Oct. 29, 1957 R. D. HOFFMAN 2,810,955

CARTRIDGE POWERED COW DEHORNER WITH PIVOTED CUTTER BLADE

Filed April 9, 1956 4 Sheets-Sheet 1

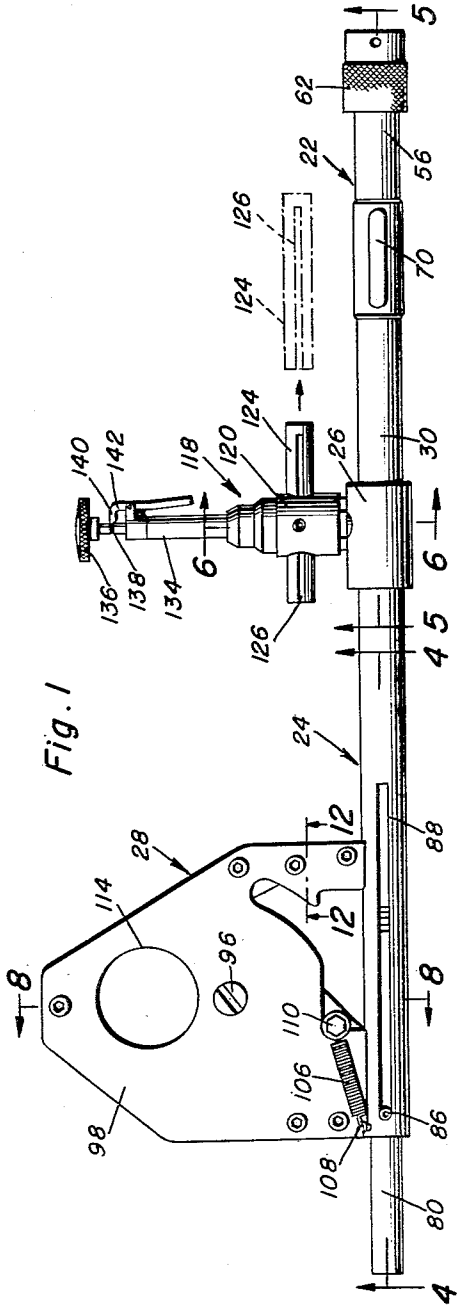


Fig. 1

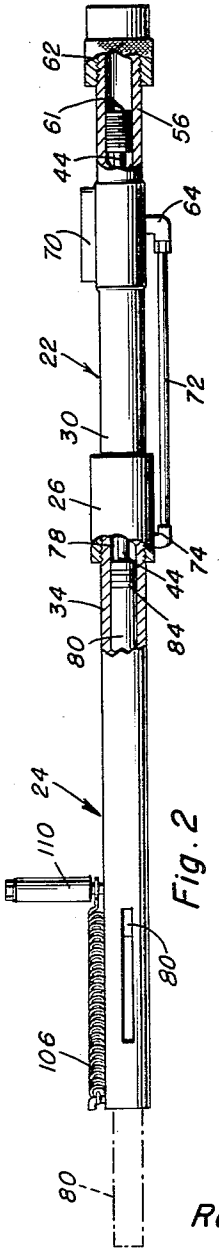


Fig. 2

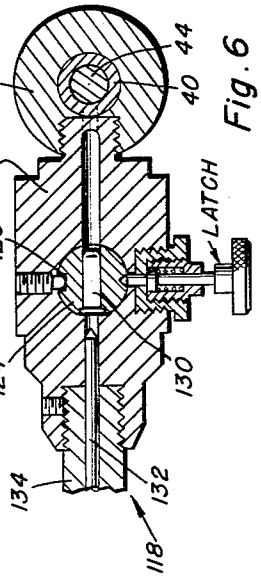


Fig. 6

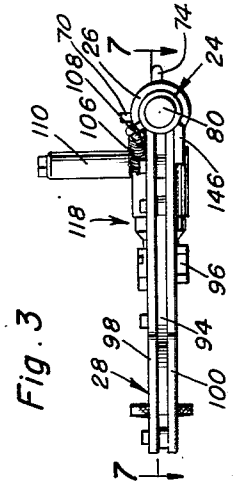


Fig. 3

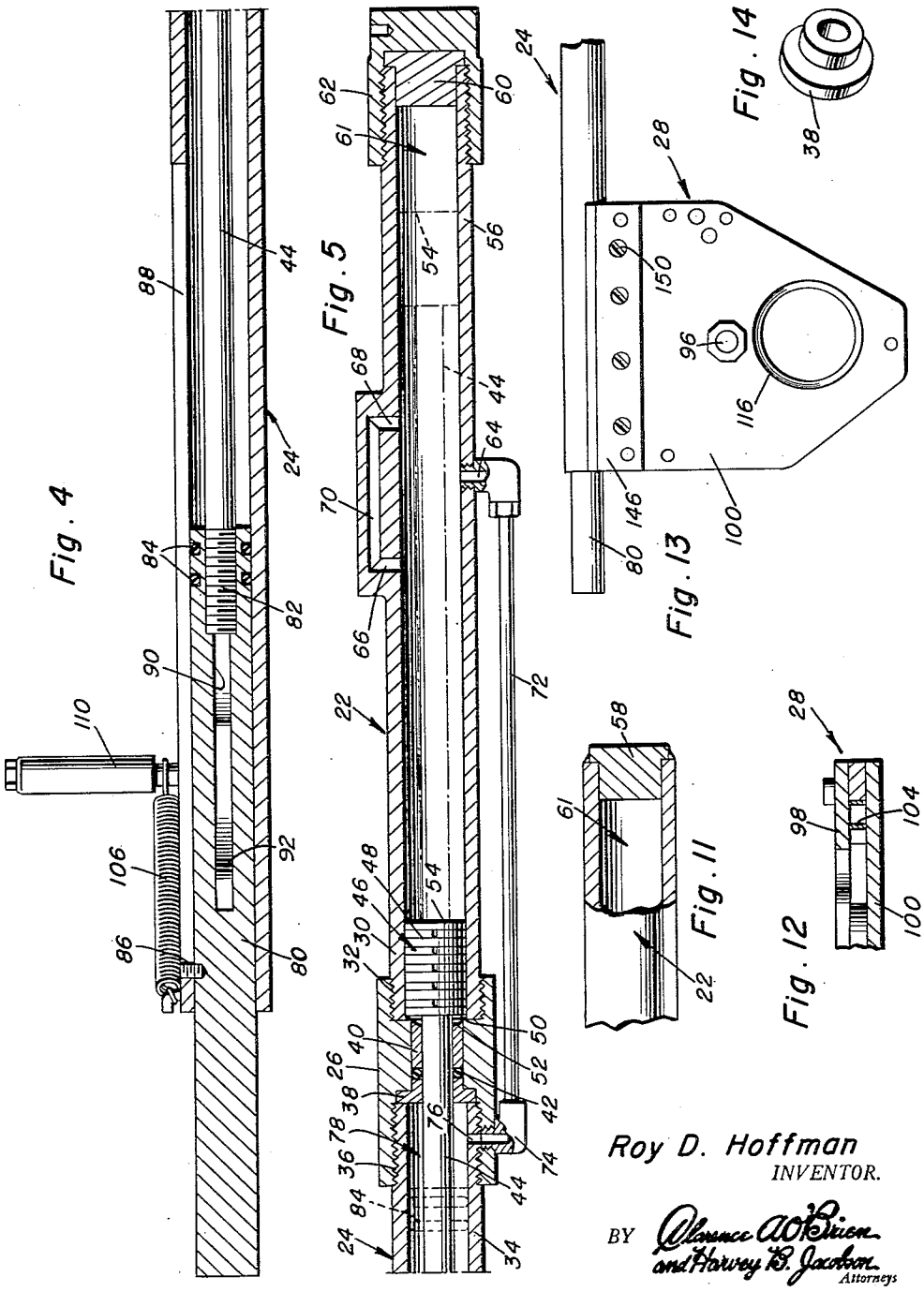
