

April 19, 1949.

E. MOYER

2,467,399

TAPERING MACHINE DRILLING ATTACHMENT

Filed Oct. 2, 1946

5 Sheets-Sheet 1

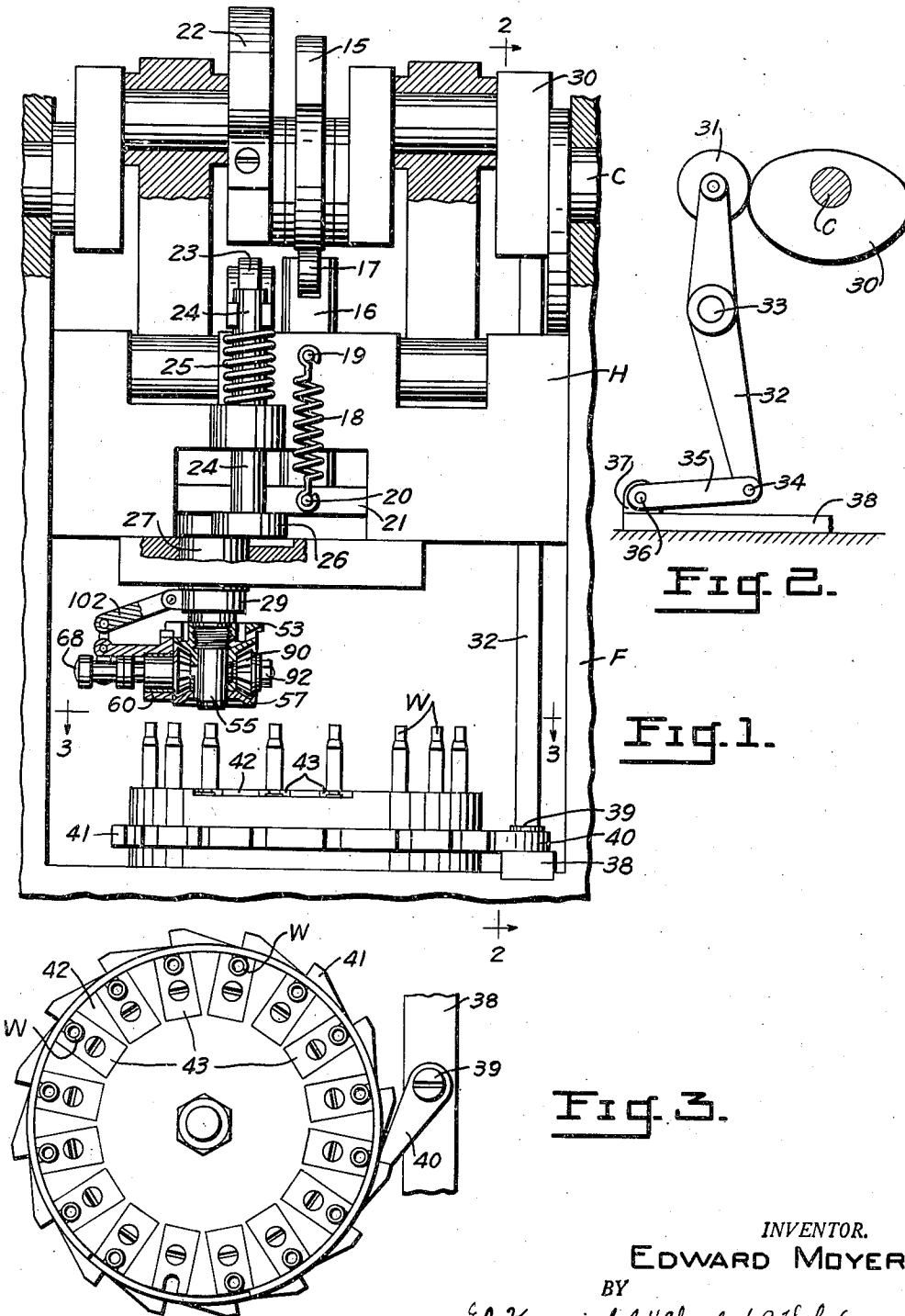


Fig. 1.

