 3—3 of Fig. 1.

Fig. 4 is a fragmentary section taken on the plane of Fig. 1, showing the control valves in closed position.

Fig. 5 is a cross sectional view taken on line 5—5 of Fig. 1.

Fig. 6 is a diagrammatic view showing a blast hole formed in the earth or rock strata with a blasting charge and tamping stick positioned therein and illustrating the manner of operation of the improved power hammer for applying mechanical driving power to the tamping stick.

In this illustrative construction, as shown in the drawing, the improved power hammer, generally designated 1, is shown associated with a tamping stick or rod 2. The tamping stick is of cylindrical, rodlike formation and is desirably non-metallic and non-conducting, preferably composed of hard wood, so that there is no possibility of the creation of sparks generated by static electricity or by contact with rock formation. The power hammer is constructed with an axial passageway extending therethrough for axially receiving the tamping stick and may be connected to the stick at any desired point along the length of the stick.

The power hammer is fluid operated and includes a so-called valveless motor having a motor cylinder 3 formed with an annular bore 4 containing a reciprocable hammer piston 5. The motor cylinder has an integral forward housing 6 containing a releasable resilient gripping device or yieldable clamp or chuck 7 adapted to surround the tamping stick and to grip the exterior periphery of the tamping stick to connect the power hammer thereto, as later more fully explained. A rear motor head 8 is secured as by bolts 9 to the rear end of the motor cylinder and has a tubular rearward extension 10 providing a handle 11 adapted to be grasped by the operator whereby the hammer may be manually positioned and supported. The motor cylinder has a concentric inner sleeve 12 providing the inner wall of the cylinder bore and the ends of this sleeve are mounted in bores 13 and 14, the former being formed in the rear cylinder head 8 and the latter being formed in a front cylinder head 15 integral with the front housing 6. The hammer piston is of cylindrical annular construction and slidably engages the concentric inner and outer walls of the motor cylinder, and has a front annular impact surface 16.

Now referring to the fluid distribution means for the motor cylinder it will be noted that attached at 18 to one side of the motor cylinder is a fluid inlet pipe 19 which may supply fluid under pressure from any suitable source to an inlet passage 20. Arranged parallel to the cylinder bore at one side of the cylinder is a longitudinal bore 21 in which a sleeve 22 is fitted with the rear end of the sleeve abutting the rear cylinder head, as shown in Fig. 1. The front end of the sleeve is formed with a conical seat 23 with which a conical end-seating valve 24 is engageable, and this valve has a stem 25 guided in the sleeve-bore and extending rearwardly through a bore 26 in the rear head 8. A coil spring 27 seated in a recess 28 engages the valve 24 for urging the latter toward its seat. Pivoted at 30 on pivot screws 31 secured to the sides of the tubular head portion 10 is an annulus 32 having an integral lever 33 provided with a grasping portion extending rearwardly along one side of the handle 11 and adapted to fit closely to the side of the handle. This annulus at its side opposite from the lever 33 carries a bolt 34 whose front head 35 is engageable with the projecting end of the valve stem 25. The operator by pressing the lever 33 toward the handle 11 may swing the annulus 32 to effect movement of the valve stem 25 to the right, as viewed in Fig. 1, to unseat the valve 24 against the action of the coil spring 28. The front end of the sleeve 22 terminates a short distance from the front end of the bore 21 to provide a chamber 35 in which the valve 24 is arranged, and the inlet passage 20 communicates with this chamber. The sleeve 22 has a peripheral groove 36 and longitudinally spaced ports 37 in the sleeve connect the sleeve bore with this groove. The valve stem is peripherally grooved or reduced in cross section at 38 so that, when the valve is unseated,

