March 31, 1953 C. TIETIG 2,632,890

NAIL-DRIVING FIREARM

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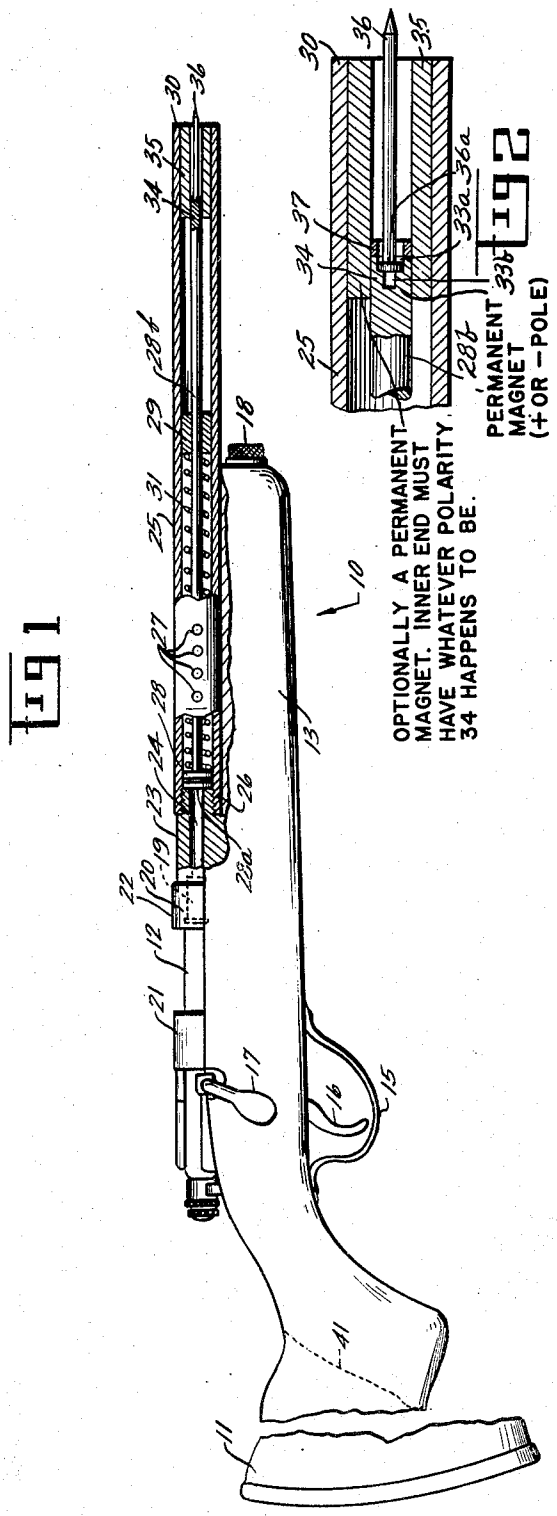

Fig 1

Fig 2

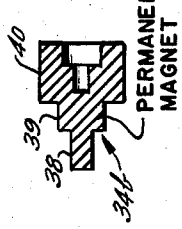

Fig 3

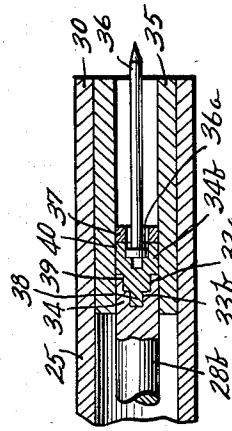

Fig 4

INVENTOR.
Chester Tietig
Wade Kouty AND
Chester Tietig
ATTORNEYS

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NAIL-DRIVING FIREARM

Chester Tietig, Covington, Ky.

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9 Claims. (Cl. 1—44.5)

(Granted under Title 35, U. S. Code (1952), sec. 266)

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

This invention relates to nail-driving fire arm which is adapted for building structures or for any of the uses to which a conventional nail and hammer combination are customarily used. The term "nail" as herein used is intended to include drive-screws, spikes and rivets.

One object of the invention is to provide a nail-driving fire arm which can easily be operated much faster than the conventional nail and hammer combination.

Another object is to provide a nail-driving fire arm which will enable nails and drive screws to be more easily driven in places which are inaccessible for conventional nail driving or accessible only with difficulty.

