O. R. CLARK AND C. H. FRANKLIN.

DROP HAMMER.

APPLICATION FILED JAN. 31, 1919.

1,393,501.

Patented Oct. 11, 1921.

2 SHEETS—SHEET 1.

Fig. 1.

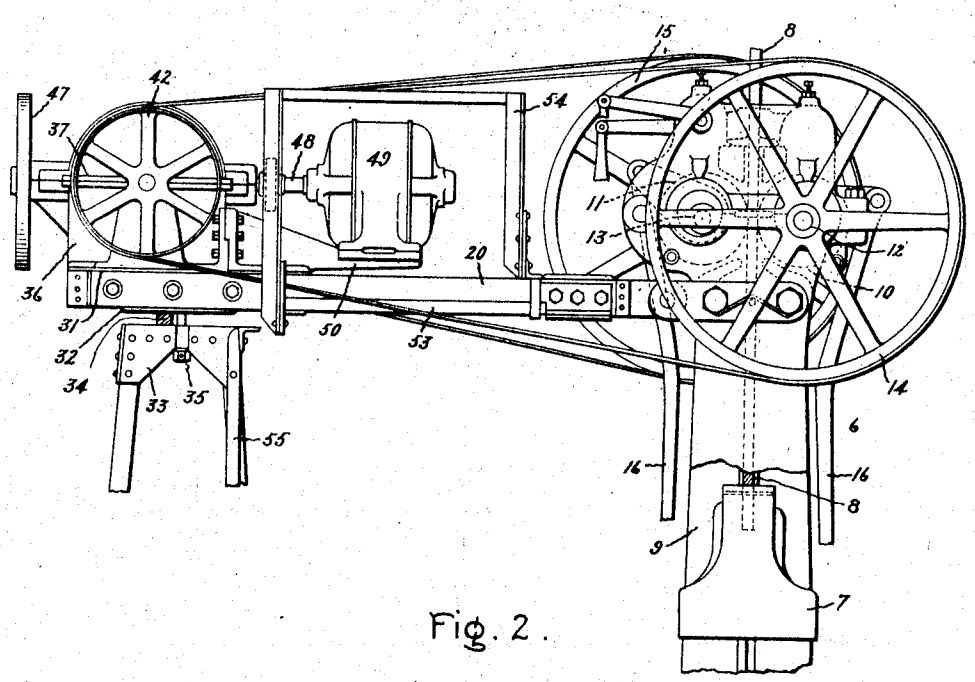
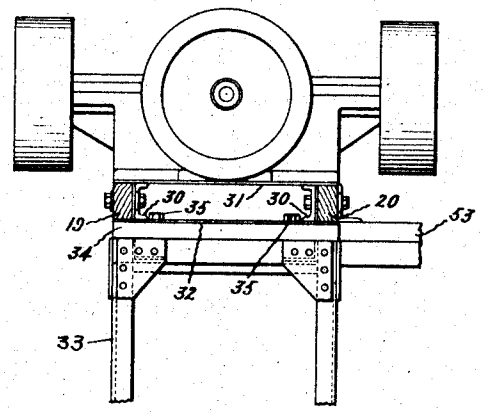


Fig. 2.



Inventors:
Otis R. Clark,
Charles H. Franklin,
by Albert G. Davis
Their Attorney.

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2 SHEETS—SHEET 2.

Fig. 3.