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fluid may flow past the valve through the ports 37 to the groove 36. Longitudinally spaced ports 39 and 40 in the cylinder wall connect the groove 36 with the cylinder bore 4 near the longitudinal center of the cylinder. The hammer piston is annularly grooved at 41 on its exterior periphery substantially midway between its ends. Longitudinally spaced exhaust ports 42 and 43 in the sleeve 12 are spaced equal distances from the ends of the cylinder bore, and the inner wall of the piston is annularly grooved or recessed at 44. There is an annular clearance space, at 45, between the inner periphery of the sleeve 12 and the exterior surface of the tamping stick 2, and one or more exhaust passages 46 in the rear head connect this clearance space to atmosphere. Formed in the opposite wall of the cylinder from the inlet valve 24 are longitudinal supply passages 48 and 49, and longitudinally spaced ports 50 and 51 connect the ends of the passage 48 with the cylinder bore while longitudinally spaced ports 52 and 53 connect the opposite ends of the passage 49 with the cylinder bore. The ports 50 and 53 communicate with the cylinder bore near its remote ends while the ports 51 and 52 communicate with the cylinder bore at points nearer the longitudinal center thereof, and these latter ports 51 and 52 are communicable with the exterior piston groove 41. A starting port 54 located at the inner side of the port 51, in adjacency thereto, connects the inner end of the passage 48 with the cylinder bore so that when the hammer piston is in its centrally located position substantially midway between the cylinder-ends the port 54 may communicate with the exterior piston groove 41.

The fluid distribution means for the motor cylinder functions in the following manner: When the hammer piston is in its midstroke position shown in Fig. 1 and the inlet valve 24 is opened, pressure fluid may flow from the inlet passage 20 through ports 37 and 40 and the exterior groove 41 on the piston to the port 54 and through passage 48 and port 50 to the rear end of the cylinder bore at the rear side of the hammer piston; the pressure fluid acting on the rear pressure fluid of the piston to drive the latter forwardly. As the piston moves forwardly the external piston groove 41 is moved into communication with the port 52 thereby effecting fluid flow through passage 49 to the front end of the cylinder bore, and as the piston moves forwardly its rear edge uncovers the exhaust ports 42 connecting the rear end of the cylinder bore to exhaust. The pressure fluid in the front end of the cylinder bore acts on the front pressure area of the piston to drive the latter rearwardly to effect its return stroke. As the piston moves rearwardly the port 52 is covered by the piston and the exterior piston groove 41 is brought into communication with the ports 54 and 51, supplying pressure fluid to the passage 48 and port 50 to the rear end of the cylinder bore, and as the piston approaches the rear end of its stroke the front end of the cylinder bore is connected to exhaust through exhaust ports 43, the annular clearance space 45, and the exhaust port 46. The pressure fluid in the rear end of the cylinder bore acts on the rear pressure area of the piston to drive the piston forwardly to effect its working stroke, and the operations above described are repeated in rapid sequence, to effect rapid reciprocation of the hammer piston. The type of valveless motor disclosed is well known and does not per se enter into the present invention. Evidently, other types of hammer motors may be employed without departing from the spirit of the invention.

In this improved construction, arranged at spaced points in the front cylinder head 15 are longitudinal bores 56 in which striking block plungers or tappets 57 are reciprocally mounted and these plungers project rearwardly into the front end of the cylinder bore into a position to receive the impact blows of the hammer piston. Arranged in the bore 58 of the front housing 6 is a sleeve-like member 59 and this member is slidably mounted in the housing bore and contains an annular rubberlike mass or resilient annulus 60 which performs the function of a gripping or clamping ring or bushing. This rubberlike annulus surrounds the tamping stick 2 which passes axially through the hammer tool. The slidable sleeve-like member 59 has a reduced front sleeve portion 61 which is slidably guided at 62 on the exterior surface of a guide sleeve portion 63 integral with a front cap 64 threadedly secured within the bore of the front housing 6. The member 59 carries a sealing ring 65

