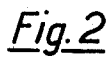


JEAN-MARIE F. MASSACRIER

PLUGGING GUN OF THE REPEATING TYPE

3 Sheets-Sheet 1



July 2, 1963

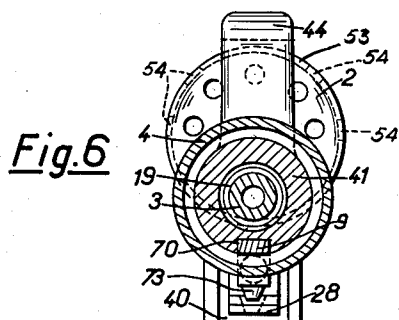
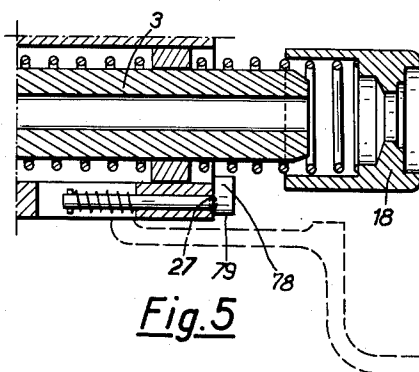
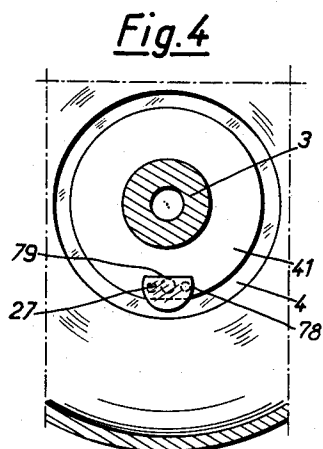
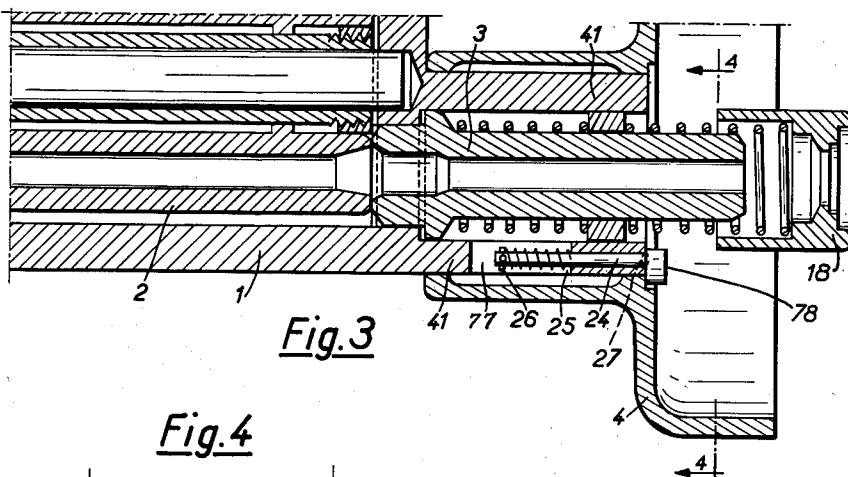
JEAN-MARIE F. MASSACRIER

