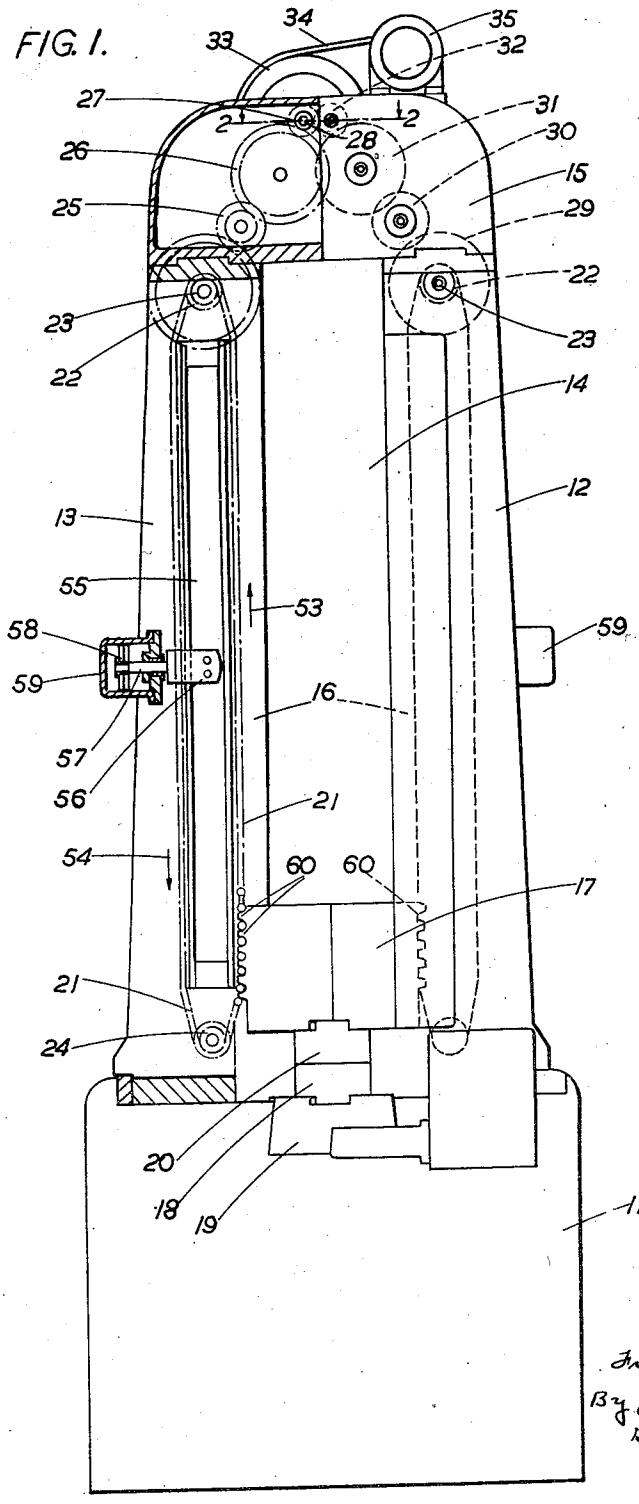
Sept. 28, 1948. F. EMANUEL 2,450,189

DROP HAMMER, STAMP, AND THE LIKE

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FIG. 1.



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FIG. 2.

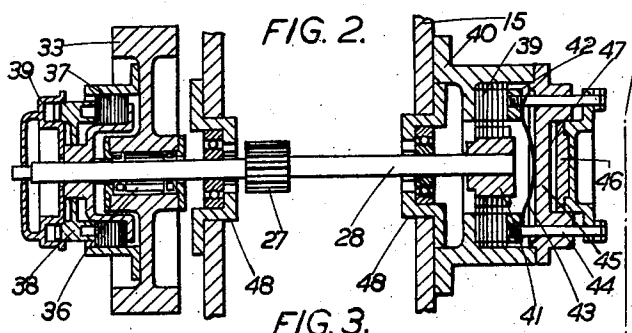


FIG. 3.

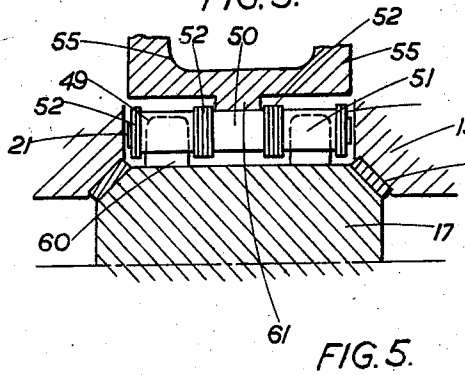


FIG. 4.