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Oct. 29, 1957 R. D. HOFFMAN 2,810,955

CARTRIDGE POWERED COW DEHORNER WITH PIVOTED CUTTER BLADE

Filed April 9, 1956 4 Sheets-Sheet 2



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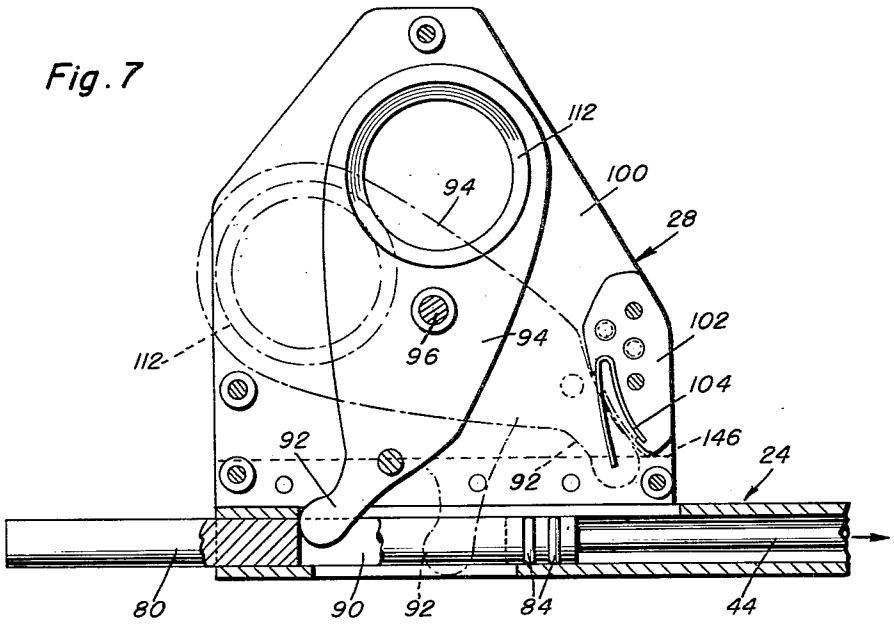
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Oct. 29, 1957 R. D. HOFFMAN 2,810,955

