

June 14, 1960

M. C. HENGEL
MECHANISM FOR PACKING LONG LENGTH DYNAMITE
CARTRIDGES OF LOW DENSITY

2,940,353

Filed Nov. 13, 1957

3 Sheets-Sheet 1

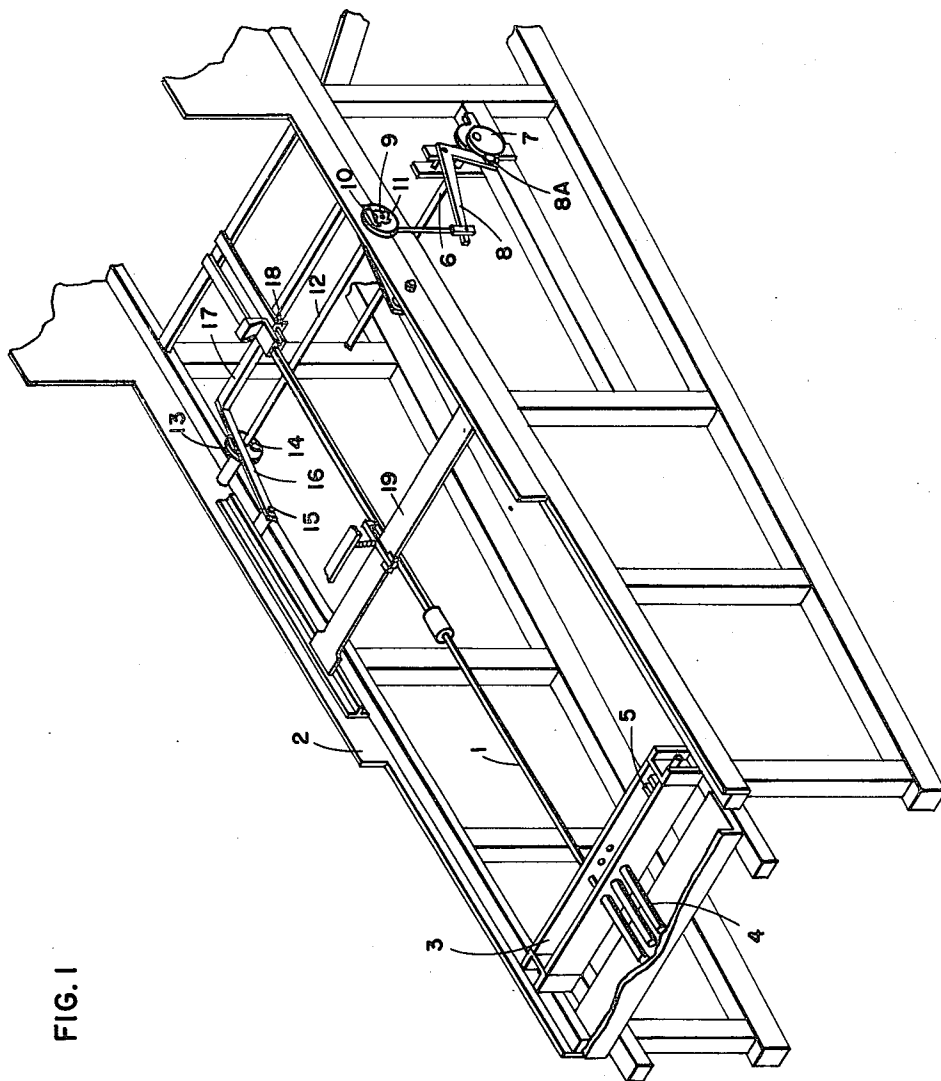


FIG. 1