3,095,572

PLUGGING GUN OF THE REPEATING TYPE

Filed April 4, 1961

3 Sheets-Sheet 2



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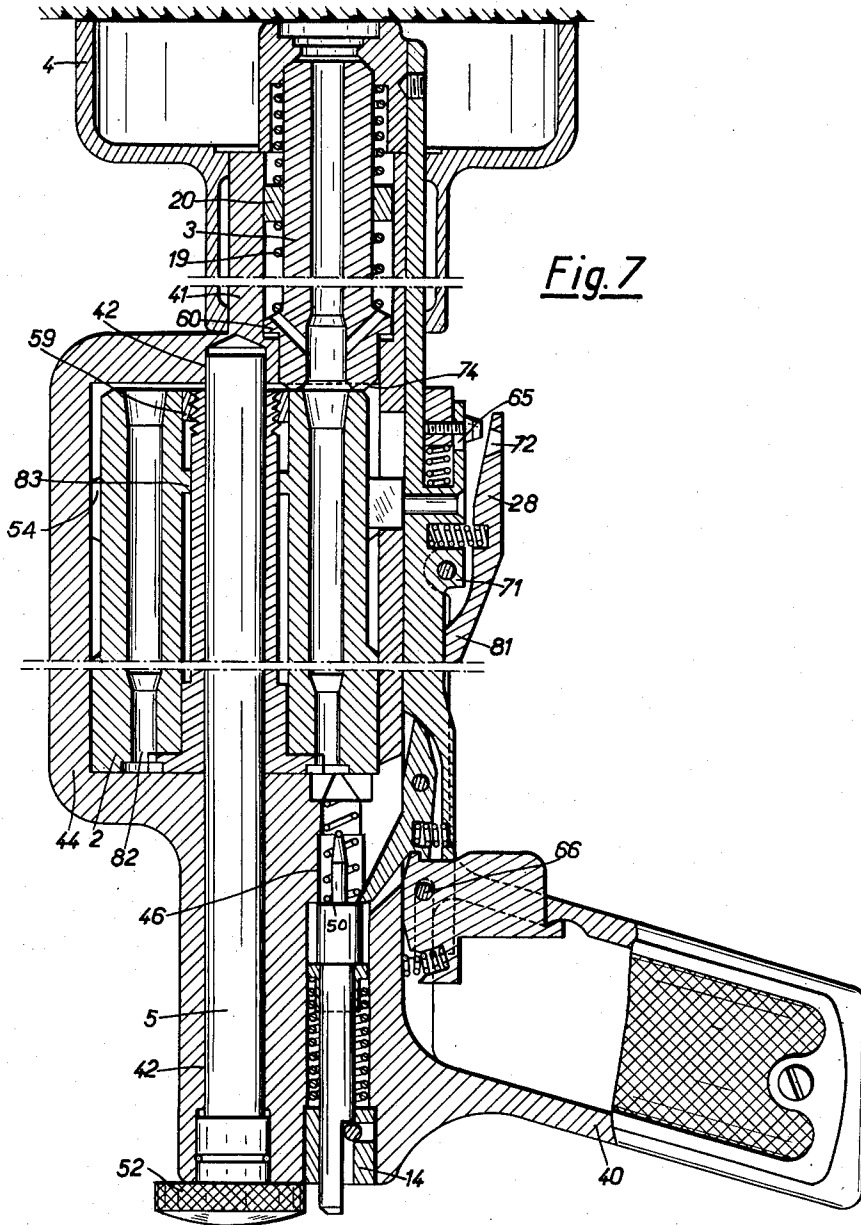
JEAN-MARIE F. MASSACRIER

3,095,572

PLUGGING GUN OF THE REPEATING TYPE

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3,095,572

PLUGGING GUN OF THE REPEATING TYPE

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6 Claims. (Cl. 1—44.5)

The present invention relates to plugging guns and more particularly to plugging guns of the repeating type.

My invention has for a principal object the provision of means for improving the safety in using plugging guns of the repeating cylinder-carrying type. In this respect, the gun according to the invention, removes all difficulties in handling and operation, chiefly as concerns the dismantling of the shield of the gun. The gun also enables the free rotation of the cylinder however distorted the cartridge case may be.

The popular use of plugging guns operating through a thrust produced by an explosion has led to the imposition of safety conditions. The arrangement forming the object of my present invention satisfies in a simple, efficient and reliable manner the most drastic requirements of the rules of safety.

According to a primary feature of my invention, the plugging gun includes a body having a housing portion which is open for the movable insertion therein of a cylinder associated with a system including a trigger, striker and sear cooperating with a slider carrying at its front end an end-piece for the barrel. The gun is provided with a safety lever pivotally secured to the slider for cooperation both with the body of the gun in its locked position and with the head of a movable piston, the lever being adapted to assume two positions in accordance with whether the splinterproof shield is dismantled, or is positioned on the gun.

According to a further feature of my invention, the shield is held on the front section of the gun by means adapted to provide for its speedy locking and release without requiring any tool or implement, said means being constituted by a spring-urged rod including a head forming an abutment having flat surfaces which may be positioned in two different angular positions. These positions are firstly a position securing the shield on the gun without preventing the adjustment of the angular position of said shield and secondly a position insuring the free removal of said shield.