CARTRIDGE POWERED COW DEHORNER WITH PIVOTED CUTTER BLADE

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Fig. 7



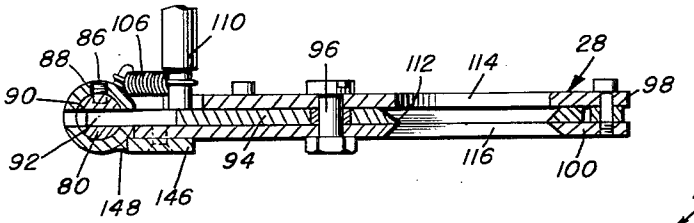


Fig. 8

Fig. 9

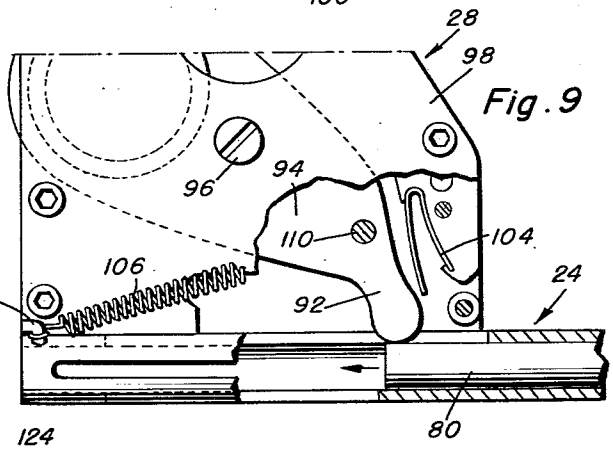
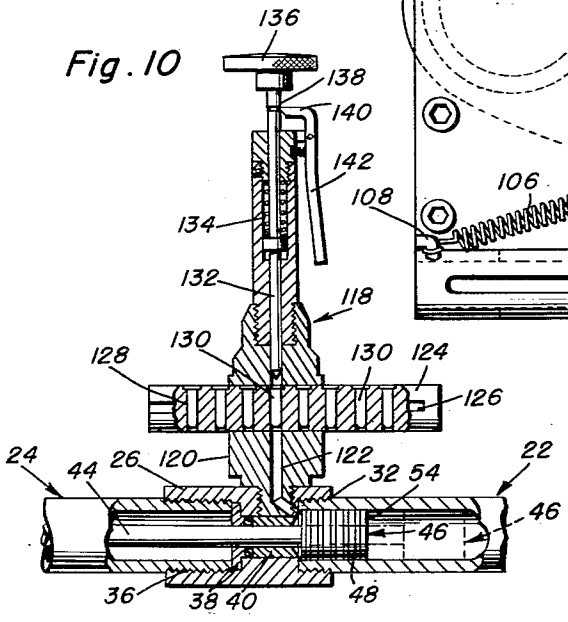


Fig. 10



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CARTRIDGE POWERED COW DEHORNER WITH PIVOTED CUTTER BLADE

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Fig. 15

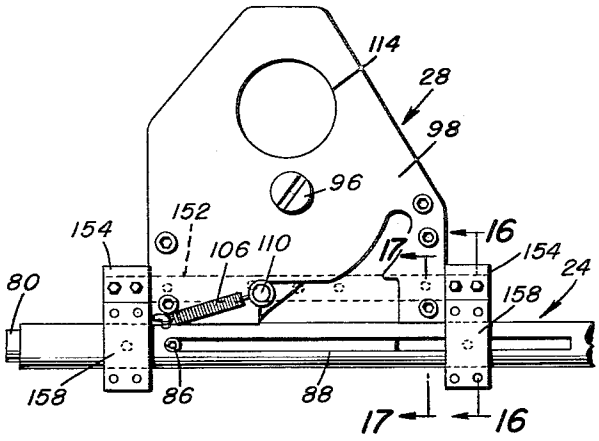
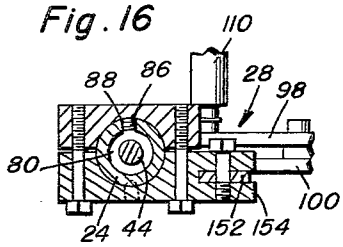


Fig. 16



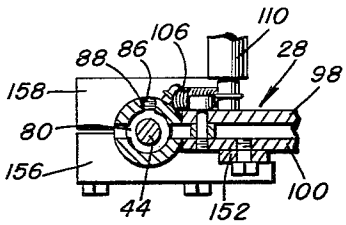


Fig. 17

Fig. 19

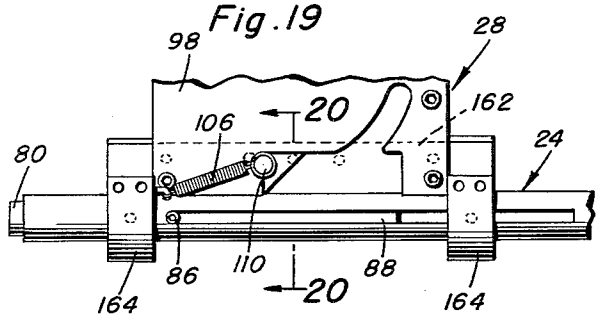
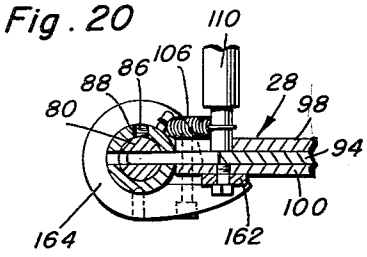