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sealingly engaging the housing bore and the sleeve-like portion 63 carries a sealing ring 66 sealingly engaging the bore of the sleeve-like portion 61. Guided in the bore 67 of the sleeve-like body of the member 59 at the rear of the annulus 60 is an anvil ring 68 which is engaged by the plungers 57 as shown in Fig. 1. A passage 69 connects the spring recess 28 with an annular space 70 between the member 59 and the front cap 64, for conducting pressure fluid to the space to act on the front pressure area of the member 59 to force the latter rearwardly in the housing bore 58 thereby to compress the rubberlike mass or annulus 60 into gripping engagement with the outer surface of the tamping stick 2. As the hammer piston of the hammer tool reciprocates in the cylinder bore a series of rapid, relatively light blows are transmitted through the plungers 57, the anvil ring 68 and the rubberlike mass or annulus 60 to the tamping stick mechanically to drive the latter inwardly to effect the tamping operation. Thus, the rubberlike mass not only serves to grip the tamping stick but also transmits the hammer blows to the stick so that a relatively light vibratory jarring action on the tamping stick is effected thereby rendering the mechanical tamping operation comparatively safe and with little effort on the part of the operator.

Communicating with the passage 69 is a bore 71 at its inner end surrounded by a valve seat 72 and a ball valve 73 in the bore is engageable with the seat to cut out flow of fluid from the valve chamber 35 to the space 70. A plunger 74 reciprocally mounted in a plug 75 threadedly secured to the cylinder wall, has a handle 76 whereby the plunger may be moved to engage and seat the ball valve. When the ball valve is seated, as shown in Fig. 4, the space 70 may be vented to atmosphere through the passage 69, the bore 71 and grooves 77 in the body of the plunger, thereby to effect release of the rubberlike mass or annulus 60 from gripping engagement with the tamping stick. When the gripping device is released the hammer tool may be moved axially along the tamping stick into different positions, and may be bodily removed from the stick if desired.

As shown diagrammatically in Fig. 6 the blast hole in the earth or rock strata is designated H and the blasting charge of powder or dynamite is designated C. The tamping stick or rod 2 may be inserted in the hole as shown and the power hammer tool may be slid onto the stick with the latter passing axially through the tool in the manner shown. Fluid under pressure may then be supplied through supply pipe 19 to the tool and the pressure fluid flowing past the ball valve 73 through passage 69 to the space 70 acts on the front pressure area of the member 59 to move the latter rearwardly in the bore of the front housing to effect compression of the rubberlike mass or resilient annulus to cause the latter to clamp firmly or grip the tamping stick. The operator supports the power tool and tamping stick by grasping the handle 11 and when the lever 33 is swung inwardly toward the handle the valve stem 25 is slid inwardly to unseat the valve 24. Pressure fluid may then flow through the distribution ports and passages to the motor cylinder to effect rapid reciprocation of the hammer piston thereby to deliver impact blows through the plungers 57 and the anvil ring 68 to the rubberlike mass or resilient annulus 60 and through the latter to the tamping stick. Thus, a series of rapid relatively light cushioned blows are mechanically transmitted through the compressed resilient mass 60 to the tamping stick to vibrate or jar the latter in such manner as to effect efficient tamping of the blasting charge in the bottom of the hole. The operator grasping the handle 11 of the hammer tool may move the tamping stick inwardly against the blasting charge as the tamping stick is vibrated. When tamping of the charge is completed the tamping stick may be withdrawn from the hole by pulling outwardly on the impact tool. As long as fluid under pressure is supplied to the supply pipe 19 and the ball valve 73 is open the hammer tool cannot slip off from the tamping stick, but the gripping engagement of the tool with the tamping stick may be quickly released simply by pressing on the handle of the plunger 74 to seat the ball valve 73 thereby to effect venting of the space 70 to atmosphere. Whenever the handle 33 is released by the operator the inlet valve 24 is instantaneously seated by the coil spring 27 to interrupt the fluid supply to the hammer motor.

