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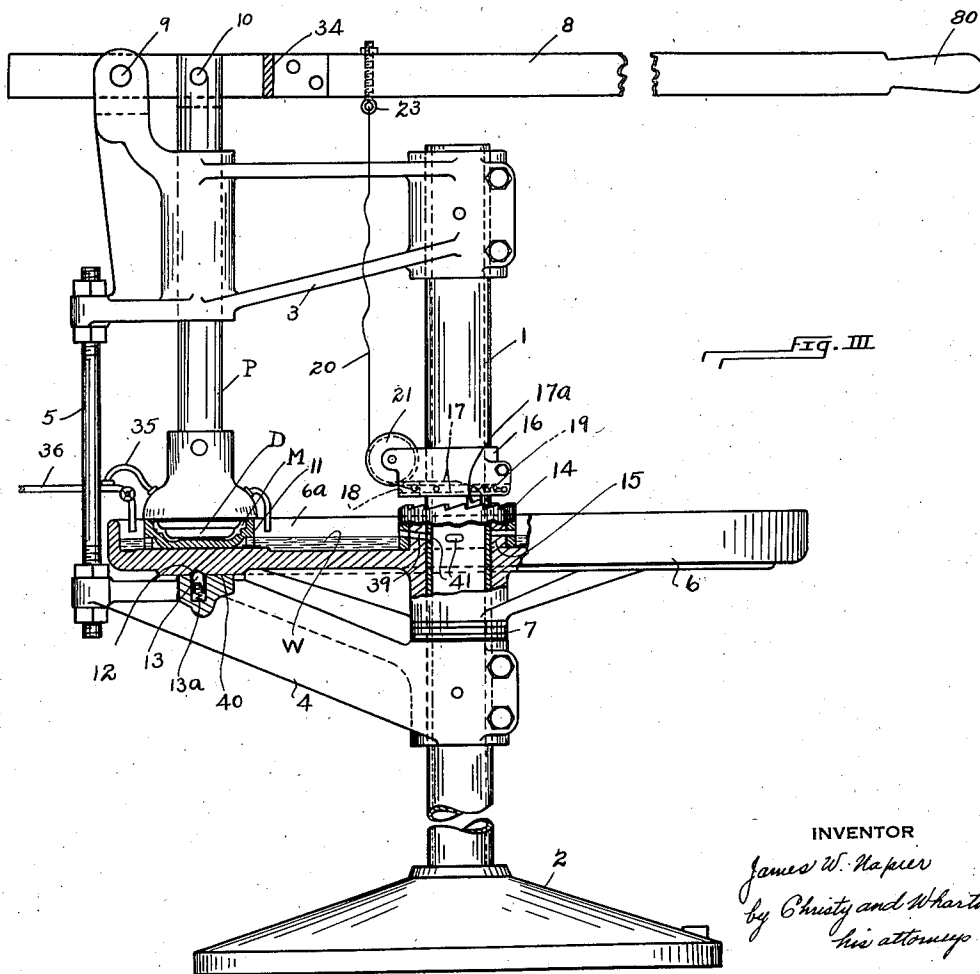
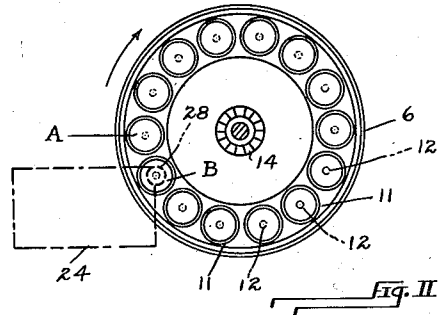
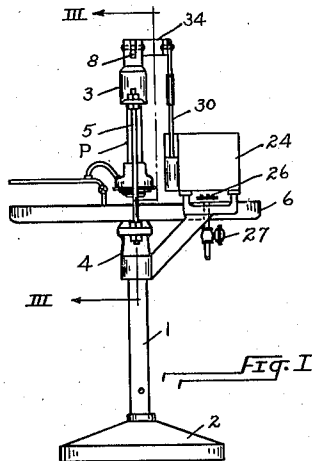
J. W. NAPIER