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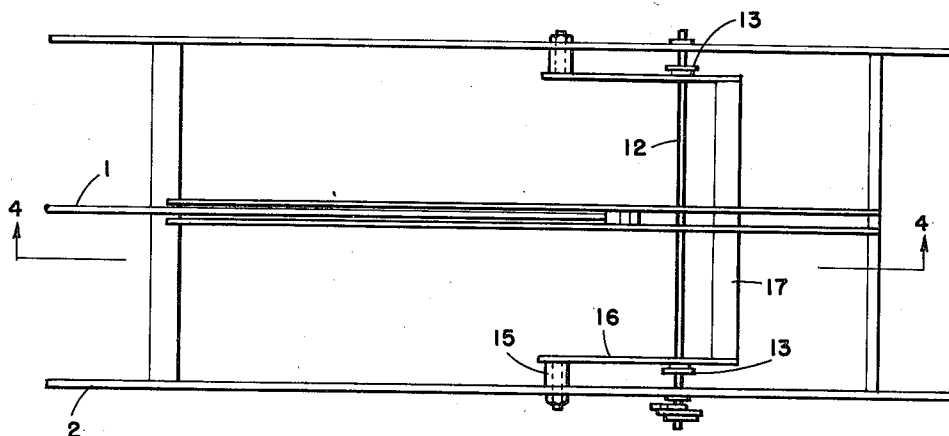


FIG. 2

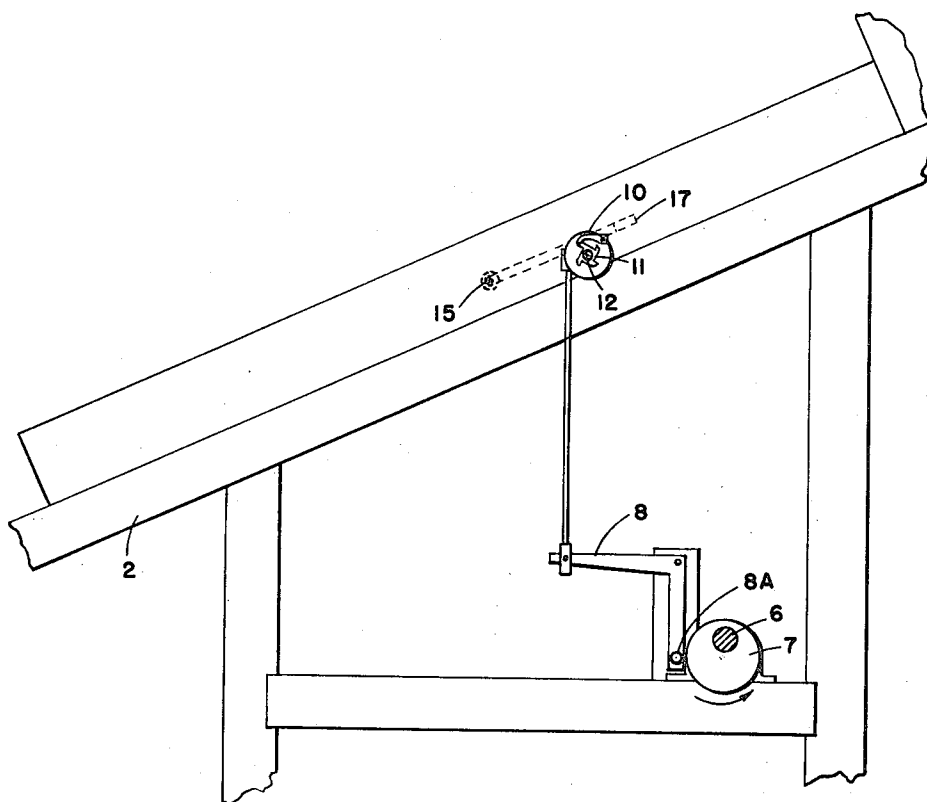


FIG. 3

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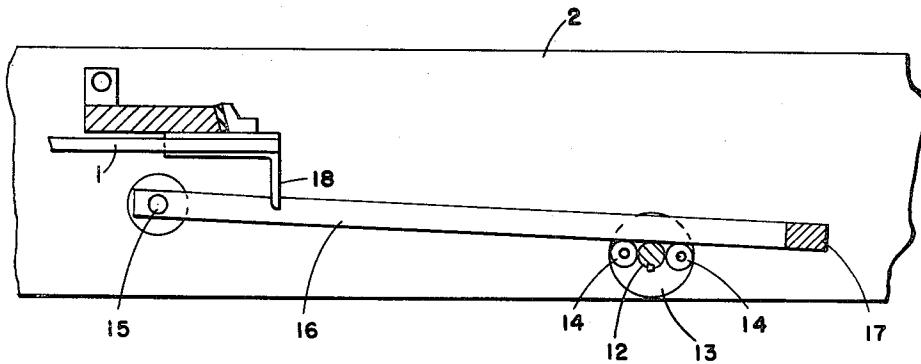