Another object is to provide a nail-driving gun which may be used by cripples and unskilled persons, for example, women, to drive larger diameter nails than they would be able to drive by conventional means. The term "cripples" indicated includes persons injured in aircraft accidents who will find this tool useful in making repairs to their aircraft after crashes in places where aid and shop facilities are not available.

Another object of the invention is to combine a safe means for driving nails in which the customarily experienced mashing of fingers with a hammer is obviated.

Referring now to the accompanying drawings:

Fig. 1 shows a side elevation of my fire arm partly in section with a nail in place and ready to be driven;

Figure 2 is a longitudinal sectional view of the outer end of the cylinder and its associated parts showing a construction in which the head of a nail is seated in the recessed end of the piston rod;

Fig. 3 is a detail showing a supplemental nail holder for contact with the piston rod; this nail holder may be a magnet. It is shown in longitudinal section; and

Figure 4 is a longitudinal sectional view of the outer end of the cylinder and its associated parts in which the supplemental nail holder tip or adapter of Figure 3 is fitted into the recessed end of the piston rod.

In Fig. 1 the fire arm shown is a conventional bolt action rifle **10**, the stock of which is shown with its middle portion of the stock **11** deleted. In the rifle shown, **12** is a bolt; **13** is the fore end; **15** is the trigger guard; **16** is the trigger; **17** is

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a bolt handle; **18** is a cap for a tubular magazine (not shown); **19** is a blank cartridge in the chamber **20**, while **21** and **22** are the rear and front receiver rings, the front ring being adapted to receive the gun barrel **23**.

The barrel of my fire arm comprises a conventional rearward section comprising a barrel **23** which is provided with a conventional smooth bore **24** preferably of .22 caliber. The chamber **20** is preferably of a size to accommodate .22 long rifle blank cartridge, which will then also accommodate .22 long and .22 short blank cartridges. My device is intended to use blank cartridges only; ball cartridges should never be used except perhaps in extreme emergencies. Ball cartridges would undoubtedly operate the device by the impact of the bullet, but would clog the mechanism thereby and might be dangerous to the operator.

Threadedly attached to the front portion of the barrel portion **23**, there is a cylinder **25** of considerably less wall thickness than that of the conventional barrel **23**. At one side, preferably the right side of the cylinder at a point a few inches to the front of the threaded joint **26** between the barrel and the cylinder, there is a row of small perforations **27**, which are gas and air exhaust ports and also for internal lubrication. They lie on both sides of the piston head **28***a* when it is at its extreme outward position. Within the cylinder **25**, there is a piston **28** which is a moderately-tight sliding fit in the bore of cylinder **25**, the piston head **28***a* abutting the squared end of the barrel **23**. The piston rod **28***b* extends through a bearing **29** which is tightly positioned in the bore of the cylinder **25**, preferably a little closer to the cylinder outer end **30** than to the barrel **23**. Together the piston and the piston rod constitute plunger means. The bearing **29** may be integral with the cylinder **25** or it may be threadedly engaged therein. A stiff coil spring **31** holds the piston head **28***a* against the squared end of the barrel **23**, utilizing the shoulder of the bearing **29** as a base. The piston rod **28***b* extends entirely through the bearing **29** a short distance, preferably an inch more or less, and into a combination sleeve bearing and nail support **35** the outer end of which extends to the outer end of the tube **25**.

The outer end of the piston rod **28***b* may bear a compound recess **33***a* and **33***b*, the former being closest to the end of the rod **28***b* and being of larger diameter than the recess **33***b*. These recesses are intended to fit accommodation of nail heads of different diameters. More than two recesses can be utilized if desired, i. e. the

end of the rod 28b may have a multiplicity of recesses of different diameters to accommodate any size nail head that is likely to be used. While it is preferred that the recesses be concentric with the axis of the rod 28b, such arrangement need not necessarily be followed.

Instead of the recesses 33a and 33b being machined or otherwise formed on the outer end of the rod 28b, the recesses may be formed in a separable tip 34b which is a permanent magnet. The entire rod 28b may be a permanent magnet or only its tip or nail holder 34, shown in section in Figs. 1 and 2 need be magnetized. In Fig. 3 it is shown in its separable form in longitudinal section as 34b. This tip 34 or 34b is preferably made out of "Alnico" alloy or any other extremely powerful permanently-magnetic material, for example, tungsten tool steel. The purpose of the magnet is to hold the nail so that it will not drop from the cylinder outer end 30 while the operator is aligning it to a position on the work and to which he wishes to drive it. Its magnetism should be strong enough to hold the nail against gravitation. The tip 34b may be threadedly or otherwise detachably affixed to the outer end of rod 28b so that magnet tips of different sized recesses or different magnetic properties may be selectively affixed to the rod end. The recessing may be lined with especially-hardened steel or other metal.