2,064,624

TARGET-MAKING MACHINE

Filed June 12, 1935

2 Sheets-Sheet 1



INVENTOR

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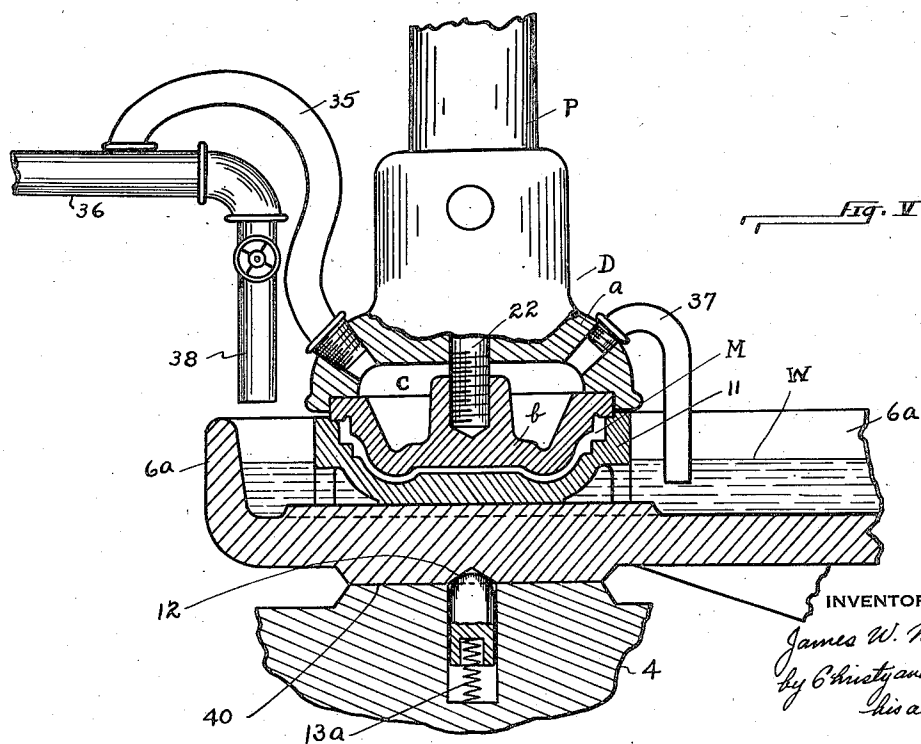
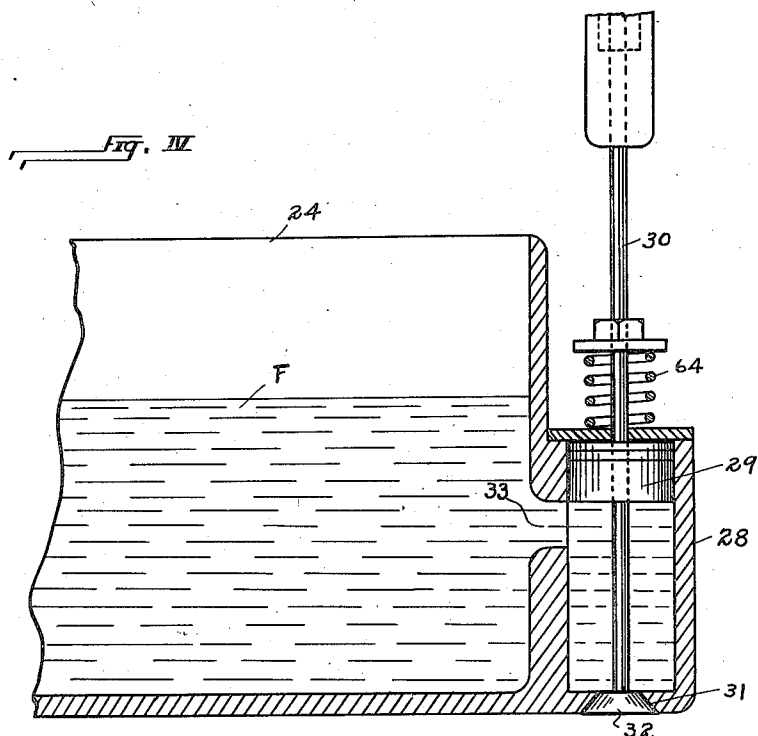
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TARGET MAKING MACHINE