According to a still further feature of my invention, the barrel is elastically urged rearwardly against the cylinder to provide clearance between the front surface of the cylinder and the body of the gun. I also provide different sizes for the removable cylinders and barrels, which may be inserted, depending on the different gauge plugs to be used in the same gun, these differences in size being necessary for safety purposes and for preventing any mistake in the assembly of the cylinder and barrel in the gun.

In order to allow my invention to be better understood, I will now describe it with further detail, reference being made to the accompanying drawings, wherein:

FIGURE 1 is a longitudinal sectional view of a sealing gun according to my invention.

FIGURE 2 is a sectional view of the front end of the gun of FIG. 1 shown after removal of the splinterproof shield.

FIGURE 3 is a plan view, partly sectional, of the front end of the gun, through lines 3—3 of FIG. 1, the shield being illustrated as fitted in position and secured to the gun.

FIGURE 4 is a partial sectional view of the front section of the gun through line 4—4 of FIG. 3.

FIGURE 5 is a partial sectional view similar to FIG.

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3, showing a different position of the locking means which allows the removal of the shield which is illustrated in dotted lines.

FIGURE 6 is, on a smaller scale, a cross-section of the plugging gun through line 6—6 of FIG. 1, and

FIGURE 7 is a sectional view similar to that in FIG. 1 showing the gun in a ready to fire position against the work.

My improved gun is of the type including a body 1 having a handle 40, a housing portion 44 which accommodates a cylinder 2 and a front carrier sleeve 41 inside the bore of which is fitted a barrel 3. Surrounding the sleeve 41 is a splinterproof shield 4, which is angularly adjustable as desired. The cylinder 2 is revolvably supported on a spindle 5 via a sleeve 7. The spindle 5 is engaged slidably in a bore 42 in said body 1. The spindle 5 is held in position, either by a slight frictional fit or under the elastic action of an expansible elastic annular member 6 housed inside an annular groove formed in a bearing 51 having an enlarged diameter at the rear end of spindle 5. A still larger head 52, and preferably knurled, provides a convenient hold for operating spindle 5.

The sleeve 7 is supported in the cylinder 2 for axial sliding and on the sleeve is threadably engaged an annular member 59 which is adapted to abut against a shoulder 74 formed on the barrel 3 in a manner most clearly seen in FIG. 2. A collar 8' on the sleeve is fitted in the cylinder at one end in registry with the corresponding ends of the chambers 82 provided for the cartridges, the shape of said collar 8' matching partly that of the cartridge beads. When the cylinder is dismantled, i.e. removed from housing portion 44 the bearing surface 51 for the spindle 5 may serve for pushing axially the annular member 59 and the sleeve 7, so as to release conveniently in one operative step the cartridge cases which have been expanded by the firing. The cylinder 2 is removed from the housing by withdrawing the spindle to the left in FIG. 1. Once the spindle has been withdrawn from the housing 44 the cylinder 2 is free to be removed from the housing. To remove the spent cartridge cases in the cylinder, the end of the spindle 5 remote from the head 52 is inserted into the end of cylinder 2 proximate the annular member 59, until bearing member 51 contacts annular member 59 and the end of sleeve 7. Further displacement of bearing member 51 will cause relative sliding movement of the sleeve 7 within the cylinder 2 thereby causing displacement of the cartridge cases in the cylinder 2 by engagement with the heads thereof.

The system including the trigger, striker and sear of the gun provides perfect safety because it requires, before firing, the setting of the gun under steady pressure against the surface in which plugging is to be obtained. To accomplish this, a longitudinal slider 9 is adapted to move inside a longitudinal groove 70 formed in the lower part of the body. Inside a slot formed at the rear end of said slider, there is pivotally mounted at 61 a sear 10 which is biased in a clockwise direction under the pressure of a spring 11. A nose 68 on the sear 10 cooperates with the shoulder 50 of the striker rod 12, which latter is guided slidably inside the corresponding bore 46 of the gun body, while a thrust-exerting spring 13 and an axially perforated stopping plug 14 behind the spring hold the striker inside said recess. The spring 13 urges the striking rod forwardly, while a less powerful spring 15 urges the rod 12 rearwardly for returning the striker rod into its inoperative position after firing. A trigger 16 is pivotally connected at 66 to the body 1 and is adapted for counteracting the action of the spring 17 to produce the firing. The nose 67 on the trigger cooperates, when the cocking slider 9 is urged rearwardly, with a cor-

responsingly shaped section 69 of the sear, so as to rock the sear and withdraw the nose 68 from the shoulder 50 to allow the striker to operate under the action of spring 13.