As a result of this invention an improved hammer

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tool is provided for mechanically imparting relatively light jars or vibrations to a tamping stick or rod whereby tamping of a powder or dynamite charge in a hole formed in the earth or rock strata to be blasted, is effected in an efficient manner, and with comparative ease and safety. By the provision of the resilient gripping device and by the passing of the tamping stick axially through the impact tool, the tamping stick may be gripped at any desired point along its length to connect the impact tool at the stick. The novel arrangement for transmitting the blows of the hammer tool to the tamping stick through the resilient gripping device enables the delivery of a series of rapid relatively light, cushioned blows to the tamping stick so that the latter may be mechanically driven with comparative safety. The hammer tool is relatively simple and compact and relatively light in weight yet is extremely effective in operation. By the provision of the novel control valve the gripping device may be quickly released from the tamping stick and in the event the power tool is released by the operator the hammer motor automatically stops. The rubberlike gripping annulus which is compressed by the action of pressure fluid into gripping engagement with the tamping stick provides for effective gripping of the stick by the tool, substantially eliminating the possibility of slippage. These and other advantages of the invention will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

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

1. A power hammer tool for imparting vibratory jars to a tamping stick comprising a hammer motor having an axial passage extending completely therethrough for receiving a tamping stick and within which the latter is adapted to be variably axially positioned, a releasable gripping device carried by said tool for connecting said tool in the desired position to the stick and for maintaining the same in such connected position during the tamping operation, and means for transmitting the jars set up within the tool through said gripping device to the tamping stick.

2. A power hammer tool for imparting vibratory jars to a tamping stick comprising a hammer motor having an axial passage extending completely therethrough for receiving a tamping stick and within which the latter is adapted for axial insertion, a releasable gripping device carried by said tool for connecting said tool to the stick at any desired point along the length of the latter and for maintaining the same in such position during the tamping operation, and means for transmitting the jars set up within the hammer tool through said gripping device to the stick to effect jarring of the latter.

3. A power hammer tool for imparting impacts to a tamping stick comprising a hammering device having an axial passage therethrough for receiving a tamping stick, a resilient gripping device embodied in the tool for connecting the latter to the tamping stick, means for transmitting the hammer blows of said hammering device to said gripping device whereby the hammer blows are imparted to the stick, fluid actuated means for actuating said gripping device to effect gripping of the tamping stick and for maintaining said gripping device in gripping position during the tamping operation and operator controlled means for subjecting said actuating means to the action of pressure fluid.

4. A power hammer for imparting vibratory jars to a tamping stick to effect mechanical tamping of a blasting charge, comprising a fluid actuated hammer motor having an annular cylinder formed with an axial passage for receiving a tamping stick, an annular hammer piston reciprocable in said cylinder and surrounding said axial passage, a gripping device carried within the front end of the hammer for gripping the tamping stick and through which vibrations are transmitted to the stick, and reciprocatory plunger means cooperating with said gripping device for transmitting the piston blows to said gripping device to effect vibration of the tamping stick.

5. A power hammer tool for imparting vibratory jars

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to a tamping stick to effect mechanical tamping of a blasting charge, comprising a fluid operated hammer motor including a reciprocable hammer piston, a yieldable annular mass carried by the tool, means embodied in the tool for effecting compression of said yieldable mass to cause the latter to grip the tamping stick in the desired position completely about the periphery of the stick and for maintaining said mass in such gripping position during the tamping operation, and means for transmitting the blows of said piston to said compressed yieldable mass to effect vibration of the tamping stick.

6. In a hammer tool of the character disclosed, a motor cylinder provided with a front head and having an axial passage extending completely therethrough for receiving a tamping stick, an annular hammer piston reciprocable in said cylinder and surrounding said axial passage, a plurality of spaced plungers carried by and arranged in an annular series about said head for receiving the impact blows of said piston, an anvil ring associated with said front head and to which the hammer blows are transmitted by said plungers, and a rubberlike mass for gripping the tamping stick and engaged by said ring and through which the piston blows are transmitted to the tamping stick.