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UNITED STATES PATENT OFFICE

2,064,624

TARGET-MAKING MACHINE

James W. Napier, Carnegie, Pa.

Application June 12, 1935, Serial No. 26,162

5 Claims. (Cl. 18—20)

My invention relates to apparatus for manufacturing targets—the so-called clay pigeons employed in the game of trap shooting.

A target of this sort comprises a discular body that is of sufficient strength and integrity to withstand the action of a catapult in throwing the target into the air, and yet is readily frangible when struck by gun shot. Such targets are usually formed of a thermoplastic material, usually a mixture of pitch and an inert filler, such as powdered limestone, and usually one or the other of the ingredients of the mixture ranges from forty to sixty per cent. of the whole. In manufacturing the targets, the mixture is heated to 300° F., more or less, and rendered plastic, and in such condition the material is formed into the desired discular bodies. The shaped material is allowed to cool and harden, whereby the shaped bodies provide the desired frangible targets.

In accordance with present practice, large automatic machines are employed in the manufacture of the targets. These machines are located in several key centers in the country, and from these centers the targets are distributed. Due to the fragile nature of the targets, they must be carefully packed and crated, and in shipment they are subject to the highest freight rates. The automatic machines employed in producing the targets each involve an investment of many thousands of dollars, and require the supervision of many attendants. It will be readily understood, therefore, that the purchasers are required to pay many times the value of the targets, as based upon actual cost of production plus normal profit.

More particularly my invention consists in a small portable machine for making targets. The machine is inexpensive to build; it may be readily set-up at or adjacent each shooting range, and, subject to the supervision of a single attendant, the targets used on such range may be manufactured in situ. Accordingly, the high costs of packing and crating for transportation, and the cost of transportation, are eliminated. It will be further understood that there is no loss due to transportation breakage; there is no careful packing of targets to do; in fine the practice of my invention eliminates much labor, and affords substantial economies in manufacture of targets.

A machine embodying the invention is shown in the accompanying drawings, in which Fig. I is a view of the machine in front elevation; Fig. II is a view of the rotary table of the machine in plan from above; Fig. III is a fragmentary view to larger scale, showing the machine partly in

side elevation and partly in vertical section, as indicated by the section planes III—III of Fig. I; and Figs. IV and V are fragmentary sectional views, showing to still larger scale particular details of construction.

Referring to the drawings, the machine comprises a hollow supporting standard 1 which is fixed at its lower end in a supporting base 2. At the top of standard 1 a bracket 3 is rigidly secured, and spaced vertically downward therefrom a bracket 4 is secured upon the standard. The two brackets extend in parallelism, and radially from the standard, and are interconnected and reinforced at their outer ends by means of a tie-bolt 5. Rotatably mounted upon the standard is a dished table 6; the table 6 lies immediately above the bracket 4 and is vertically supported by means of a disc bearing 7.

A plunger P is vertically reciprocable in bracket 3; the plunger is spaced laterally from the standard and extends, in this case, parallel thereto; an arm 8 is hinged at 9 to the bracket 3, and the plunger is pivotally connected at 10 to such arm (see Fig. III); and the organization is such that, by swinging the arm upward and downward, the plunger is reciprocated. The arm 8 will ordinarily be provided with a hand-hold 80, whereby the reciprocation of the plunger (and the accompanying, coordinated operations of the apparatus, presently to be described) may be manually effected. But it will be readily apparent to the mechanic that a small motor, say a water motor or an electric motor, may be organized in known way, to oscillate the arm 8 at desired frequency.