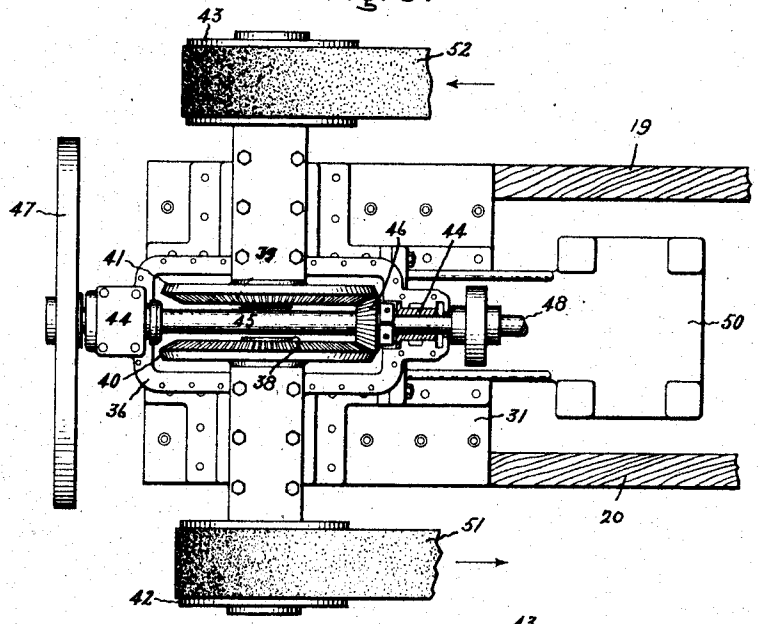
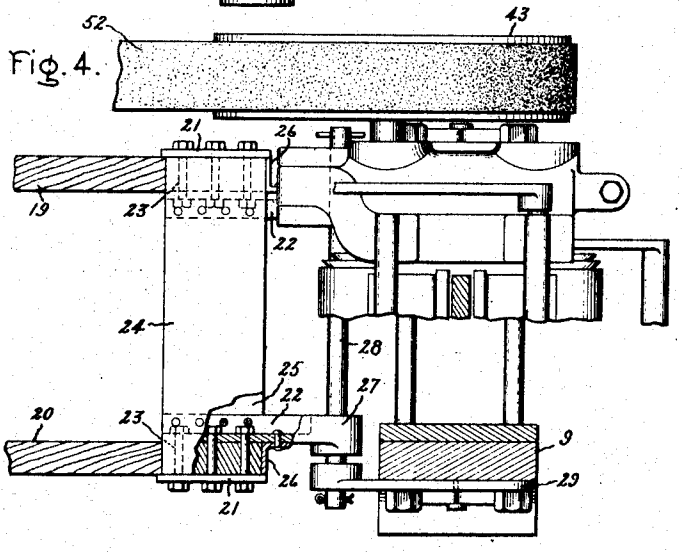


Fig. 4.



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Their Attorney.

UNITED STATES PATENT OFFICE.

OTIS R. CLARK AND CHARLES H. FRANKLIN, OF SCHENECTADY, NEW YORK, ASSIGNORS TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

DROP-HAMMER.

1,393,501. Specification of Letters Patent. Patented Oct. 11, 1921.

Application filed January 31, 1919. Serial No. 274,273.

To all whom it may concern:

Be it known that we, OTIS R. CLARK and CHARLES H. FRANKLIN, citizens of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Drop-Hammers, of which the following is a specification.

The present invention relates to drop hammers and particularly to what is commonly known as board drop hammers. Such hammers comprise a heavy weight termed the hammer which moves vertically between two side frames or guides, and has attached to it a board which extends up between two rollers which may be moved into and out of engagement with the board. In operation, the rollers, which are continually operating, are moved to frictionally engage the board on opposite sides to lift it after which they release the board and permit the hammer to drop. As is obvious, the two rollers must rotate in opposite directions. Heretofore, as far as we are aware, the rollers of drop hammers have in practice always been driven by wheels and belts from line shafting, one of the belts of each pair of wheels being crossed to give the desired direction of rotation. This crossing of belts is objectionable from a practical standpoint for the reason that such belts wear much more rapidly than ordinary straight belts, and for the further reason that the crossed belt covers more surface on the wheel or pulley than the straight belt, giving rise to a certain inequality of action. The use of line shafting is highly objectionable. It has to be suspended from the roof of the building or from pillars, which either makes it impossible or greatly interferes with the use of overhead cranes. Any trouble affecting the line shaft or a hammer causes the whole line of machines to be affected to a greater or lesser extent, usually the whole line has to be shut down. On account of the noise in a hammer shop it is very difficult or impossible to detect small faults and as a result the apparatus is usually run until something breaks, necessitating a shut down.