Fig. 2.

Fig. 3.

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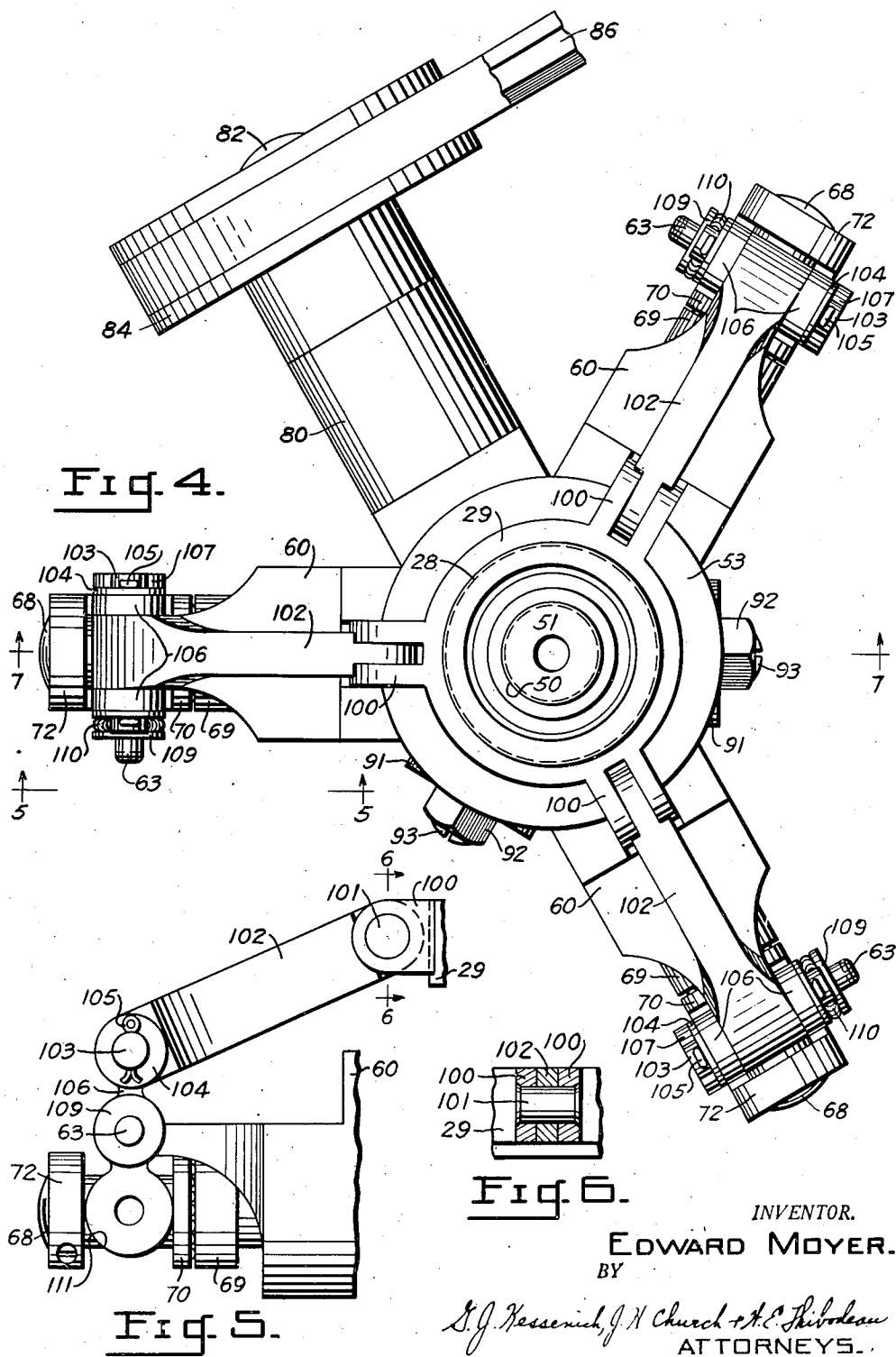
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5 Sheets-Sheet 2