The lower end of the plunger P carries a die D, and the table 6 bears a plurality of cups 11, each adapted to receive and to contain a fluid or semi-fluid charge of the thermoplastic mixture of which the targets are made. Each cup is so internally contoured, and the die is so externally shaped, that, when the plunger is lowered and the die is forced into engagement with the cup, a closed matrix M is provided. And in such matrix the charge of thermoplastic material is pressed into the form of a target.

Advantageously, the cups 11 are secured upon the table in equispaced, circular arrangement (as shown in Fig. II), and means responsive to the upward swing of arm 8 are provided for rotating the table through an arc equal to the circular interval between successive cups. Thus, each downward swing of the arm moves the die D into target-forming cooperation with the cup 11 in position beneath it, while the ensuing upward

swing of the arm effects the movement of the table, to bring the next succeeding cup into position beneath the plunger.

The table-rotating means include a cylindrical sleeve 14 whose upper edge carries an annular series of teeth, as shown in Figs. II and III. The sleeve 14 is secured to a hub 15 which is integrated with the table 6. A member 16 is secured upon the standard 1 above the sleeve; member 16 includes a way 18, in which a pawl 17 is reciprocable transversely of the standard 1; the point 17a of the pawl extends angularly downward from the supporting member 16, and makes engagement with one of the teeth on the sleeve 14 (cf. Fig. III). A tension spring 19 serves normally to retain the pawl at the right-hand end of its range of reciprocation; a flexible cable or chain 20 is secured at its lower end to the pawl, and passes around a pulley 21, whence it extends upward and is fastened to an eye-bolt 23 adjustably fixed in arm 8. When the arm 8 is swung upward, removing the die D from engagement with the cup 11 beneath, the cable 20 is drawn upward, pulling the pawl to the left, and, by virtue of the engagement of the pawl with one of the teeth on the sleeve 14, effecting an angular movement of the table 6, whereby the cup beneath the plunger (including a formed target) is moved on, and the next succeeding cup in the series is moved into a position beneath the plunger. The subsequent lowering of the arm 8 relieves tension on the cable, whereupon the spring 19 draws the pawl to the right. During such left-to-right movement, the point 17a of the pawl rides over and latches behind the next succeeding tooth on the sleeve. In such position the pawl rests, ready to effect another angular advance of table when the arm 8 is again swung upward.

When the arm 8 is in its lower position, and the die D is, in consequence, held in target-shaping engagement with a cup 11, the cable 20 hangs slack, as shown in Fig. III. When the arm 8 is swung upward from its said lower position, the slack is first taken up in the cable, and then the cable, drawn taut, moves upward around the pulley 21, and effects a right-to-left, table-rotating movement of the pawl 17. It will be perceived, therefore, that the cable 20 operates as a lost motion device. The amount of lost motion—the slack in the cable—is such that the upward swing of the arm 8 is effective to raise the die from engagement with the cup before the table is rotated. Thus, an adequate time interval is provided for the clearance of the die from the engaged cup, and mechanical interference in the several synchronized operations of the apparatus is avoided.

The proportions of the parts are such that a person, by pulling with forty or fifty pounds force downward upon the hand-hold 80, may cause the die to engage the cup beneath it with from four to five hundred pounds pressure—an adequate pressure to achieve the desired ends. Advantageously, the bracket 4 is provided with a seat 40 upon which the table bears; when the table rotates, its nether face slides over such seat; and, by virtue of the rigid integration of the outer end of the bracket 4 with the bracket 3 (note bolt 5), the seat 40 provides sturdy reinforcement for the table against the relatively great thrusts of the plunger.