The use of a line shaft also necessitates locating the hammer in some definite position in the shop which is in many cases highly objectionable. Such shafts frequently get out of line, the couplings break and keys for the pulleys are frequently sheared off. Line shafting means that the building structure must be heavier than is otherwise necessary. To offset the tension of the belts it is customary to use guy rods which are anchored to some part of the building. It is necessary to support the hammer on some sort of a cushion which yields more or less, and any undue tension or slackness of a belt, due to unequal tension of the guy rods or any other cause, is accompanied by a corresponding change in relation of the top and bottom dies used in the hammer which is detrimental to the finished product.

The object of the present invention is to overcome the above noted objections and to provide an improved arrangement of drop hammer driving mechanism whereby each hammer is self-contained, including all the driving wheels, belts and driving motor, and wherein the correct relation of parts is preserved at all times.

A drop hammer when in operation sets up vibrations of considerable magnitude and a further object of our invention is to provide an arrangement in a motor driven drop hammer wherein vibrations from the hammer will not be transmitted to any great extent to the motor.

For a consideration of what we believe to be novel and our invention, attention is directed to the accompanying description and the claims appended thereto.

In the drawing, Figure 1 is a side elevation of a motor driven drop hammer embodying our invention; Fig. 2 is an end view of the motor end of the drop hammer; Fig. 3 is a top plan view of the motor end; and Fig. 4 is a plan view of the hammer end of the drop hammer with parts broken away to aid in illustrating the invention.

Referring to the drawing, 6 indicates a drop hammer which may be of any suitable or well-known type. The specific structure of the drop hammer mechanism forms no part of the present invention and no attempt is made therefore to fully illustrate and describe the same. The structure and operation of a board drop hammer is well-known and understood by those familiar with the art. In the arrangement shown, 7 indicates the hammer or weight, 8 the member commonly termed a board attached thereto, and 9 the side frames or guides. The board passes between friction rollers 10

and 11 which are carried by shafts 12 and 13. On shaft 12 is a pulley or belt wheel 14, and on shaft 13 is a pulley or belt wheel 15. 16 indicates the usual control levers for the drop hammer. As is well understood the two belt wheels 14 and 15 are rotated in opposite directions when the drop hammer is in operation.

Now, according to our invention, we provide an electric motor to drive the two belt wheels of the drop hammer, which motor is mounted on the outer end of a supporting member, the inner end of which is fastened to the drop hammer frame. The outer end of the supporting member is supported on a tower or column built up from the floor. It is preferable to attach the inner end of the support to the frame by a hinge joint since this obviates the necessity of extreme accuracy in the settings of the hammer frame and tower with respect to each other. Further the arrangement permits the hammer frame to settle slightly without stressing the supporting member as it otherwise would do. Where the use of an overhead crane is not desirable or necessary the outer end of the supporting member may be suspended by an auxiliary support from the ceiling. The motor and parts directly associated therewith are located preferably with their center of gravity over the supporting block so that one part counterbalances the other part. The supporting member is made sufficiently long to give a suitable distance between driving centers and while it may be formed of any suitable material it is preferably made of one or more wooden planks or beams as these possess the desirable qualities of being non-resonant and able to absorb vibrations to a substantial degree. The motor, which is situated between the outer end of the support and the hammer to decrease the overhang, drives two driving belt wheels which are belted to the belt wheels of the drop hammer; and to give the correct directions of rotation to the driving belt wheels, so as to avoid the necessity of crossing one of the belts, the motor shaft is connected to the same through suitable gearing which serves to drive one belt wheel in one direction and the other in the opposite direction. This arrangement means that both belts cover the same amount of surface of the pulleys or belt wheels thus insuring equal action on both sides. Further, the belts are made long enough to have some stretch when the load is applied and in this manner aid in taking up the shock on the motor. The specific structure and arrangement of the supporting member depends primarily on the size of the hammer. In the case of a small hammer it may comprise a single board, plank or beam, while in the case of a larger hammer it may be desirable to build up a framework from two or more boards, planks or beams in order to obtain a support of the necessary strength. Also it is so arranged as to preserve the parallel relation of the driving and driven shafts.