FIG. 4

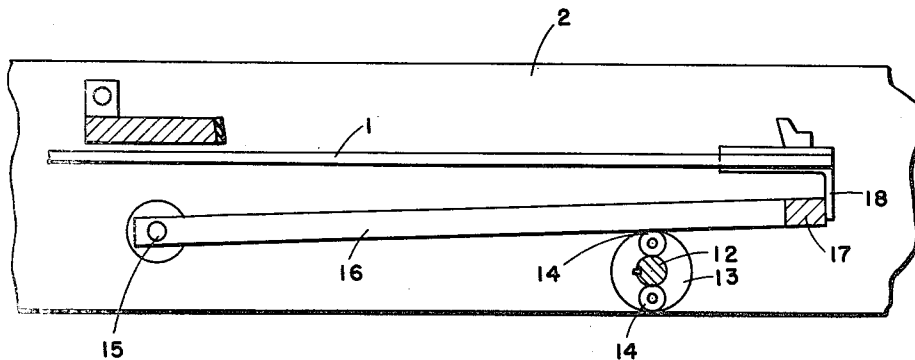


FIG. 5

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**MECHANISM FOR PACKING LONG LENGTH
DYNAMITE CARTRIDGES OF LOW DENSITY**

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Filed Nov. 13, 1957, Ser. No. 696,167

5 Claims. (Cl. 86—20)

This invention relates to a new mechanism for the control of the density of dynamite sticks during the packing thereof.

One of the more common methods of packing dynamite sticks is to provide a mechanism by which a series of packing tamps are reciprocated through a reservoir of loose dynamite powder into the cartridges to be filled. Various machines of this type have been described, as for example in the patent to Kimber No. 813,435, the patent to O'Brien U.S. 1,126,651 and the patent to Bashford U.S. 1,911,299, as well as my copending application Serial No. 667,266, filed June 21, 1957. When short cartridges such as 8 inch cartridges are being packed, the problem of getting a charge of low apparent density, which is sometimes desired, is easily solved by allowing the sticks to reciprocate through the powder into the open end of the cartridges, but not to tamp the powder in. The sticks are stopped when the tamp has just entered the cartridge. When the latter are all full of loose powder, the sticks are allowed to make one tamping stroke. When the same method is tried with longer (16 and 24 inch) cartridges the loose powder never fills the cartridge. The loose powder is pushed into the top of the empty cartridge and never gets pushed all the way to the bottom because the tamp is not entering the cartridges to push it down. Consequently, such loose packed (or "soft packed") cartridges have been feasible for 16 inch sizes only by packing from both ends in succession and not possible at all for larger sizes without hand packing.

I have discovered a simple apparatus which in conjunction with the type of packing apparatus involving a tamp reciprocating through a powder reservoir permits not only soft packing of all sizes, but also allows more accurate control of the density of the powder packed in the dynamite stick.

My invention can be further understood with reference to the drawings in which:

Fig. 1 is a perspective view of a portion of one such common packing machine showing the pack stick, the powder reservoir and the cartridges;

Fig. 2 is a top view of that portion of the machine on which the packing density control is mounted;

Fig. 3 is a side elevation of the same portion of the machine;

Fig. 4 is a cross section of the same portion of the machine along the line 4—4 in Figure 2, and

Fig. 5 is a cross section of the same portion of the machine showing the apparatus in an engaged position.