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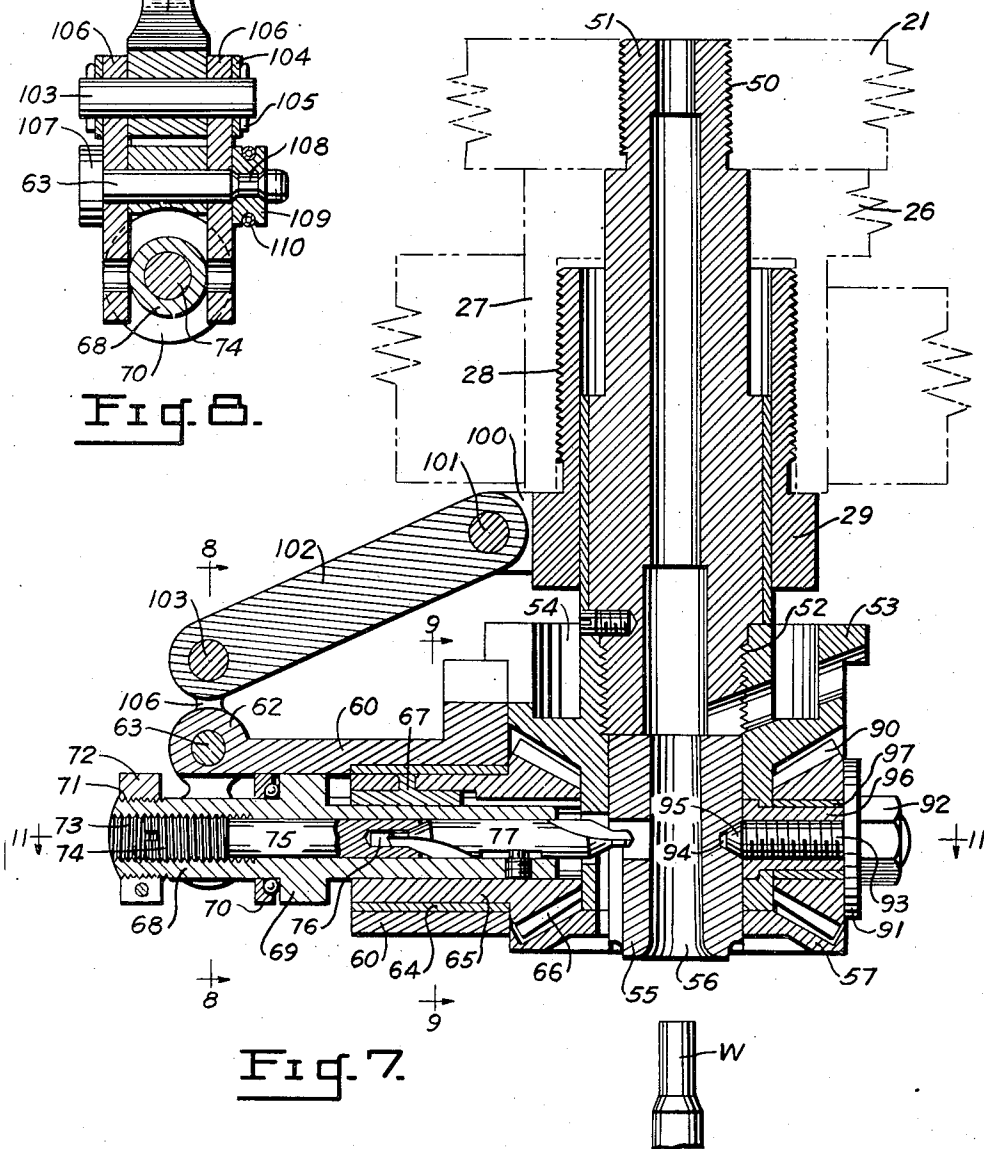
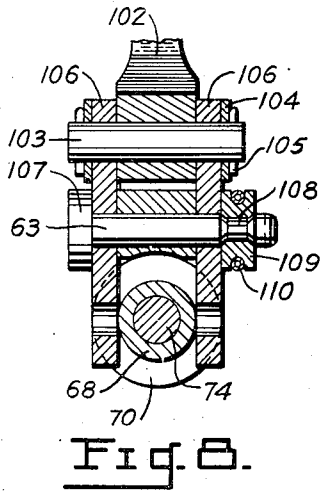
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5 Sheets-Sheet 3