Referring now to the drawing, the supporting member illustrated comprises a frame built up of two side beams 19 and 20 with their ends held in spaced relation to each other by suitable cross pieces, said beams being stiff enough to prevent buckling. In the present instance the inner ends of the beams 19 and 20 are clamped between plates 21 and hinge irons 22 by bolts 23 and suitable top and bottom cross pieces 24 and 25 are riveted or otherwise fixed to flanges on hinge irons 22. At the end surfaces of beams 19 and 20 are angle iron braces 26 riveted to the hinge channel irons 22 which serve to take the longitudinal thrust on beams 19, 20 due to the pull of the belt drive. This relieves the strain on bolts 23. The two hinge irons 22 terminate in eyes 27 through which passes a shaft 28 carried by arms 29 which project from side frames 9. By this arrangement the inner end of the supporting member is hinged to the drop hammer. To the outer ends of beams 19 and 20 are bolted channel irons 30, Fig. 2, to which are fastened top and bottom cross pieces 31 and 32. Beneath the outer end of the frame which forms the motor support is an auxiliary support, tower or column 33 which may be built up in any suitable manner and on tower 33 is a cushion 34 upon which directly rests the bottom cross piece 32 to support the outer end of the supporting frame. The cushion should be of non-resonant material and we have found a block of hard wood to be satisfactory for the purpose. This block preferably extends across the entire top of the tower so as to prevent the outer end of the frame from twisting as it tends to do under the action of the motor, fly wheel and belts. To prevent any substantial movement of the outer end of the supporting frame relative to tower 33 bolts 35 are provided which pass through oversize openings in bottom cross pieces 32 and the top of tower 33. The said bolts 35 serve also to hold the outer end of the supporting frame from any substantial lateral movement, although owing to the oversize openings through which the bolts pass, an adjusting movement is permitted in case the drop hammer should settle.

Mounted on top cross pieces 31 is a gear casing which is split horizontally to form a bottom portion 36 and a cap 37 and supported by bearings in the gear casing are shafts 38 and 39 which carry on their adjacent ends gear wheels 40 and 41 respectively and on their outer ends driving belt wheels 42 and 43 respectively. Supported by bearings 44 in the gear casing is a pinion shaft 45 on which is a pinion 46 which meshes

on opposite sides with gear wheels 40 and 41. The pinion 46 when turned, therefore, will drive gear wheels 40 and 41 in opposite directions. Shaft 45 projects beyond the casing at both ends and at one end it carries a fly wheel 47 which assists the motor in taking up the load and at its other end it is coupled to shaft 48 of a motor 49. Motor 49 is mounted on a platform 50 which is bolted to the gear casing, the purpose being to obtain the full benefit of the wooden beams without making them unduly long. The motor, gearing, and fly wheel may be considered as a single unit and such unit is so located on the end of the supporting frame that its center of gravity comes over the block 34. The driving belt wheels 42 and 43 are belted to wheels 14 and 15 by belts 51 and 52 which on account of their elasticity assist the motor in taking up its load. In this connection it should be noted that the load is very suddenly applied to the motor and released. Fixed to the side of the supporting frame is a platform 53 adjacent which is a hand railing 54 for use of the operator in attending to the machine, and on the side of the tower is a ladder 55 for use in mounting to platform 53.

The operation of the motor in driving the drop hammer is obvious, the pinion 46 driving gear wheels 40 and 41 in opposite directions which results in driving the belt wheels 42 and 43, and hence belt wheels 14 and 15, in opposition directions. The fly wheel 47 performs the usual function of storing energy from the motor during periods of light load, which energy is released to assist the motor during periods of heavier loads. It also assists in counterbalancing the weight of the motor.