7. A hammer tool for imparting a series of rapid, relatively light blows to a tamping stick comprising a hammer device for receiving and surrounding a tamping stick, and a releasable clamping device for connecting the tool to the tamping stick at any desired point along the length of the latter and for maintaining said device in such position during the tamping operation, and means for transmitting the hammer blows of the tool through said clamping device to the stick.

8. A mechanism for mechanically driving a tamping stick comprising a power hammer tool having an axial passage extending completely therethrough for receiving a tamping stick, said tool having an annular piston chamber surrounding said axial passage and containing an annular hammer piston through which said axial passage extends, a releasable chuck for connecting the tool to the tamping stick at any desired point along the length of the latter, and means for transmitting the piston blows to said chuck to effect hammering of the tamping stick.

9. A mechanism for mechanically driving a tamping stick by imparting vibrations thereto including means forming a housing having a bore and adapted to surround a tamping stick, a resilient annular mass in said housing-bore, means for transmitting the vibrations of said mechanism to said annular mass and thence to impart such vibrations through said mass to the stick, and means for effecting compression of said resilient mass to cause the latter to grip the tamping stick completely about the periphery thereof and for maintaining said resilient mass in such gripping position during the tamping operation.

10. A mechanism for mechanically driving a tamping stick by imparting vibrations thereto including means forming a housing having a bore extending axially therethrough and adapted to surround a tamping stick and through which the latter extends, an annular plungerlike member reciprocable in said housing bore, a resilient annular mass contained in said reciprocable member and to which vibrations are imparted by the mechanism, and means for subjecting said reciprocable member to the action of pressure fluid to effect compression of said resilient mass to cause the latter to grip the tamping stick completely about the periphery of the stick at any desired point along the length of the latter and to maintain said mass in such gripping position during the tamping operation whereby the vibrations are imparted through said mass to the stick.

11. A mechanism for mechanically driving a tamping stick by imparting vibrations thereto including means forming a housing having a bore extending axially therethrough and adapted to surround a tamping stick and through which the latter extends, a plungerlike member reciprocable in said housing bore, a resilient annular mass contained in said reciprocable member, a ring arranged in said housing-bore at one end of said member and engaging said resilient mass for transmitting vibrations to the latter, and means for subjecting the opposite end of said reciprocable member to the action of pressure fluid for effecting compression of said resilient mass against said ring to

cause said mass to expand inwardly to grip the tamping stick at any desired point along the length of the latter and for maintaining said mass in such gripping position during the tamping operation whereby the vibrations are imparted through said mass to the stick.

12. A mechanism for mechanically driving a tamping stick by imparting vibratory blows to the latter including means forming a housing having a bore and extending axially therethrough and adapted to surround a tamping stick and through which the latter extends, a reciprocable plungerlike member contained in said housing bore, a resilient annular mass contained in said reciprocable member, an anvil ring arranged in said housing bore at one end of said member and engaging said resilient mass for transmitting vibratory blows to the latter, means for subjecting the opposite end of said reciprocable member to the action of pressure fluid for effecting compression of said resilient mass to cause the latter to expand inwardly to grip the tamping stick at any desired point along the length of the latter and for maintaining said mass in gripping position during the tamping operation, and means for transmitting vibratory blows to said ring to said compressed resilient mass whereby such blows are imparted to the tamping stick.

13. A hammer tool for imparting a series of rapid, relatively light blows to a tamping stick comprising a hammer motor having an annular cylinder providing an axial passage through which the stick is adapted to extend, a front head for said cylinder, an annular hammer piston reciprocable in said cylinder and surrounding said axial passage, a series of reciprocatory plungers mounted in spaced circular relation about said front head and projecting into said cylinder in a position to receive the piston blows, an anvil ring associated with said front head to which the piston blows are transmitted by said plungers and means for operatively connecting the tool to the stick so that the blows imparted to said ring are transmitted to the tamping stick.