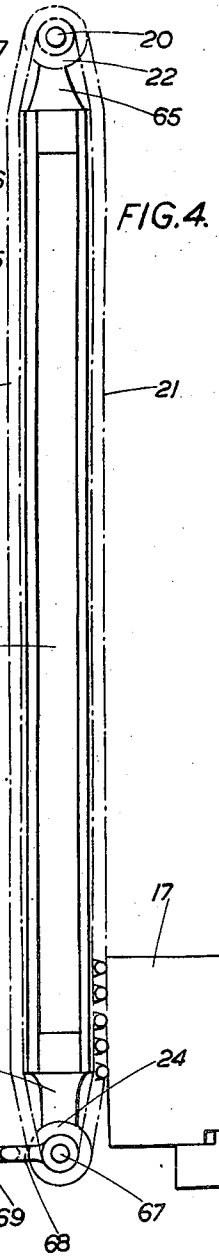


FIG. 5.

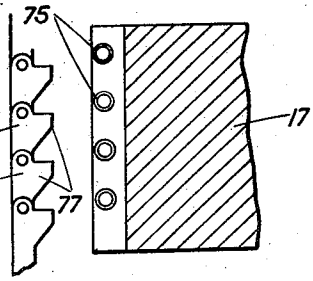
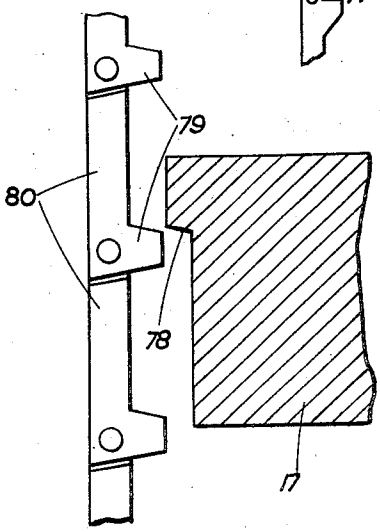


FIG. 6.



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Patented Sept. 28, 1948 2,450,189

UNITED STATES PATENT OFFICE

2,450,189

DROP HAMMER, STAMP, AND THE LIKE

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Application October 12, 1944, Serial No. 558,303
In Great Britain October 13, 1943

4 Claims. (Cl. 78—30)

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This invention comprises improvements in or relating to drop hammers, stamps and the like.

In drop hammers there is a heavy tup which is lifted by some form of mechanical driving means and released when it reaches a certain height so as to fall on the work and effect a forging blow. Similar mechanisms are used for mining stamps and pile drivers and the like. On some hammers the tup is lifted by means of a belt which passes over a continuously rotating pulley. The mechanism presses the belt on the pulley when the tup is to be lifted and releases the belt when the tup is to fall. Another known method is that employed in what is known as a board hammer in which a board is engaged by a friction wheel and lifted, the tup being attached to the board. Again instead of the board there may be a metal rod against which driving rollers are pressed in order to lift the hammer. Such rods may be either circular or of fluted formation, the latter formation being adopted to increase the friction surface. In all cases, however, difficulties arise through wear of the driving members and in many instances the fall of the hammer is not entirely unimpeded by friction in the driving means. It is an object of the present invention to provide a driving mechanism for a drop hammer, stamp or the like in which these objections are obviated.

According to the present invention in a drop hammer, stamp or the like means are provided for lifting the tup comprising a driving chain and means to bring the chain into positive engagement with the tup when it is to be lifted and for disengaging the tup from the chain when it reaches the required height.

Preferably the chain is mounted so as to be laterally movable and means are provided to effect such movement, to bring the chain into engagement with the tup and to disengage it therefrom.

The following is a description, by way of example, of certain constructions in accordance with the invention as applied to drop hammers, reference being made to the accompanying drawings, in which:

Figure 1 is a front elevation of a drop hammer in accordance with the invention, the left-hand portion of the figure being shown partly in section;

Figure 2 is a detail section through a portion of the driving mechanism upon the line 2—2 of Figure 1;

Figure 3 is a detail, in sectional plan, showing the engagement of the chain with the chain guide and with the tup;

Figure 4 is a detail of a modification;

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Figure 5 is a detail of an alternative form of chain and of its engagement with the tup, and

Figure 6 is a detail of a further modification of chain and tup.