Fig. 20



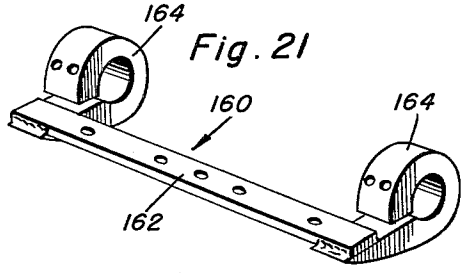


Fig. 21

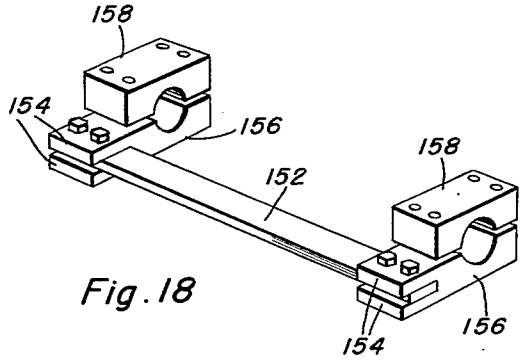


Fig. 18

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2,810,955

CARTRIDGE POWERED COW DEHORNER WITH PIVOTED CUTTER BLADE

Roy D. Hoffman, Bedford, Pa.

Application April 9, 1956, Serial No. 576,944

11 Claims. (Cl. 30—228)

This invention relates to a cartridge-powered blade-type cutter which is mechanically constructed and suitably designed to serve as a cow dehorner and is characterized, generally construed, by an elongate cylinder, a piston reciprocable for high powered operation in said cylinder and provided with a rod which operates a precision-type cutter blade, and cartridge holding and firing means operatively mounted on and communicably cooperable with a chamber at one end of the cylinder and functioning, when the cartridge is exploded, to generate intensive force which is trapped, concentrated and restrictively focused to impinge upon said piston, whereby to forcibly impel the piston and rod and spontaneously move and operate the cutting and shearing blade.

As is evident from the preceding general statement of the instant invention it is not new in the art to fire blank cartridges from a revolver or an equivalent holding and exploding device. In fact it is a common objective of those engaged in gas powered tools and implements to generate pressure which, when concentrated in a receptive space or chamber in a cylinder, functions to bring about instantaneous high speed actuation of a piston and piston rod and corresponding high speed "gun shot" shearing action of cooperating cutting blades. For example the teaching found in my copending application Serial No. 428,186 covering a Cartridged-Powered Dehorner and now identified as Patent No. 2,764,813 issued to me on October 2, 1956, is typical of the state of the art hereinunder consideration.

Reference being had to my previous patent it will be seen that it also has to do with a construction which is as above set forth and wherein additional means, which is limitary in construction and nature, utilizes the piston impelling pressurized gas as a compressed piston cushioning agent and limits the travel of the movable blade in a direction towards the stationary blade in a manner to gradually check and bring the movable blade to a stop and to, in this manner, prevent the cutting edge of the movable blade from moving to a position beyond its intended limit so as to thus prevent damage to the cutting edge of said blade.

In carrying out the principles of the instant invention the stated limitary means is utilized in conjunction with a pivoted cutting blade operating in a sheath which is apertured to accommodate the horn which is to be severed.

With further reference to Patent 2,764,813 it will be observed that the sliding cutter blade is propelled by exerting a "push" on the piston rod and blade to which it is connected. This has been to lack full effectiveness because of the likelihood of the rod, under unusual stress or strain, becoming bent or otherwise distorted. It follows that it is a significant objective in the instant presentation to reduce the possibility of bending, shearing or distortion of the piston rod due to the fact that in the present construction the piston "pulls" the piston rod instead of "pushing" it as above stated. Application of this pulling principle makes the over-all dehorner safer to use in every way. It also makes for a more effective mode of cylinder

and piston construction for arresting the driven stroke of the piston and bring about a positive stop by reason of the fact that the outward end of the cylinder is positively closed and effectually traps atmospheric and powder gases between the closed end and the oncoming piston, all in a manner to check and stop the gunshot stroke of the piston, whereby to better control the thus safe guarded pivoted cutter blade.