14. A hammer tool for imparting a series of rapid, relatively light blows to a tamping stick comprising a hammer motor having an annular cylinder providing an axial passage through which the stick is adapted to extend, a front head for said cylinder, an annular hammer piston reciprocable in said cylinder and surrounding said axial passage, a series of reciprocatory plungers mounted in spaced circular relation about said front head and projecting into said cylinder in a position to receive the piston blows, an anvil ring associated with said front head to which the piston blows are transmitted by said plungers, and a chuck associated with said ring and engageable with the tamping stick and through which the blows from said ring are imparted to the tamping stick.

15. A hammer tool for imparting vibratory jars to a tamping stick and embodying means for setting up vibratory jars, a releasable gripping device attachable to the tamping stick at any desired point along the length of the stick and for maintaining the same in such position during the tamping operation, means for effecting attaching engagement of said gripping device with the stick, and means for transmitting such vibratory jars through said gripping device to the stick.

16. A hammer tool for imparting a series of rapid, relatively light blows to a tamping stick comprising a hammer motor including a motor cylinder having an annular piston chamber and provided with an axial opening extending completely therethrough for receiving a tamping stick, said chamber having its inner wall surrounding said axial opening and there being a clearance space between the wall of said axial opening and the exterior periphery of the stick, an annular hammer piston reciprocable in said piston chamber and surrounding said axial opening, and fluid supply and exhaust means for said motor including passages for supplying fluid under pressure to said piston chamber and exhaust ports in the inner wall of said piston chamber and opening into said axial stick-receiving opening, said exhaust ports controlled by said piston and communicating with said clearance space.

17. A hammer tool for imparting a series of rapid, relatively light blows to a tamping stick comprising a hammer motor including a motor cylinder having an annular piston chamber and provided with an axial opening extending completely therethrough for receiving a tamping stick, said chamber having its inner wall surrounding said axial opening and there being a clearance space between the wall of said axial opening and the exterior periphery of the stick, an annular hammer piston reciprocable in said piston chamber and surrounding said axial opening, fluid supply and exhaust means for said motor including passages for supplying fluid under pressure to said piston chamber and exhaust ports in the inner wall of said piston chamber and opening into said axial stick-receiving opening, said exhaust ports controlled by said piston and communicating with said clearance space, and an exhaust passage in a wall of said motor cylinder for connecting said clearance space with the exterior of said hammer motor.

18. A hammer tool for imparting a series of rapid, vibratory jars in a forward direction to a tamping stick comprising a hammer motor having a housing and provided with an axial opening completely therethrough for receiving a tamping stick, a fluid actuated chuck for yieldingly connecting said hammer motor to the tamping stick at any desired point along the length of the latter and including a yieldable gripping element, and fluid actuated means acting in a rearward direction for effecting gripping of the stick by said yieldable element and for maintaining the latter in gripping position during the tamping operation, and said hammer motor including a hammering element for imparting longitudinal impulses in a forward direction to said yieldable element whereby such impulses are imparted through said yieldable element to the stick, said fluid actuated means acting in opposition to the forward impulses imparted by said hammering element.

19. In combination, a tamping stick, a yieldable element clamped in a predetermined position to said stick for transmitting longitudinal impulses thereto during the tamping operation, hammering means including a casing having blow-striking means reciprocable relative thereto for transmitting longitudinal impulses to said element in one direction to effect vibration of the stick, and means forming a yielding cushion between said element and said casing acting upon said element oppositely to the direction of such impulses.

20. In combination, a tamping stick, a yieldable element maintained clamped in the desired position to said stick for transmitting forward longitudinal impulses to said stick during the tamping operation, hammering means including a casing having blow-striking means reciprocable relative thereto for transmitting longitudinal impulses to said element in one direction to effect vibration of the stick, and means forming a yielding cushion between said element and said casing acting upon said element oppositely to the direction of such impulses, said cushion forming means including a member urged in such opposite direction by fluid under pressure and operator controlled means for subjecting said member to the action of pressure fluid.

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