Referring to Figures 1, 2 and 3, the drop hammer comprises a base 11 and on the base two tall vertical uprights 12, 13 separated from one another by a space 14. Each of the uprights is a double member with a space between so that in effect there are four columns on the base 11 which are united together by a head 15. The inner faces of the columns are machined to constitute vertical guides 16 for a tup 17 which is located between the guides so that it can be lifted to the top of the guides and if released will fall to the bottom. Under the tup on the base is a lower die 18 supported on a bolster 19 and on the tup there is mounted an upper die 20 to co-act with the lower die 18.

It will be seen that the guides 16 engage the tup 17 at the four corners and between the guides on each side there is located a chain-mounting for a chain 21. Each chain-mounting comprises a sprocket 22 at the top on a driving shaft 23, and a second idler-sprocket 24 at the bottom, each of the sprockets being supported by bearings secured in the walls of the uprights 12 and 13. The two upper sprockets 22 constitute driving sprockets and the shafts which drive them are each connected by a train of gearing 25, 26, 27 in the one case and 29, 30, 31, 32 in the other case to a shaft 28 which forms a common driving shaft for the two trains. It will be noted that the gear wheel 32 in the train 29, 30, 31, 32 forms an additional gear so that the direction of rotation of the shaft 23 in the right-hand column 12 is opposite to the direction of rotation of the shaft 23 in the left-hand column 13. On the shaft 28 is a fly-wheel 33 which is driven by V driving belts 34 from an electric motor 35 mounted on the top of the head 15.

The fly-wheel 33 runs on roller-bearings 36 on the shaft 28 and is connectable to the shaft through a concentric friction clutch 37 of the plate type. A ring piston 38 working in a ring cylinder 39 is provided for operating the clutch and the ring cylinder is connected to a compressed air supply under the control of the operator for engaging the clutch. Compressed air connections are not shown in the drawings. At the opposite end of the shaft 28 from that which carries the fly-wheel 33 there is a brake mechanism comprising a multiple plate clutch 39 the fixed plates of which are secured in a casing 40 bolted to the side of the head 15, the movable plates being secured to a hub 41 on the shaft 28. A pressure ring 42

is acted upon by a number of flat spring arms in the form of a spider 43 for engaging the brake. Sliding studs 44 screwed into the pressure ring pass through the end plate 45 of the casing 40 and are connected to a piston 46 in a pneumatic cylinder 47 having a very short stroke. Air pressure applied to the cylinder 47 therefore serves to release the brake against the action of the springs 43. The air supply to the cylinder 47 can be connected to the same pipe as that which supplies the ring cylinder 39 of the clutch 37 and thus when air is turned on the brake 39 is disengaged and the fly-wheel clutch 37 is engaged. When air pressure is cut off the clutch drive 37 is disengaged and the brake 39 is put on. By this means the driving shaft 28 can be promptly started and stopped by the operator, and when stopped is firmly held from rotation by the brake 39. The shaft 28 with the mechanism described is supported from the head 15 by ball-bearings 48.

Returning to the driving chains 21 which are located between the columns 12, 13, each of these chains is of the triplex roller type, as can be seen in the cross-section, Figure 3, that is to say each consists of a roller chain with three rollers 49, 50, 51 on each rivet, the rollers being separated by flat links 52 extending from rivet to rivet. The chains are made of such length that they would be slack on the sprockets but for the fact that the upside and the downside of the chain (indicated by arrows 53, 54 respectively in Figure 1) are held apart by a chain guide 55 located between them. Each chain guide consists of a long hollow parallel-sided member which extends in a vertical direction from a point near the upper driving sprocket 22 to a point just above the lower, or idler, sprocket 24 and the width of the chain guide 55 is such that it spreads the sides of the chain apart sufficiently almost to take up the slackness aforesaid. The chain guides are mounted on bridge-pieces 56 which are secured to the sides of each chain guide and are such as to bridge the downside of the chain, the bridge-piece being mounted on a horizontal piston rod 57 carrying a piston 58 in an air cylinder 59. The horizontal air cylinder 59 and the associated movable parts are located at about the middle of the guide 55 and by applying pressure in the cylinder 59 the guide 55 can be moved laterally inwards towards the line of movement of the tup 17, the two sides of the chain being by this means carried over laterally towards the tup with the guide. The cylinder 59 is double-acting and by applying air pressure in the opposite direction the chain can be carried away from the tup. There is a similar cylinder 59 and corresponding gear for moving the chain between the pillars 12 to that which is shown in the drawings between the pillars 13.