Briefly summarized, a preferred embodiment of the invention therefore comprises a cylinder which is closed at its inward and outward ends, a relatively short piston reciprocable in said cylinder from the inward toward the outward end and normally occupying a ready-to-start position in close proximity to said inward end, a piston rod joined axially at its leading end to the impact receiving trailing end of said piston and reducing the cross-sectional area of the exploded gas concentrating chamber, that is, the chamber between the inward closed end of the cylinder and trailing impact end of the piston, in proportion to the cross-section and extent of the piston rod projecting into said chamber prior to the initial movement of said piston, cutter blade means embodying at least one movable cutter blade operatively connected with said piston rod, and blank cartridge holding and firing means operatively mounted on the inward end of said cylinder and having a restricted exploded gas delivering passage communicating with said gas intake and concentrating chamber so that when a cartridge is fired the expanding pressurized gas enters said chamber and impinges upon the trailing end of the piston, whereby the piston rod is "pulled" instead of being pushed and distortion is therefore minimized.

Features and advantages not so far mentioned will become evident from the following description of the details and the accompanying sheets of illustrative, but not restrictive, drawings.

In the drawings wherein like numerals are employed to designate like parts throughout the views:

Figure 1 is a top plan view of the improved cartridge-powered cow dehorner with pivoted cutter blade;

Figure 2 is an elevational view of the same with portions broken away and appearing in section;

Figure 3 is an end view of the same;

Figures 4, 5, 6 are sections taken on the lines **4—4**, **5—5** and **6—6**, respectively, of Figure 1;

Figure 7 is an enlarged view in section and in elevation with parts removed detailing the cutter blade means, the view being taken approximately on the plane of the line **7—7** of Figure 3;

Figure 8 is a view on the line **8—8** of Figure 1;

Figure 9 is a view in section and elevation similar to Figure 7 showing the recoil of the over-all piston rod and the manner in which the pivoted cutter blade functions at this stage of operation;

Figure 10 is a view with parts in section and elevation and on a reasonably enlarged scale detailing the construction and arrangement of the cartridge containing magazine and holder and firing device for the cartridges;

Figure 11 is an enlarged view of the plugged or closed outward end of the cylinder, the view being in section and in elevation;

Figure 12 is a section on the line **12—12** of Figure 1 looking in the direction of the arrows;

Figure 13 is a bottom plan view of the cutter blade or cutter head showing how, in one form, it is mounted on the cooperating end portion of the barrel;

Figure 14 is a perspective view of one of the details;

Figure 15 is a fragmentary plan view of the same cutter head but showing a different means whereby the same is mounted on the stated barrel;

Figures 16 and 17 are detail views on the lines **16—16** and **17—17**, respectively of Figure 15;

Figure 18 is a perspective view of the mounting bracket for the cutter head, the arrangement seen in the assembled view in Figure 15;

Figure 19 is a fragmentary plan view similar to Figure 15 and showing another mode of attaching or mounting the cutter head on the barrel;

Figure 20 is a section on the line 20—20 of Figure 19; and

Figure 21 is a perspective view of the mounting device appearing in Figures 19 and 20.

Referring now to the drawings with the aid of reference numerals and accompanying lead lines it seems advisable to refer to Figures 1 to 5 inclusive. As shown in Figures 1 and 2 the elongate cylinder is denoted by the numeral **22**. The correspondingly elongated companion axially alined barrel at the left is denoted by the numeral **24** and the coupling between the adjacent ends keeping the parts in axially and assembled alignment is denoted at **26**. The bladed cutter head is referred to generally by the numeral **28**. Reference may be had now to Figure 5 where it will be seen that the inward end portion **30** of the cylinder **22** is threaded at **32** into the cooperating end of the axially alined coupling **26**. The inward end portion **34** of the barrel **24** is likewise threaded at **36** into the coupling **26** and is clamped against a flanged collar **38** pressed upon a shoulder at one end of the restricted bore of said coupling. The collar **38** is spaced from bushing **40** by a packing ring **42** and through which the piston rod **44** extends slidably for operation in both the cylinder and barrel. The piston **46** is provided with suitable packing rings **48** and is confined for operation in the cylinder. The initial or starting position of the piston is shown in Figure 5 where its trailing end or surface **50** is in close proximity to the recessed end portion **52** of the bushing **40**. This space provides the chamber into which the explosive gases discharge for operating the piston. The leading end of the piston is denoted at **54** and the piston and rod move from left to right as shown respectively in full and dotted lines in Figure 5. The outward end portion **56** of the cylinder is closed by a permanently fitted plug **58** (Figure 11) or by a removable plug **60** (Figure 5) which is held in place by an applicable and removable closing cap **62**. Intermediate its ends and on one side the cylinder is provided with a used gas exhaust port into which an elbow is fitted as at **64**. On a diametrically opposite side it is provided with a pressurized gas intake port **66** and at a longitudinally spaced point with a complemental pressurized gas discharge port **68**, said ports **66** and **68** being joined by a by-pass **70**. Said ports are progressively valved and closed by the cooperation of the piston operating under confinement in said cylinder. The by-pass serves to communicate the ports **66** and **68** and serves to permit the gas under pressure to be trapped and compressed in the cylinders between the plugged or closed end at the right in Figure 5 and the leading end **54** of the piston as the latter advances toward that end in order to utilize the trapped gas as a cushioning and check medium in limiting the travel of the piston **46** in the cylinder **22** in said one direction. An auxiliary by-pass **72** in the form of an exteriorly arranged pipe is connected at one end with the elbow or fitting **64** and at its opposite end (Figure 5) is a complemental elbow or fitting **74** which in turn is connected with a port or orifice **76** communicating with the chamber **78** between the cylindrical slide **80** and the flange **38**. This slide in effect is a secondary piston and operates in the bore of the barrel **24** and has a socket into which the threaded end **82** of the piston rod **44** is connected as shown in Figure 4. It is also seen here that this secondary piston is provided with suitable packing rings **84**. The slide **80** is provided with a setscrew (Figures 1 and 4) **86** operating in a keying slot **88** provided therefor preventing turning and also displacement of the secondary piston or slide. The slide itself is also provided with a lengthwise groove or slot