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5 Sheets-Sheet 4

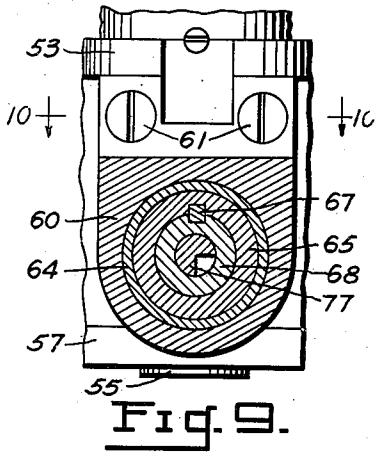


Fig. 9.

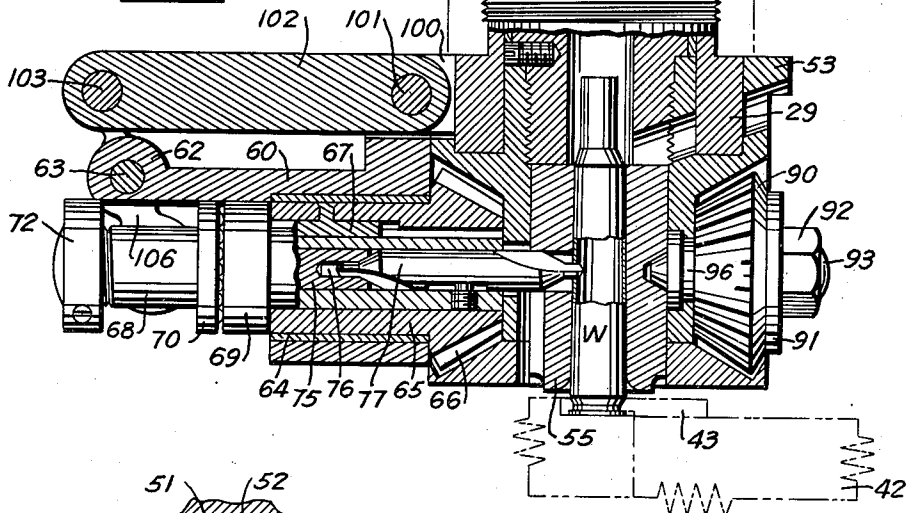


Fig. 7A.

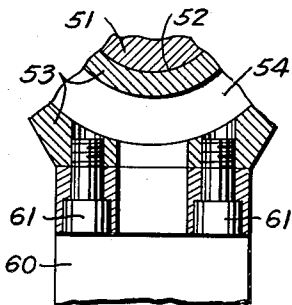


Fig. 10.