Not only may the tip 34 or 34b be a permanent magnet, but the bearing 35 in which the rod 28b operates, may be a permanent magnet, so that the attraction for the nail is increased. Either the tip 34 or the bearing 35, or both, may be magnetized as preferred, but care is to be exercised so that the polarity arrangement is such that the nail head 36a is held in magnetic contact with the nail holder 34 which is integral with the rod 28b or with the separable rod tip 34b prior to the driving of the nail 36.

Figure 4 shows, in longitudinal section, the position of the separable tip or adapter 34b fitted into the recesses at the outer end of rod 28b. Stem 38 fits into recess 33b and shoulder 39 fits into recess 33a. The adapter as a whole fits the sleeve bearing 35 with an easy sliding fit. The outer end of the adapter 34b preferably lies wholly within the bearing 35 before the tool is fired; however, it may project beyond the bearing 35 and the outer end 30 of cylinder 25 a short distance as long as its maximum diameter 40 still has substantial contact with the inner surface of the sleeve bearing 35. Thus, adapters 34b of different lengths may be used for the accommodation of nails of different sizes; the purpose being to magnetically support the nail so that its pointed end will always lie outside the outer end 30 of cylinder 25, and in a straight line which is a prolongation of the piston rod axis. However, for certain kinds of work it may be preferred to have the tip 34b positioned outside the outer end 30 of cylinder 25 so that the shoulder 39 of the tip 34b abuts the end 30. Any appropriate change in the dimensions of the tip 34b may be made to render such positioning feasible provided that the length and dimension of stem 38 is such as to fit into the outer end of piston rod 28b.

Operation

The operator first manually introduces into the cylinder outer end 30 the nail 36 and fits it into one of the recesses 33a or 33b, depending upon the size of its head. He then opens the bolt 12 of the rifle and inserts into the chamber a blank cartridge, the size of which is appropriate to the nail to be driven and also to the material in which it is to be driven. For example, if he has a large nail to drive, he will use a large cartridge; if he has a small nail to drive he will use a small cartridge. At times, if he must drive a small nail into very hard material, he will use a large cartridge or one with a heavier powder charge. In .22 caliber, he has at least a choice between the .22 short blank cartridge and the .22 long rifle blank cartridge. After loading the chamber and closing the bolt he will place the cylinder outer end 30 so that the projecting tip of the nail is on the exact spot in which he desires that it be driven. He may, if he chooses, align the nail exactly with the bore of the gun, but such alignment is not necessary. He then pulls the trigger 16, thereby firing the cartridge 19 and causing its gases to act upon the piston head 28a. The piston rod 28b thereupon is pushed forward, and the outer end of the piston rod 28b drives the nail. If desired, the outer end of the piston rod 28b may be shod with a soft felt washer 37 to prevent the work being marred. This washer may be oil-soaked to provide lubrication for the operation of the piston rod in the bearing 35.

If the nail is of such size that more than one explosion is required to drive it fully, the gun may be reloaded, the cylinder outer end 30 fitted over the incompletely driven nail so that the nail head again fits in one of the recesses 33a or 33b and another shot fired.

For close work it may be desired that this device have more the form of a pistol than of a rifle. For such purposes the stock may be cut off along the dotted line 41 shown in Fig. 1, thereby giving the tool a pistol grip only.

While I have shown the bolt action rifle for the sake of simplification of drawing, it is to be understood that the kind of firearm action or breech mechanism may be other than of the kind shown; more specifically the rifle action may be lever action, trombone action, semi-automatic or full automatic, it may be repeating or single shot. For work in which it is advisable to start the nail by hand, the end of rod 28b need not be magnetized. The gun is not restricted as to caliber nor to rim-fire cartridges.

Likewise, the cylinder 25 and its contents can be used as an attachment to ordinary rifles provided that the end of the rifle barrel is threaded or otherwise adapted for the firm attachment of the cylinder 25.