90 which has separable connection with the cooperating cutter blade. The slot **90** may pass all the way through the slide as shown best in Figure 7 and it serves to accommodate a projecting lug **92** on the movable or pivoted cutter blade **94**. This blade is centrally pivoted as at **96** between the top and bottom plates **98** and **100** respectively of the sheath. Mounted between the plates is a spacer block as shown in Figure 7 at **102** having a cushioning spring **104** for the lug **92**. The return spring **106** is anchored as at **108** at one end and connected at its opposite end to a handle or pin **110** carried by the pivoted cutter blade. The cutter blade has a circular hole with a beveled endless blade or cutting edge **112** which cooperates with aligned holes **114** and **116** (Figure 8) whereby to permit the cow's horn to be inserted (not shown) in a manner to be obviously severed when the impulse is imparted to the cutter blade **94** by the keyed action between the lug **92** and the slotted portion **90** of the secondary piston or slide **80**.

With reference in particular to Figure 10 the numeral **118** designates the cartridge mounting and firing device or so-called "gun." This embodies a base **120** having a bored neck which is screwed into an opening provided therefor in the intermediate portion of the aforementioned coupling **26**. The pressurized gas passage **122** leads into the restricted chamber between the bushing **40** and piston **46** as shown. The base **120** is suitably constructed and bored to accommodate the insertible and removable magazine **124** the latter having a keying groove **126** suitably keyed and being provided with pockets **128** for the blank cartridges **130**. These are brought one-by-one into line with the passage **122** and the spring biased firing pin or hammer **132**. The latter is suitably mounted in the sleeve **134** and has a setting knob **136** on its upper end and a keeper groove **138** into which the trigger portion **140** of the trip latch **142** is removably seated. By pressing the latch and releasing the trigger the spring biased pin **132** strikes the aligned cartridge and explodes the latter and the gases under pressure pass through the passage **122** and are obliquely diverted into the restricted chamber existing between the bushing **40** and the piston **46** all as is reasonably well evident from Figure 10 especially when taken in conjunction with the other views. Consequently, the piston **46** and rod move from the initial set position and the rod pulls the slide **80** and the slide, having operating connection with the lug **92** and blade **94** serves to swing the blade in an obvious manner to shear the cow's horn.

No claims are being made herein for the so-called blank cartridge mounting and firing means seen in Figure 10 and therefore a more specific description of the same appears to be unnecessary.

It will be obvious that pressurized gas escaping through the exhaust port means **64** passes through the by-pass **72** and elbow **74** and passage **76** into the chamber **78** to cushion and assist in bringing to a stop the slide or secondary piston **80**, in a seemingly obvious manner. Said gas under pressure also passes through the orifice or port **66** and by-pass **70** and port **68** in a progressively and obviously valved manner to trap compressed gases and atmospheric air in the chamber **61** between the plug **60** and advancing end of the piston **46** to bring said piston to a positive stop. It will be evident too that the cutting blade is pivotally mounted and separably connected with the cooperating portion of the secondary piston or slide by way of the actuating lug **92** projecting into the slot **90** that is, when the blade is in its initial or set position. The lug is, however, withdrawn from the slot **90** when the blade moves to its horn shearing position.

As is evident, the blade **94** is pulled toward the cartridge firing device or so-called gun **118**, and after travelling sufficient distance to cut the horn, the blade is automatically "lost" from the slot **90** and glides along the surface of the slide **80** until recoil takes place and the rod

44 again reverts to its original position. On the travel back to the original position, the slide **80** picks up the blade **46** automatically and carries it back to the starting position as depicted in Fig. 9.

The bladeholder is composed of two parts which makes it possible for the blade to slide over a cutting edge on the bottom plate. The top plate is merely a protection plate. It may or may not be necessary to use this plate according to the desire of the operator. Holes are drilled in the plate in order to reduce weight and make it possible to clean the gun.

It is to be mentioned that the gun can be reversed and used in a "pushing" mode of operation applying the firing charge on the cap end and as shown at the same time pushing the blade with the same type mechanism except that the blade would start on the opposite side of the cutting hole. In other words I can apply the pull method as used or the push method as used in my previous patent with this same machine by merely reversing the blade and starting from the spring stop side of the blade rather than ending at this point with the movement.