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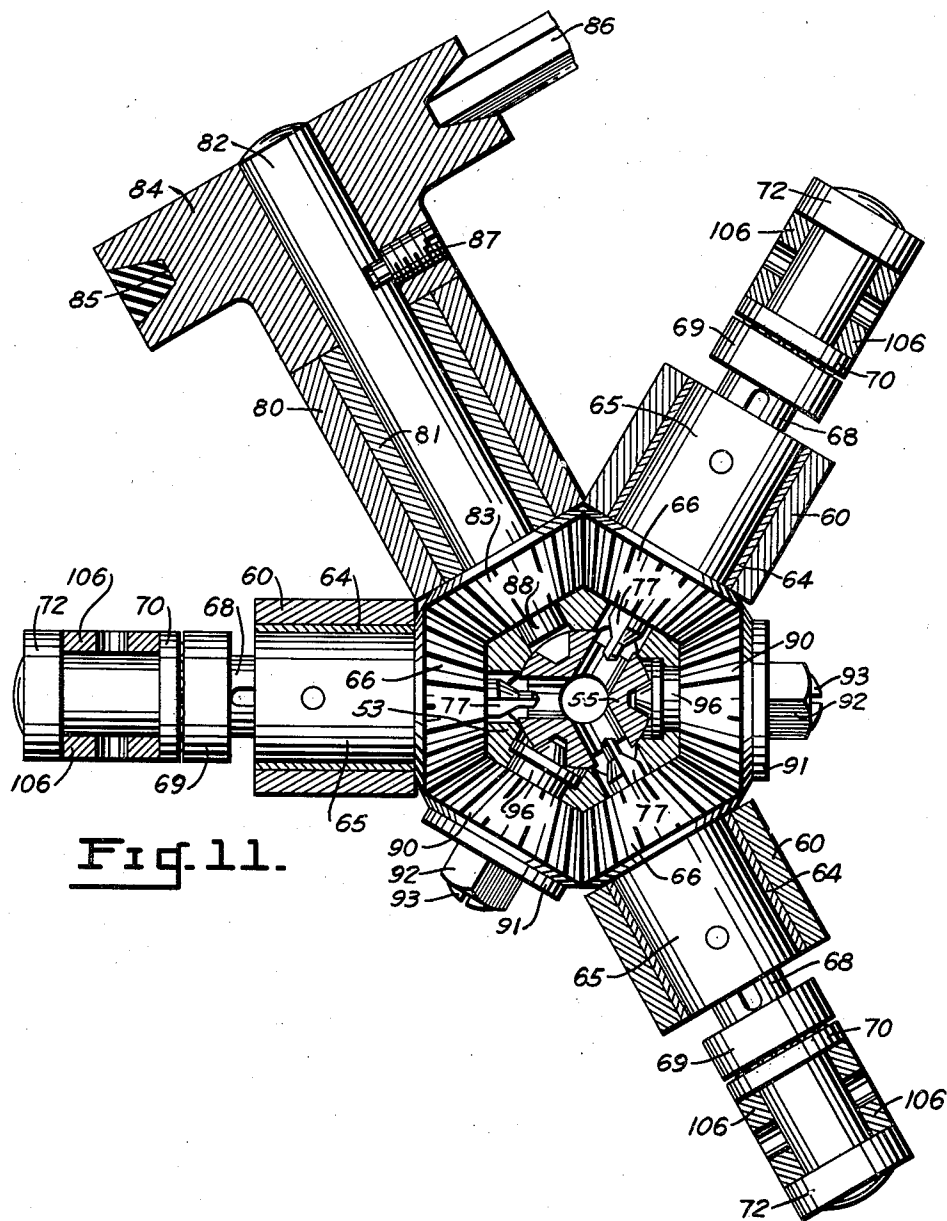
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TAPERING MACHINE DRILLING ATTACHMENT

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5 Sheets-Sheet 5



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## UNITED STATES PATENT OFFICE

2,467,399

TAPERING MACHINE DRILLING  
ATTACHMENT

Edward Moyer, Trenton, N. J.

Application October 2, 1946, Serial No. 700,629

2 Claims. (Cl. 77—26)

(Granted under the act of March 3, 1883, as  
amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to an attachment for a tapering machine. This attachment, comprising a multiple spindle drilling machine, is arranged so that it can be lowered over a dummy cartridge case or like work piece, thus drilling a plurality of holes in the cartridge case, and then be raised off the cartridge case to permit a new cartridge case to be fed to and the drilled cartridge case to be removed from the drilling station.

It is an object of this invention to provide a drilling attachment or fixture which can be readily applied to existing machines.

It is a further object of this invention to provide a multiple spindle drilling attachment capable of quickly and efficiently drilling a number of holes in a cartridge case or the like in a most economical manner.