The chains 21 are driven in such a direction that their sides, which are nearest to the tup 17, move upwardly. The tup carries teeth 60 on both side of it the teeth being arranged in two rows on each side so that when the chain is advanced towards the tup the teeth fit in between the outer lines of rollers 49, 51. The central line of rollers on the chain which are marked 50 in Figure 3, run on a rib 61 provided on the centre-line of the chain guide 55 and suitably machined to guide the chain and help it to run smoothly. Thus when the laterally movable chain guides 55 are moved inwards towards the tup by means of their air cylinders 59 the chains are brought into engagement with the teeth 60 on the sides of the tup and as this engagement

is positive the tup is lifted without depending in any way upon friction. When the chain guides are moved outwardly away from the tup the tup is released and allowed to fall.

The engagement and disengagement of the chains with the tup may be effected by a hand-control, if desired, or alternatively in the path of the tup there may be secured a trip member (not shown in the drawings) for operating an air valve which controls the air cylinders 59. Such a trip member may be adjustably mounted so that it can be secured at any desired height and serve to release the tup by reversing the air cylinders as soon as the tup strikes the trip member. Re-engagement of the tup with the chains may be effected either automatically by another trip at the bottom or by the operator, as may be desired. If the operator throws the trips out of operation, or if trips are not provided, he is able to engage the chains with the tup and he can then run the tup to any desired height and hold it there by manipulating the air clutch 37 and brake 39.

Referring to Figure 4, this shows a modified construction in which the upper sprocket 22 drives a chain 21 as before but the chain guide 55 instead of being mounted on a bridge-piece 56 so that it moves parallel to itself is hung by means of an extension 65 from the spindle 23 of the upper sprocket. At the lower end the chain guide has an extension 66 which carries the spindle 67 of the lower sprocket 24 and the spindle 67 is connected to a bridle 68 on a piston rod 69 which carries a piston 70 working in an operating cylinder 71. The lower end of the chain guide is therefore moved in and out towards or from the tup and thus the chain 21 and its guide 55 move together into or out of engagement with the tup 17. In order to release the chains from the tup the chains and guides are swung outwardly when the tup reaches the desired height. The movement of the piston rod 69 must in this case be made sufficient to ensure that at the height where release is desired the chain 21 has sufficient lateral movement and the upper sprockets 23 must be substantially above the uppermost level at which the tup is to be released.

Referring to Figure 5, in this case the tup 17 carries a series of rollers 75 to engage the chain and the chain is provided with links 76 each of which is shaped to provide a lug 77. The lugs 77 engage a number of rollers 75 on the tup 17 simultaneously. Figure 6 shows an alternative construction in which the tup 17 has a shoulder 78 beneath which may engage lugs 79 on a chain provided with relatively long links 80.

It is to be observed that the plate clutch drive between the fly-wheel 33 and the shaft 28 is able to slip a little under shock and so tends to cushion the shock which might otherwise occur when the chain is moved into engagement with the tup and has to start it into immediate motion upwardly. It is possible also to provide a spring coupling on the shaft 23 to cushion the shock further if desired. When the chains are out of engagement with the tup the tup is entirely free and its fall is not restricted in any way by friction in the driving mechanism.

I claim:

1. In a forging machine, in combination, a frame comprising guides extending generally vertically, a tup slidably mounted within said guides, a projection on said tup extending laterally therefrom and providing a downwardly fac-

ing fixed surface adapted to be engaged for lifting the tup, a driving chain disposed alongside the path of the tup, means for moving the chain toward said tup to cause it to engage said surface for lifting the tup, and for moving said chain away from said tup to cause it to disengage said surface to allow the tup to fall, and means to drive said chain.

2. In a forging machine, in combination, a frame comprising guides extending generally vertically, a tup slidably mounted within said guides, a projection on said tup extending laterally therefrom and providing a downwardly facing fixed surface adapted to be engaged for lifting the tup, chain supporting means disposed alongside the path of the tup, a driving chain carried on said supporting means, means for moving said supporting means toward said tup to cause said chain to engage said surface for lifting the tup and for moving said supporting means away from said tup to cause said chain to disengage said surface to allow the tup to fall, and means to drive said chain.

3. A device according to claim 2, said supporting means comprising upper and lower sprockets

and a chain guide disposed therebetween, said chain guide being movable toward and away from said tup.

4. A device according to claim 2, said supporting means comprising upper and lower sprockets and a chain guide disposed therebetween, said chain guide being pivoted at its upper end, and means connected to the lower end of said chain guide for oscillating the latter toward and away from said tup.

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