The construction is such that the piston rod is pulled rather than pushed. By this means, the charge feeds in on the piston rod side of the piston, greatly reducing the firing chamber size and also exerting a push on the piston and a pull on the rod. This eliminates the possibility of bending the piston rod from the direct thrust. It also confines the powder charge and increases the pressure exerted from the explosion. I have found that the size of the cavity **52** greatly influences the effect of the charge. It also eliminates the possibility of danger in the firing due to the O rings and packing rings being at the firing point.

In case of a leak, the gun will not operate. To this end the trapped atmospheric air and the gas charges are confined in the manner shown and do not require the aid of O rings or packing rings. Previously, I had difficulties with confining the gas by means of O rings. At the end of the stroke of the piston **46** (dotted lines Fig. 5) the estimated pressure is approximately double that of the firing pressure thus necessitating use of the positive closing and sealing means **60** and **62** seen in Fig. 5.

The construction shown prevents vibration and possibility of bending the piston rod. It also has an advantage in that the piston rod **44** does not carry the blade **94** along its entire length. The slide **80** picks up the blade **94** from the start and carries it until the horn severance is completed, then "loses" the blade and continues until stopped by the air which is compressed in the space **61**. On the recoil the slide **80** picks up the blade and carries it back to the starting position. This is novel in that the blade is picked up and released in proper sequence of operation.

As shown in Figures 8 and 13 a flange **146** is welded or otherwise secured at **148** to the bottom of the barrel and the bottom plate of the cutter head sheath is bolted thereon as at **159**. It is within the purview of the invention to provide other ways and means of mounting this sheathed cutter means and this is shown in Figures 15 to 21 inclusive. For example instead of using the flange **146** a mounting strip or bar **152** is employed as seen in Figure 18 with its ends fastened between furcations **154** on blocks **156** having complemental clamping blocks **158** which are clamped on the barrel in the manner shown in Figures 15, 16 and 17.

Another arrangement may be employed as shown in Figure 21 wherein the mounting means **160** comprises a support bar **162** having its ends connected to adapters **164** which embrace and are suitably bolted or otherwise secured to the barrel. This is perhaps better shown in Figures 19 and 20. Other ways of supporting the cutter head may be, obviously, employed.

As is reasonably evident, the invention, by using suitably designed and modified cutter blades, lends itself for castrating and docking needs. The claims are to be construed accordingly.

The foregoing is considered as illustrative only of the

principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A power operated cow dehorner comprising, in combination, a cylinder closed at at least one end, a piston mounted for reciprocation in said cylinder and having a complemental linear piston rod, at least one movable cutting blade operatively connected with said piston rod, blank cartridge containing and firing means operatively mounted on and communicably connected with the piston chamber of said cylinder and functioning, when the cartridge is fired, to generate explosive gas pressure which is focused and acts upon said piston and serves to bring about the desired instantaneous high speed actuation of the piston, rod and cutting blade, said cylinder being provided intermediate its ends and on one side with a used gas exhaust port, being provided on an opposite side with a pressurized gas intake port and at a longitudinally spaced point with a complemental gas discharge port, said ports being progressively valved and closed by the cooperation of the piston operating under confinement in said cylinder, a by-pass for the pressurized gas communicably connecting said intake and discharge ports and serving to permit gas under pressure to be trapped and compressed in the cylinder between the closed end of the latter and piston advancing toward that end in order to utilize the trapped gas as a cushioning and check medium and limiting the travel of the piston in said cylinder in said one direction, said cutting blade being pivotally mounted and separably connected wth the cooperating portion of said piston rod by way of a reciprocable blade actuator, said actuator being detachably coupled to the adjacent end of said cutting blade having an actuating lug projecting into said slot when the blade is in its inital set postion and being withdrawable from said slot when the cutting blade moves to its horn-shearing position.

2. A power operated cow dehorner comprising a pair of cooperating cutter blades having normally separated overlapping cutting edges which, when they overlap, bring about the intended and desired horn shearing result, one of said blades being pivotally mounted and swingable in an arc toward and from the other blade and being designed to be propelled at high-powered gunshot speed toward the other blade, a cylinder, a piston mounted for reciprocation in said cylinder, a rod connected at one end with said piston and operable in conjunction therewith, said rod being operatively connected with said pivotally mounted cutter blade, said cylinder having a vent and being further provided on one side intermediate its ends with longitudinally spaced pressurized gas intake and discharge ports, said ports being communicably connected by way of the cooperating end portions of a pressurized gas by-pass, said cylinder being provided at one end with a union, said union having a bushing and said piston rod being operable through said bushing, a barrel in axial alignment with said cylinder and connected at one end with said union and completely open at its end opposite to said one end, said rod passing not only through and beyond the bushing but into the bore of the barrel, said cutting blades being mounted on said barrel by way of a sheath carried by the barrel, said pivotally mounted blade operating in the slot provided therefor in said barrel and being reciprocably but operably connected with a cooperating portion of said piston rod.