More specifically, it is an object of this invention to provide in a machine for producing a taper in cartridge cases, which machine has a crankshaft and a crosshead connected to the crankshaft so as to be raised and lowered thereby, a pair of cams mounted on the crankshaft, a pair of cam followers operated by said cams, a pair of springs stressing said cam followers toward said cams, a drilling attachment carried by one of said cam followers so as to be raised and lowered by the action of the cooperating cam on said cam follower, a plurality of drills mounted in said attachment for slidable and rotary movement, a pivotally joined linkage between the other of said cam followers and said drills whereby action of the cooperating cam on said cam follower projects the drills toward a cartridge case so that each of said drills forms a hole in the cartridge case and retracts said drills after the holes have been formed, and a motor connected to said drills to rotate them.

Those skilled in the art to which this invention pertains will readily perceive other objects and advantages of it, or such other objects and advantages will be apparent from a reading of the annexed specification and drawings to which reference is here made for a further exposition of this invention.

In the drawings:

Fig. 1 is a side elevation of a part of a tapering machine with the drilling attachment of this invention applied to it, parts of the drawing being broken away in vertical cross section.

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Fig. 2 is a vertical cross section substantially on line 2—2 of Fig. 1 on a reduced scale.

Fig. 3 is a top or plan view of the conveyer disc substantially on line 3—3 of Fig. 1.

Fig. 4 is a top or plan view of the drilling appliance on an enlarged scale.

Fig. 5 is a side elevation of a part of the appliance as viewed from line 5—5 of Fig. 4.

Fig. 6 is a vertical cross section of a portion of the machine substantially on line 6—6 of Fig. 5.

Fig. 7 is a view in vertical cross section on line 7—7 of Fig. 4.

Fig. 7A is a view similar to Fig. 7 with a part shown in lowered position.

Fig. 8 is a view in vertical cross section on line 8—8 of Fig. 7.

Fig. 9 is a view in vertical cross section substantially on line 9—9 of Fig. 7.

Fig. 10 is a horizontal cross section of a portion of the machine substantially on line 10—10 of Fig. 9.

Fig. 11 is a horizontal cross section on line 11—11 of Fig. 7.

One embodiment of this invention, which has been selected from among others for illustration in the drawings and description in this specification, is as follows:

An existing tapering machine, to which the drilling fixture of this invention may readily be applied, consists of a frame F in which is rotatably mounted a crankshaft C which supports a crosshead H mounted for vertical reciprocating movement.

On crankshaft C is mounted a first cam 15. A first cam follower shaft 16 is slidably mounted in crosshead H beneath this first cam. Shaft 16 rotatably supports at its upper end first cam follower disc 17. First cam follower spring 18 is fastened at one end by a pin 19 to the crosshead H and at its other or lower end by a pin 20 to a supporting plate 21 slidably mounted in crosshead H. Fig. 7 shows that plate 21 supports the drilling attachment as a whole and raises and lowers it in consequence of the rotation of cam 15.

Also mounted on crankshaft C is a second cam 22 which cooperates with a second cam follower disc 23 mounted at the upper end of a second cam follower shaft 24 and stressed upward by a second spring 25. Second cam follower shaft 24 is fastened at its lower end to a cam follower plate 26. Fig. 7 shows that cam follower plate 26 has a downwardly extending boss 27 which has a cavity in it containing screw threads 28. Screw threads 28 mesh with screw threads on spindle yoke 29 and connect cam follower plate 26 to

spindle yoke 29 to lower or raise spindle yoke 29 to project and retract the drills, as will be later more fully described.

Crankshaft C also has on it an indexing cam 30 against whose surface is stressed indexing cam follower 31 which is rotatably mounted on indexing cam follower lever 32 which is pivotally mounted on a stationary rod 33. At its lower end, lever 32 carries a pivot pin 34 pivotally secured to one end of a link 35, the other end of which is pivotally secured to pin 36 pivotally secured in a boss 37 projecting upwardly from the surface of slide 38. Fig. 3 shows that slide 38 has mounted on it for horizontal oscillating movement, by means of a screw 39, a pawl 40 whose outer end abuts the flat faces of successive ratchet teeth 41 which are carried on the edge of a conveyer in a form of a disc 42. Figs. 1 and 7A show that disc 42 has on its upper surface a plurality of means 43 for contacting with and holding a cartridge case or like work piece W by means of the extracting groove in it.