In the type of apparatus used for illustration in the figures, the packing stick 1 is mounted on an incline frame 2 in such a way that it can reciprocate. At the bottom of the incline a powder reservoir 3 is mounted in such a position that the packing stick or tamp 1 passes through the same on each reciprocation. Beyond the powder reservoir 3 the empty cartridges 4 are mounted in such a position that each packing stick on passing through the

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reservoir enters the cartridges. In the operation of the prior art, on each reciprocation, a pack stick 1 picked up powder from the reservoir 3 and pushed it into the cartridge 4 and pushed it as far as it could until it met resistance. The packing stick 1 was impelled by either its own weight or by the assistance of other weights, or as described in my copending application Serial No. 667,266, can be impelled by the action of a reciprocating cross head. However impelled, the packing stick pushed the dynamite powder as far as it could and the effect of the packing force was to tamp it into the bottom of the cartridge.

In the powder reservoir 3 there is located a paddle 5 which makes 1 revolution per reciprocation in order to keep the powder stirred up and evenly distributed in the reservoir. This paddle is driven by a belt drive (not shown) from a shaft 6 which in turn is rotated from the main power source (not shown), the rotation being timed to make one revolution per reciprocation of the pack stick 1. In the apparatus of my invention, there is mounted on this shaft a cam 7 concentrically shaped. A lever 8 is mounted so that a cam follower 8A is caused by cam 7 to make one reciprocation per revolution. The lever 8 actuates a crank 9 upon which is mounted a pawl 10. Concentric with the crank 9, but rotating independently, is a ratchet 11 mounted on a shaft 12. This shaft extends fully across the frame of the packing machine underneath the reciprocating pack stick 1. On the shaft 12 at either side of the packing apparatus on the inside of the frame, is mounted a cam 13. This cam is constructed as a circulating rotating wheel containing a concentric circular row of holes. Into one or more of these holes is bolted one or more rotating rollers 14. On either side of the frame 2, on the inside of the apparatus, is mounted a pivot 15 on which is pivoted a lever arm 16. The two lever arms 16 are joined by a stop 17 which extends right across the apparatus underneath the reciprocating pack stick 1. On each pack stick there is mounted an angular dog 18 on the end of the sticks above the packing cross-head 19 (which reciprocates the sticks) in such a way that when the lever arm 16 is raised by the rollers 14, as in Fig. 5, the stop 17 engages the dog 18. The position of the dog 18 on the pack stick is such that when the dog 18 is engaged by the stop 17 the tamping end of the pack stick 1 is just extended through the powder reservoir 3 and barely into the cartridge 4. When the lever arm 16 resting on the rollers 14 is in the down position, as is shown in Fig. 4, the stop 17 does not engage the dog 18 and the pack stick 1 can make its normal stroke to the bottom of the cartridge 4.

In operation, as illustrated in the figures, the cam 7 rotates once with each reciprocation of the pack stick 1. Each such rotation causes the cam follower 8A to pivot lever arm 8 in such a way as to cause crank 9 to rotate $\frac{1}{4}$ turn. This pulls the pawl 10 through a $\frac{1}{4}$ turn which in turn pulls the ratchet 11 through a $\frac{1}{4}$ turn. The return reciprocation of the lever arm 8 pulls the crank 9 back in such a way that the pawl 10 engages the next notch of the ratchet 11. The net effect of this motion is to rotate shaft 12 through $\frac{1}{4}$ turn for each reciprocation of the pack stick 1. The rotation of shaft 12 through $\frac{1}{4}$ turn causes the rollers 14 to be in either a horizontal or a vertical relationship to one another. Depending on whether they are horizontal or vertical, they cause the lever arm 16 and the stop 17 to be in the up or down position. The arrangement as shown in the figures causes the stop 17 to be in the up position on every other stroke of the pack stick 1. Consequently, the pack stick going down through the powder reservoir 3 picks up powder and pushes it into the cartridge 4. The stop 17 being in the up position as in Figure 5, stops the down stroke of the pack stick 1 and the powder remains