With the above described arrangement it will be seen that since the supporting member or frame for the motor is connected to the drop hammer preferably by hinging as shown, the driving belt wheels 42 and 43 are held correctly spaced from belt wheels 14 and 15 and are maintained in correct alinement so that the belts 51 and 52 will function properly. At the same time, however, the fact that the outer end of the supporting frame is supported by a material which absorbs vibrations and is non-resonant, sufficient vibrations will not be transmitted from the hammer to the motor to derange the operation of the motor or to jar it to pieces, or to jar loose the associated parts. It is also to be noted that with our improved arrangement no crossing of belts is required and no line shafting. It will also be seen that the hammer can now be put in any convenient place in the shop instead of being restricted to some specific place due to limitations of the driving means. Further, trouble with one hammer does not affect any other. Due to its independent motor drive a new board may be readily inserted in the hammer without danger to the repair man because there need be no belts or rollers in motion. The arrangement also avoids the use of objectionable guy rods and the tensions on the belt may be made uniform even though the hammer itself gets slightly out of perpendicular. It also has the advantage of saving power because it is possible to have a complete shut down while the dies are being set or between heats or during relays due to any cause. Since the mechanism is entirely independent of line shafting it follows that overhead cranes may be employed to their full advantage.

In accordance with the provisions of the patent statutes, we have described the principle of operation of our invention, together with the apparatus which we now consider to represent the best embodiment thereof; but we desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

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

1. In an apparatus of the character described, the combination of a hammer, a stationary supporting and guiding frame therefor, a pair of actuators mounted on the frame and arranged to raise and release the hammer, mechanism for moving the actuators which includes driving and driven wheels and yielding means to absorb the shock between the driving wheels and the actuators, an electric motor connected to the driving wheels, means having one end fastened to and supported by the frame for holding the motor and driving wheels in predetermined position with respect to the driven wheels, and an auxiliary support for the other end of said means.

2. In an apparatus of the character described, the combination of a hammer, a stationary supporting and guiding frame therefor, a pair of friction rolls, arranged to raise and release the hammer, a driven wheel for each roll, a driving wheel for each driven wheel, a belt connecting each driving wheel with its driven wheel, said belts serving as driving means and also as shock absorbing means, a member having one end connected to and supported by the frame, an electric motor supported at the other end of the member for rotating the driving wheels, and a support for the said other end of the member.

3. In an apparatus of the character described, the combination of a hammer, a stationary supporting and guiding frame therefor, a pair of friction rolls arranged to raise and release of the hammer, a driven wheel for each roll, a driving wheel for each driven wheel, a belt conecting each driving wheel with its driven wheel, said belts serv-

ing as driving means and also as shock absorbing means, a member hinged at one end to the frame, an electric motor supported by the other end of the member for rotating the driving wheels in opposite directions, and a support for said other end of the member.

4. In an apparatus of the character described, the combination of a hammer, a stationary supporting and guiding frame therefor, a pair of friction rolls arranged to raise and release the hammer, a driven wheel for each roll, a driving wheel for each driven wheel, a belt connecting each driving wheel with its driven wheel, said belts serving as driving means and also as shock absorbing means, an electric motor which is common to and drives both of the driving wheels, a support for the motor comprising two members which are hinged to the main frame and which serve to hold the motor in spaced relation with respect to the main frame and also prevent lateral movement of the motor, and a vertical column arranged near the outer end of the support upon which such outer end rests.

5. In an apparatus of the character described, the combination of a main frame, a hammer, a board for actuating it, a pair of friction rolls arranged to raise and release the board and hammer, a driven wheel for each roll, said wheels being arranged on opposite sides of the frame, a supporting member which is located at one side of the frame and is attached thereto, a pair of driving wheels mounted on opposite sides of the member, a pair of gear wheels located between the driving wheels and connected thereto, an electric motor which drives both of the gears and is carried by the supporting member near its outer end, and means for supporting the outer end of said supporting member.

6. In an apparatus of the character described, the combination of a main frame, a hammer, a board for actuating it, a pair of friction rolls arranged to raise and release the board and hammer, a driven wheel for each roll, said wheels being arranged on opposite sides of the frame, a pair of spaced non-resonant bars which are attached at one end to the main frame and are connected by a platform at their outer ends, a pair of belt wheels and their shafts, means mounted on the platform for supporting the shafts and wheels, gears mounted on the shafts for rotating them in opposite directions, an electric motor having a driving gear which meshes with the gears on the shafts, belts connecting the driving and driven wheels, and an auxiliary support for said platform.