While the ratchet and pawl device 14, 17 is effective to rotate the table through such intervals as to bring the cups 11 successively into position beneath the plunger, it has been found desirable to provide indexing means for auto-

matically registering the cups on dead center with the plunger. Such means include a detent 13 vertically disposed in bracket 4; the head of the detent is spherical, and a spring 13a tends to shift the detent outward or upward from the face of the seat. On the vertical center line of each cup the bottom of the table 6 includes an indentation 12. The detent yieldingly engages in the indentation associated with the cup that is in position beneath the plunger P, and insures an accurate centering of the cup with the die D. When, thereafter, the plunger is raised and the table begins turning, the inclined wall of the indentation reacts upon the round tip of the detent, and forces the detent downward. As the table continues in its partial rotation, the tip of the detent bears against the nether surface of the table, until the next succeeding indentation 12 comes into registry with it. Thereupon, the tip of the detent "snaps" into the indentation. Thus, the detent is effective, at the termination of each advance of the table, to index a cup on dead center with the plunger and the die carried thereby.

Organized with the machine is a tank 24, in which a supply of the thermoplastic material is held in fluid state. Advantageously, the tank is located above the table 6, and includes a feeding device for charging measured quantities of the material downward and into the cups 11. Heating means, subject to thermostatic control, are organized with the tank 24, to keep the supply of material at desired temperature, and, conveniently, such heating means comprise a gas burner 25 (Fig. I), whose heating effect is controlled by a thermostatic valve 27. As shown in Fig. IV, the feeding device includes a cylinder 28 which in this case is integral with the wall of the tank; within the cylinder is a piston 29 fixed upon a piston rod 30; the cylinder includes in its otherwise closed bottom wall a discharge orifice 31 that is adapted to be closed by a valve 32, secured to the lower end of the piston rod 30; a passage 33 opens through the wall of the tank into the cylinder, and, as shown, such passage lies below the normal surface of the fluid pool F of thermoplastic material maintained in the tank. As shown in Fig. I, the upper end of the piston rod 30 is pivotally secured to a bracket 34 that extends laterally from the arm 8, whereby, as the arm is slowly swung up and down, the piston rod 30 is vertically reciprocated within a predetermined range, carrying the piston 29 and valve 32 with it.

A spring 64 (Fig. IV) tends to hold the piston rod 30 and arm 8 in elevated positions, in which the valve 32 closes the discharge orifice of the feeding device, and the piston 29 lies above the passage 33. When the parts are thus positioned, the cylinder 28 is filled with heated thermoplastic mixture flowing from the supply pool F. Upon the downward swing of the arm 8, the piston rod lowers, and carries the valve 32 and the piston 29 downward. Accordingly, the outlet 31 is opened, and the piston 29, upon moving below the passage 33, forces a quantity of the fluid material from the cylinder. Manifestly, the amount of the material forced through the outlet may be regulated (to comprise the charge required for the production of a single target) by adjusting the stroke of the piston, other things being considered equal.

Referring to Fig. II, it may be understood that the cup 11 in station A is in position beneath the plunger, and the next succeeding cup, in station B, is centered beneath the outlet 31 of the feed-

ing cylinder 28. As the arm 8 is pulled downward, forcing the die D into target-forming cooperation with the cup in station A, the piston rod 30 is simultaneously forced downward, effecting the introduction of a regulated charge of thermoplastic material into the cup in station B. Upon the ensuing upward swing of the arm 8, the table 6 is rotated in the manner already described, and the piston rod 30 is moved upward, carrying the valve 32 into outlet-closing position, and raising the piston 29 to a position above the passage 33, whereby the cylinder 28 is again filled with thermoplastic material, ready to deliver a charge into the cup 11 next moved into position beneath it. It will be understood, therefore, that the manipulation of the arm 8 controls or effects all operations necessary to the rapid formation of thermoplastic material into targets.

In accordance with my invention, the thermoplastic material is not only shaped in the manner described, but when shaped it is quickly chilled and hardened in the cups.

It will be observed in Fig. V that the die D comprises two sections a and b, forming between them a chamber C, in which is maintained a cooling circulation, say of water. The water is introduced by way of a lead 35, extending from a water supply line 36. The lead 35 comprises flexible hose, and accordingly does not interfere with the vertical reciprocations of the plunger and die. The outlet from the chamber may comprise an open tube 37.