What I claim is:

1. A nail-driving tool comprising a firearm adapted to use propellant ammunition having a barrel, a cylinder firmly concentrically attached to the muzzle, said cylinder being perforated along its side at the neighborhood of its middle, piston means in said cylinder adapted to receive a push from gases ejected from the muzzle upon functioning of the firearm, spring means to return said piston means back to the muzzle after each functioning, means for positioning a nail on the outer end of said piston means, the head of the nail being in contact therewith, said means being adapted to support the nail in a position substantially in line with the axis of the barrel and of the cylinder whereby it may be driven into work material toward which the firearm is directed by the explosion therein provided that said work material is only a short distance from the outer end of said cylinder.

2. A nail-driving firearm comprising a stock, a

breech loading action mounted on said stock, a barrel in operative relation to said action, a cylinder attached to the outer end of said barrel, said cylinder being provided with a longitudinal row of gas ports intermediate of its ends, a piston within said cylinder arranged to abut said barrel at the outer end thereof and to receive an impulse from gases discharged from said barrel when the firearm functions, a spring normally urging said piston into abutment with the outer end of said barrel, a piston rod extending outwardly from said piston within said cylinder, a bearing intermediate of the ends of said cylinder for said piston rod, said bearing being arranged to serve also as a base for said spring, an outer bearing for said piston rod, said bearing being substantially at the outer end of said cylinder and adapted to receive a nail inserted therein so that its head abuts the outer end of said piston rod.

3. In a nail-driving tool, a firearm having a bore, a cylinder of larger bore than the firearm concentrically attached to the muzzle thereof to receive blast therefrom, a piston and piston rod slidably actuable in said cylinder by the blast, a coiled spring arranged normally to urge said piston against said muzzle, a bearing for the outer end of said spring intermediate the ends of said cylinder, the cylinder having at least one port positioned to vent gas from both sides of said piston when the latter is fully extended after the firearm is fired, and means substantially at the outer end of said cylinder for holding a nail in substantial alignment with the longitudinal axis of the cylinder and in contact with the outer end of the piston rod whereby said nail may be driven into work material by blast from the firearm transmitted by said piston and piston rod.

4. In a nail-driving tool, the combination comprising a firearm having a barrel adapted to receive an explosive charge, a cylinder attached to the muzzle of said barrel, a piston normally abutting said muzzle, a spring normally urging said piston against such abutment, a piston rod attached to said piston, means at the outer end of said cylinder for guiding and supporting said piston rod, said means being hollow and substantially capable of accommodating a nail having its head portion in contact with the outer end of said piston rod, said outer end being a permanent magnet capable of attracting and holding a nail against the action of gravitation.

5. The combination recited in claim 4 wherein the permanent magnet piston rod end is provided with a plurality of nail-head accommodating cavities of different sizes at the outer end thereof.

6. The combination recited in claim 4 wherein the piston rod supporting means is a permanent magnet having a central longitudinal cavity and is arranged to attract and hold against the action of gravitation nails fed manually into it from the outer end of the cylinder.

7. A firearm attachment to enable said firearm to drive nails, said attachment comprising a threaded cylinder, a piston and piston rod forwardly slidable therein from a position in which said piston abuts the muzzle of the firearm, means for attaching the inner end of said cylinder to the muzzle of a firearm, means for supporting said piston rod and furnishing a bearing therefor to enable said rod to slide substantially along the axis of said cylinder, said bearing means being substantially at the outer end of said cylinder and being adapted to contain and align a nail with the major axis of the firearm, the cylinder having gas escape vents through its wall substantially on both sides of said piston when the latter is at the end of its outward travel, and spring means for returning said piston and rod to its substantially original position in front of the muzzle.

8. A firearm attachment as recited in claim 7 in which the piston rod bearing is a magnet capable of holding a nail against gravitation and of aligning it substantially with said cylinder axis.

9. A nail-driving tool comprising a firearm including a barrel, a cylinder having one end attached to the outer end of the barrel and in communication therewith, a piston and piston rod assembly slidable within said cylinder with the piston adjacent to said barrel, a coil spring surrounding said piston rod and normally urging said piston against the outer end of said barrel, a bearing for said piston rod within said cylinder and in contact with the outer end of said coil spring, a sleeve bearing at the outer end of said cylinder and positioned therein so that normally only a short portion of the bearing is engaged by the outer end of said piston rod and the remainder of said bearing is open to provide a free space into which a nail may be inserted head first, and means on the outer end of said piston rod to releasably retain the head-end of said nail and to hold the nail in substantial axial alignment with the piston rod and with the outer sleeve bearing.

CHESTER TIETIG.

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