Referring more specifically to Fig. 7 for the details of the drilling attachment, it will be seen that the plate 21 has a recess in it containing screw threads 50 which mesh with the like screw threads on the upper end of a hollow central housing 51 which also has at its lower end screw threads 52 meshing with like screw threads on the upper part of the inner surface of the drilling attachment body 53 so that housing 51 and body 53 are firmly united together. Body 53 has in its upper surface a ring-shape groove into which the spindle yoke 29 moves when it is lowered. Body 53 also has secured in it a substantially tubular guide 55 into the axial opening 56 in which the cartridge case W enters for the performance of the drilling operation. A hexagonal cap 57 is secured to the bottom of the body 53.

Figs. 4, 5, 7, 8, 9 and 10 show that body 53 has secured to it three hollow drill spindle bearings 60 by means of screws 61 (Fig. 10). Each drill spindle bearing 60 has on its upper surface a perforated boss 62 through which extends a pivot pin 63 on which is mounted a second spindle link more fully described later. In the horizontally extending cavity in each of the bearings 60 is located a tubular, Phosphor bronze, drive bearing bushing 64. Each of the bushings 64 supports in its central opening an elongated stem 65 of a driven gear 66. A key 67 fastens each of the driven gears 66 to a hollow drill spindle 68 which has on its outer surface a collar 69 against which abuts an anti-friction bearing 70 having a flat circular surface. Threads 71 are formed on the periphery of the outer end of drill spindle 68 and mesh with like threads on the inner surface of a ring-shaped drill spindle collar 72 which is likewise provided with a flat circular surface confronting the flat circular surface on bearing 70. The bounding wall of the axial opening through the drill spindle 68 is also threaded by screw threads 73 which mesh with the threads on a set screw 74 which bears at its inner end against the end of a cylindrical drill anvil 75 having at its opposite or inner end an axial opening 76 into which fits an end of a drill 77.

#### Drill rotating mechanism

Figs. 4 and 11 show that guide body 53 has secured to its outer surface a hollow drive bearing 80 in which is mounted a tubular Phosphor bronze drive bearing bushing 81 through which passes a drive shaft 82 having a bevel drive gear 83 at its inner end. On the outer end of drive shaft

82 is mounted a drive sheave 84 having in its perimeter a V-shaped notch 85 for the reception of a drive belt 86. A set screw 87 secures drive sheave 84 to drive shaft 82. At its inner end drive shaft 82 has a projecting section 88 of reduced cross section which fits and rotates in a hole in body 53 formed to receive it. Drive gear 83 meshes on either side with one of the driven gears 66. The opposite side of these driven gears 66 mesh with one of a pair of idler gears 90. Fig. 7 shows that idler gears 90 are each mounted on body 53 by means of a washer 91 which is secured by a nut 92 screw-threadedly attached to the outer end of a set screw 93 which has a notch in its outer end and a frustro-conical tip 95 at its inner end which rests in a suitably formed opening 94 in the outer surface of the guide 55 and thereby aids in retaining the guide 55 in position in the body 53. Around set screw 93 is a tubular idler gear support 96 which bears on its outer surface, between it and the inner surface of idler gear 90, a tubular Phosphor bronze bushing 97.

#### Drilling and retracting linkage

Figs. 7, 7A and 8 show that spindle yoke 29 has on its outer peripheral surface three pairs of perforated projecting bosses 100. Through the projections in each of these pairs of bosses extends a spindle yoke pin 101 which is pivotally mounted in one end of one of the first links 102. Each of the links 102 carries at its opposite end a link pin 103 secured thereto by washers 104 and pin 105 so as to pivotally support a pair of perforated second links 106. Each of the second links 106 has at least two perforations in it through the upper of which passes the link pin 103 and through the middle of which passes the pivot pin 63 having an enlarged head 107 at one end and a recessed portion 108 at the opposite end (Fig. 8). The pivot pin 63 is secured in position for ready attachment and detachment by means of a collar 109 having a grooved outer surface in which is mounted a coiled spring 110 whose ends are connected together so that it forms a torus. Fig. 5 shows that each of the second links 106 has at its opposite end from the link pin 103 curved side walls 111 which lie between the flat circular surface of bearing 70 and drill spindle collar 72 and slidably abut these flat faces so that rotation of the second links 106 about pivot pin 63 project and retract the drills 77.