It will be observed that a low peripheral side wall 6a is provided on the table 6. Within the confines of this wall a pool or stream of cooling water W is maintained. The cups 11 stand in the pool.

The water flowing through the die D is directed by outlet 37 into the pool W, and additional quantities of water may be fed from the supply line 36, by way of a valve-controlled branch 38. The level of the pool is determined by means of one or more passages 39 (Fig. III), extending through the sleeve 14 and hub 15, and adapted, during table rotation, intermittently to register with ports 41 formed in the wall of the hollow standard 1. The water overflowing from the pool enters the hollow standard, whence it may be removed in any convenient way, say by means of a plain outlet, or a pipe drain.

While I speak of cooling the cups 11 and die D, it will be understood that my real concern is the chilling and hardening of the shaped thermoplastic material. Actually, the temperature of the cups and die is of no moment, as concerns these parts themselves; the quick reduction of the temperature of the work is the thing desired; and, advantageously, such desideratum is obtained by circulating a cooling stream of water in thermal communication with the shaped articles, the metal walls of the cups and die serving as heat conductors.

In practicing my invention, the above-described apparatus is installed adjacent to, or in the vicinity of, the shooting range where the targets are to be used.

The fragments of targets broken on the range may be collected and introduced to the heating tank 24. In the tank the fragments are rendered fluid, and, in accordance with the procedure above-described, such fluid is shaped, chilled and hardened in the form of new targets. That is, the fragments of broken targets may be converted into new targets. On the field of play the new targets are fragmented by gun shot.

Again the fragments may be collected, and new targets formed therefrom. The process may be repeated over and over again. Of course, from time to time quantities of virgin pitch and filler may be introduced to the cycle, to make up for slight unavoidable losses and wastage.

I claim as my invention:

1. In a readily transportable target-making machine of relatively light weight, the combination of a base, a vertical standard, two supports secured to and extending radially from said standard in vertically spaced-apart relation, a horizontal table rotatably mounted on said standard between said supports, a vertically reciprocable plunger mounted in said upper support, said table carrying a circular succession of target-shaping cups adapted by intermittent rotation of said table to be moved one after another into position beneath said plunger means for forcing said plunger into target-shaping engagement with the cup beneath it, said lower support cooperating with said table to resist the thrust of said plunger, and means interconnecting said upper and lower supports radially outward of the periphery of said table.

2. The structure of the next preceding claim, in which said plunger-moving means include a lever pivotally mounted on said upper support and pivotally connected to said plunger, said lever being movable in opposite directions angularly of said upper support for reciprocating said plunger, and mechanism including a lost-motion device connected to said lever for effecting angular advance of said table.

3. In a target-making machine, the combination of a dished table containing a pool of cooling liquid, a circular series of die cups mounted on said table and standing in said cooling pool, said cups being adapted to receive charges of heated thermoplastic material, and a plunger adapted successively to cooperate with said cups, as cooled by said pool, in shaping and chilling in the form of targets said charges of thermoplastic material.

4. A target-making machine including a dished table, means for feeding cooling liquid into the dish in said table, an overflow outlet lying above the dished surface of said table, whereby a pool of cooling liquid of substantial depth is maintained in said table, a circular series of die cups mounted on said table and standing in said cooling pool, said cups being adapted to receive charges of heated thermoplastic material, and a plunger adapted successively to cooperate with said cups, as cooled by said pool, in shaping and chilling in the form of targets said charges of thermoplastic material.

5. A target-making machine including a table bearing a series of die cups, a container for a supply of plastic material, a plunger feeding device for introducing charges of such material into said cups, a pressure die vertically reciprocable above said cup-bearing table, said table being rotatable to carry said cups successively into position beneath said pressure die and into registry with said feeding device, a lever angularly movable in opposite directions for reciprocating said pressure die to and from target-forming engagement with the cup in registry with it, and connections from said lever to said plunger feeding device, whereby the movements of said pressure die are coordinated with the cup-charging operations of said plunger feeding device.