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loosely in the cartridge. On the next reciprocation of the pack stick, the stop 17 is in the down position as is shown in Figure 4, and the pack stick is permitted to go to its full tamping stroke. It thus pushes a double load of powder into the cartridge. Because it is pushing in a double load of powder, it can not tamp it down to a density as is possible with half that amount of loose powder. Consequently, the cartridge is more loosely packed. Thus, in summary, the stop 17 is raised and lowered on a predetermined repeating pattern correlated to the reciprocation of the pack sticks 1 and consequently stop 17 is made to engage dog 18 in a predetermined pattern of uninterrupted and interrupted strokes of the pack sticks 1 during the packing of each set of cartridges.

Various modifications and variables exist in this apparatus. The ratchet 11 can similarly be constructed to provide different amounts of partial intermittent rotation of shaft 12 by varying the number of teeth. Another variable is in the cam 13 since the number of rollers 14 placed therein will also control the number of full strokes per total number of reciprocations made by the pack stick 1. Thus, if a third roller 14 is inserted in cam 13 half way between the two shown in Figures 4 and 5, the pack stick 1 will obviously make one pack stroke per 4 reciprocations. The number of holes and the arrangement of holes into which rollers 14 can be inserted in cam 13 are a matter of choice, as are the number of teeth on the ratchet 11. By changing these variables, e.g., by the insertion of rollers 14 in cam 13, the apparent density of the dynamite within the cartridges can be controlled. Some of these changes are capable of being made rapidly between the packing of said dynamite sticks. Some changes can even be made during packing, such as the stopping of the described mechanism completely by the simple expedient of moving the pawl 10 through 180° so that it cannot contact ratchet 11. Density can be controlled further by varying the speed of the reciprocation of the sticks. The customer can therefore obtain dynamite packed to the apparent density which he desired in a uniform manner.

I have shown the use of my apparatus with an inclined reciprocating pack stick. However, it is clearly usable with any such dynamite packing machine which involves the reciprocation of a tamping stick through a powder reservoir into an empty cartridge in which the flow of dynamite powder into the empty cartridge is effected by the reciprocation of the tamping stick.

I claim:

1. In an apparatus for packing dynamite which comprises a frame, a powder reservoir mounted thereon, a plurality of cartridges and a similar number of nearly

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horizontal packing tamps positioned to reciprocate through said powder reservoir into said cartridges, and a means for reciprocating said packing tamps, the improvement which comprises an apparatus which controls the ratio of full packing strokes to the total number of reciprocating strokes of said tamps, which comprises dogs on each of said tamps, two arms pivotally mounted on said frame beneath the plane of said tamps, a stop connecting said two arms pivotally mounted in said frame, said stop being positioned to engage said dogs to interrupt the full down stroke of said tamps, said dog and said stop being positioned such that, when engaged, the said tamps are extended through said reservoir, but not appreciably into said cartridges, and means for raising and lowering said stop by pivoting said arms on a predetermined repeating cycle, the said stop thus engaging said dogs on a predetermined repeating cycle of interrupted and uninterrupted reciprocating packing strokes during the packing of one set of cartridges by said tamps.

2. The apparatus of claim 1 in which said means is a cam mounted on a first shaft in the side of said frame below the plane of said tamps, the said cam having rollers mounted thereon along a circle concentric to said first shaft, the said first shaft being intermittently rotated a partial revolution with each said reciprocation of said tamps and means for such intermittent partial revolution in synchronization with said reciprocation, the said pivotally mounted arms resting on said rollers.

3. The apparatus of claim 2 in which said means for intermittent partial revolution is a ratchet mounted on said first shaft engaged by a reciprocating pawl, the said pawls being mounted on a crank reciprocally connected to a lever following a cam mounted on a second shaft journaled in said frame, the said second shaft being synchronizably rotatably connected to the means for reciprocation of said tamps.

4. The apparatus of claim 3 in which said ratio of interrupted strokes to total reciprocating strokes is 1:2.

5. The apparatus of claim 3 in which the said ratio of interrupted strokes to total reciprocating strokes is 1:4.

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