#### Operation

The cartridge cases W are fed by means of a tubular or other convenient mechanism to the conveyer disc 42 where they are received in the holding means 43. Rotation of crankshaft C causes cam 30 to operate the indexing linkage consisting of follower 31, follower lever 32, indexing link 35, slide 38, pawl 40, and ratchet teeth 41. This causes step-by-step indexing movement of the conveyer dial 42 so that the cartridge cases W are each brought in succession to a point beneath guide 55.

Cam 15 then actuates the raising and lowering linkage for the drilling attachment by means of disc 17, shaft 16, plate 21, and housing 51. This lowers guide 55 over the cartridge case W so that the cartridge case assumes the position in which it is shown in Fig. 7A.

At this point, the drilling and retracting linkage comes into operation. Cam 22 actuates disc 23, shaft 24, plate 25, spindle yoke 29, first link 102, and second link 106, whose curved wall 111 presses against the flat circular face of bearing

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70 and thus projects the drill spindles 68 and the drills 77 carried thereby, so that the inner ends of the drills 77 pass through the perforations in the walls of the guide 55 and drill holes in the sides of the cartridge case W. Upon the completion of these holes in the cartridge case W, the drilling and retracting linkage is moved in the opposite direction by the pressure of the second springs 25 so that the drills 77 are retracted and withdrawn from the holes which they have formed in the cartridge case W. The raising and lowering linkage is then operated in the opposite direction by the force of spring 18 which raises the drilling attachment so that the guide 55 is lifted off the work piece W. The next operation of the indexing linkage then removes the work piece W from the drilling station in which the work piece W is located beneath the drilling attachment.

#### Summary

It will thus be seen that this invention provides a multiple spindle drilling fixture or attachment suitable for use with existing cartridge case tapering machines and capable of efficiently and expeditiously drilling holes in dummy cartridge cases at a rate far exceeding that capable of attainment by known machines.

#### I claim:

1. In a tapering machine having a rotatable crankshaft and a crosshead reciprocated by the crankshaft, a drilling attachment including, a first cam on said crankshaft, a first cam follower slidably mounted in said crosshead so as to be operated by said first cam, a first spring stressing said first cam follower towards said first cam, a drilling attachment body carried by said first cam follower, a second cam on said cam shaft, a second cam follower slidably mounted in said crosshead so as to be operated by said second cam, a second spring stressing said second cam follower towards said second cam, at least one drill carried by said body for sliding and rotating

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movement, a linkage interposed between said second cam follower and said drill and operable to cause sliding movement of said drill towards a work piece in response to the operation of said second cam and said second cam follower and away from the work piece in response to the operation of said second spring and said second cam follower, a motor connected to said drill so as to rotate it and thereby drill a hole in the work piece during the movement of the drill toward the work piece, a conveyor for moving a succession of work pieces through the tapering machine, a third cam on said crankshaft, a third cam follower mounted so as to be operated by said third cam, and a linkage between said third cam follower and said conveyor whereby said conveyor and the work pieces carried thereby are moved step-by-step through said tapering machine.

2. In a tapering machine having a rotatable crankshaft and a crosshead reciprocated by said crankshaft, means for mounting a drilling attachment so as to make it movable onto a work piece before the drilling operation and to make it movable off the work piece after the drilling operation is completed, including, a cam on the crankshaft, a cam follower slidably mounted in the crosshead, a spring stressing said cam follower towards said cam, and an attachment body connected to said cam follower so as to move with said cam follower in response to the actuations of said cam.

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#### REFERENCES CITED

The following references are of record in the file of this patent:

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|---------|---------------|---------------|
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