7. In an apparatus of the character described, the combination of a main frame, a hammer, a board for actuating it, a pair of friction rolls arranged to raise and release the board and hammer, a driven wheel for each roll, said wheels being arranged on opposite sides of the frame, a pair of spaced non-resonant bars which are attached at one end to the main frame and are connected by a platform at their outer ends, a gear box mounted on the platform, a pair of wheels and shafts supported by the box, gearing in the box for driving the shafts in opposite directions, an electric motor carried by the gear box and driving a gear which meshes with the first named gears, belts for transmitting motion between the wheels, and an auxiliary support which engages the platform approximately in line with the center of gravity of the gear box and motor.

8. In an apparatus of the character described, the combination of a main frame, a hammer, a board for actuating it, a pair of friction rolls arranged to raise and release the board and hammer, a driven wheel for each roll, said wheels being mounted on opposite sides of the frame, a non-resonant support hinged to the frame at its inner end and supported at its outer end, a pair of driving wheels and their shafts mounted on the outer end of the support, an electric motor for driving said wheels in opposite directions which is located between the wheels and the main frame, and means transmitting motion from the driving to the driven wheels.

9. In an apparatus of the character described, the combination of a main frame, a hammer, a board for actuating it, a pair of friction rolls arranged to raise and release the board and hammer, a driven wheel for each roll, said wheels being mounted on opposite sides of the frame, a non-resonant support hinged to the frame at its inner end and supported at its outer end, a pair of driving wheels and their shafts mounted on the outer end of the support, an electric motor for driving said wheels in opposite directions which is located between the wheels and the main frame, a fly wheel located on the outer end of the motor shaft which in addition to acting as such acts as a counterbalance, and means for transmitting motion from the driving to the driven wheels.

10. The combination in a drop hammer, of a main frame, drop hammer mechanism carried thereby, a nonresonant member having one end connected to and supported by said frame, a motor supported on the other end of said member, and means connecting the motor to the drop hammer mechanism.

11. The combination in a drop hammer, of a frame, drop hammer mechanism carried thereby, a supporting member having one end connected to and supported by the frame, means supporting the other end of said member, a motor supported on the said last named end, and means connecting the motor to the drop hammer mechanism.

12. The combination in a drop hammer, of

a supporting member having one end connected to the drop hammer, means for supporting the other end of said member, a motor and a pair of driving belt wheels mounted on said last named end, a gearing between the motor and said belt wheels whereby the motor drives one belt wheel in one direction and the other in the opposite direction, and belts connecting the belt wheels to the drop hammer.

13. The combination in a drop hammer, of a supporting member having its inner end supported on the drop hammer frame, means for supporting the outer end of said member, said member being made of a material which absorbs vibrations to a substantial degree, a motor mounted on the outer end of said member, and driving belts connecting the motor to the drop hammer.

14. The combination in a drop hammer, of a main frame, drop hammer mechanism carried thereby, a wooden beam having its inner end connected to and supported by the drop hammer, means supporting its outer end, a motor mounted on such outer end, and driving connections between the motor and the drop hammer mechanism.

15. The combination in a drop hammer having two belt wheels which are driven in opposite directions, of a supporting member formed of wood and having its inner end hinged to the drop hammer, means for supporting the outer end of said member, a pair of belt wheels and a motor mounted on said outer end, gearing through which the motor drives said belt wheels in opposite directions, and belts connecting the last named belt wheels to the first named belt wheels.

16. The combination in a drop hammer having two belt wheels which are driven in opposite directions, of a supporting member having its inner end fastened to the drop hammer frame, means for supporting the outer end of said member, a pair of shafts supported at said outer end, each having a belt wheel on one end and a gear wheel on the other end, a driving shaft extending at right angles to said first named shafts and having between its ends a gear wheel which meshes with the gear wheels on the first named shafts, a motor connected to one end of said driving shaft, a fly wheel on the other end thereof, and means connecting said belt wheels together.

In witness whereof, we have hereunto set our hands this 30th day of January, 1919.

OTIS R. CLARK.
CHARLES H. FRANKLIN.