3. A power operated cow dehorner comprising, a cylinder closed at one end and provided intermediate its ends with a vent and cooperating by-pass means, a barrel in axial alignment with said cylinder, a cutter blade actuator slide mounted for reciprocation in said barrel, a coupling interconnecting the adjacent ends of said cylinder

and barrel, said coupling having a bushing arranged axially therein, a piston mounted for reciprocation in said cylinder and provided with a rod reciprocable in said cylinder and bushing and extending axially for reception into said barrel, and cutter blade means mounted for operation on said barrel, said actuator being operatively connected therewith.

4. A power operated cow dehorner comprising a cylinder closed at one end and provided intermediate its ends with a vent and cooperating by-pass means, a barrel in axial alignment with said cylinder, a cutter blade actuator slide mounted for reciprocation in said barrel, a coupling interconnecting the adjacent ends of said cylinder and barrel, said coupling having a bushing arranged axially therein, a piston mounted for reciprocation in said cylinder and provided with a rod reciprocably in said bushing and extending axially into said barrel, cutter blade means mounted on said barrel, said actuator being operatively connected therewith, said slide having a slot therein aligned with a cooperating slot formed in said barrel, means permitting said actuated slide to reciprocate but preventing the same from rotating relative to the barrel, one of the cutter blades being pivotally mounted and having a lug on one end extending through the slot in the barrel and into the slot in said slide.

5. A cow dehorner comprising an open ended barrel having a lengthwise slot, a sheath fixedly mounted on and projecting laterally from said barrel, a cutter blade pivotally mounted in said sheath, an actuator for said cutter blade reciprocable in said barrel and keyed against rotation and having a slot in alignment with the slot in said barrel, said cutter blade having a lug and said lug projecting removably into the slot in the actuator by way of the slot in the barrel, a reciprocable power operated piston having a rod and said rod being connected with said actuator.

6. The structure defined claim 5 and including a cylinder closed at opposite ends and coupled to one end of said barrel in axial alignment with the barrel, said piston and rod being mounted for reciprocation in said cylinder.

7. The structure defined in claim 6 and wherein said cylinder is provided intermediate its ends and on one side with a used gas exhaust port, is provided on an opposite side with a pressurized gas intake port and a longitudinally spaced point with a complemental discharge port, said ports being progressively valved and closed by the cooperation of the piston therewith, a by-pass on said cylinder communicably connecting said intake and discharge ports and serving to permit the gas under pressure to be trapped and compressed in the cylinder between one closed end of the cylinder and piston advancing toward that end in order to utilize the trapped gas as a cushion and check medium in limiting the travel of the piston in one direction in said cylinder.

8. The structure defined in claim 6 and blank cartridge containing and firing means communicably and operatively mounted on said coupling and functioning when the cartridge is fired to generate explosive gas pressure which is focused upon said piston and which serves to bring about the instantaneous high speed actuation of the piston, rod and cutting blade.

9. A power operated cow dehorner comprising, in combination, a cylinder closed at its inward and outward ends, a relatively short piston reciprocable in said cylinder from the inward toward the outward end and normally occupying a ready-to-start position in close proximity to said inward end, a piston rod joined axially at its leading end to the impact receiving trailing end of said piston and reducing the cross-sectional area of the exploded gas concentrating chamber, that is, the chamber between the inward closed end of the cylinder and trailing impact end of the piston, in proportion to the cross-section and extent of the piston rod projecting into said chamber prior to the initial movement of said piston, cutter blade means embodying at least one movable cutter blade operatively connected with said piston rod, and blank cartridge holding and firing means operatively mounted on the inward end of said cylinder and having a restricted exploded gas delivering passage communicating with said gas intake and concentrating chamber so that when a cartridge is fired the expanding pressurized gas enters the chamber and impinges upon the trailing end of the piston, whereby the piston rod is "pulled" instead of being pushed and distortion is therefore minimized, a linearly straight open ended barrel axially aligned and having one end connected with the inward end of said cylinder, said piston rod extending through said inward end and into said barrel, a slide snugly but slidingly fitted for reciprocation in the bore of said barrel and functioning, on the one hand, as a secondary piston and defining a compression chamber between one end thereof and said end of said barrel, said piston rod having its adjacent end secured to said slide, said cutter blade means being supported for operation on said barrel, said slide having a slot therein, said barrel likewise having a slot aligned with said first named slot, and said one blade having a lug projecting through the slot in said barrel and into the slot in said slide.

10. The structure defined in claim 9 and wherein said cylinder is provided intermediate its ends and on one side with a used gas exhaust port, is provided on an opposite side with a pressurized gas intake port and a longitudinally spaced point with a complemental discharge port, said ports being progressively valved and closed by the cooperation of the piston therewith, a by-pass on said cylinder communicably connecting said intake and discharge ports and serving to permit the gas under pressure to be trapped and compressed in the cylinder between one closed end of the cylinder and piston advancing toward that end in order to utilize the trapped gas as a cushion and check medium in limiting the travel of the piston in one direction in said cylinder.

11. The structure defined in claim 10 and the combination with said cylinder and barrel of a second by-pass having one end communicatively connected with said exhaust port and its other end communicatively connected with the aforementioned compression chamber in said barrel.

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