An end-piece 18 extending to the front of the barrel 3 is removably secured to the front end of the slider by bolt 21. The front section of the end-piece is provided with diametral opening 56 so as to hold in position washers, collars or the like parts during the plugging.

The centering of the successive chambers in the cylinder with reference to the gun is obtained through the successive engagement of a tenon 62 on the slider 9 in grooves 54 formed in the peripheral bearing surface 53 on the cylinder 2 so as to provide perfect registry with the chambers formed in said cylinder. Thus, grooves 54 are formed in the peripheral bearing surface 53 in correspondence with the chambers 82 such that when said tenon 62 is successively engaged in said grooves 54 in chambers 82 will all successively register perfectly with the bore in the barrel 3. The tenon 62 is guided slidably inside a short slot 41 in the body 1, which short slot limits the shifting of said tenon.

According to an essential feature of my invention, the barrel 3 is removably fitted in the bore formed in the carrier sleeve 41 of the gun body to enable insertion of other barrels of different bores to enable the use of the same gun for the firing of pins of various diameters. The barrel 3 is urged towards the cylinder 2 by a spring 19 held by the end-piece 18.

A bearing section 58 of the barrel is slidably guided in the gun body and a shoulder 60 limits the movement of said barrel in the bore formed in the sleeve 41. Said bearing section 58 has a length such that its end projects into the free space formed in the housing 44 for the cylinder 2. The cylinder 2 defines a small gap between the cylinder and the housing 44 of the gun body when the barrel 3 is elastically urged against said cylinder.

The above arrangement prevents wedging of the cylinder inside the gun body, for instance upon exaggerated expansion of the cartridge cases. In this case any expansion of the case is compensated by the gap and the barrel may thereafter be urged back by reason of the elastic mounting thereof, as described hereinabove. The end of the bearing section 58 is advantageously provided with a peripheral bevel 74.

There is also provided openings or vents 57 in the barrel 3 for the exhaust of the excess thrust-producing gases.

Another guiding surface for the barrel may be provided in the form of a ring 20 which is slidably mounted around the barrel and inside the bore of the carrier sleeve 41. In such a case, the barrel-engaging spring 19 is subdivided into two sections located to either side of said ring 20. The front section 75 of said spring 19 is seated in a bearing inside a rear chamber 55 in the end-piece 18.

The barrel is readily removable for cleaning and repairs or to change the gauge of the pins which are to be plugged into a surface. It is sufficient, to this end, to unscrew the bolt 21 locking in position the end-piece 18 over the end of the slider 9.

It is therefore possible, in accordance with my invention, to fit the same gun selectively with barrels of different gauges and also with different cylinders corresponding to such gauges. The possibilities of use of the gun are thus much wider and extend over a wide range of operations, which require the use of plugging rods or pins of different gauges.

In the most general manner, without limiting the scope of the invention, there is provided the possibility of resorting to two barrels and to corresponding cylinders for two different gauges, for instance gauges of 7 and 10. It is then important to prevent any mix-up when mounting the barrels and cylinders, and in particular, it is necessary to prevent the gun from carrying a cylinder for a large gauge in association with a barrel with a small gauge.

To this end, the barrel 3 and the cylinder 2 designed

for large gauges are constructed as illustrated in FIG. 1 and as described hereinabove, while, as illustrated in FIG. 2, the small gauge barrel 22 has a greater length by reason of the fact that the bearing surface 76 which is formed on barrel 22, is longer than surface 58 and thereby extends further into the recess in the body provided for holding the cylinder 23 corresponding to said small gauge barrel; the length of the cylinder 23 is therefore shorter than that of the above-described cylinder 2, while exhibiting the same general structure. The barrel 22 is elastically urged against the cylinder 23 without any leak of gases being possible, as provided by the elastic thrust produced by the spring 19.

It is therefore impossible to make a mistake in the mounting of the barrels and cylinders, firstly because the operator will readily distinguish the different parts, the lengths of which are different and, furthermore, because their size does not allow fitting a long cylinder 2 provided for a large gauge with a long barrel 22 provided for a small gauge and, conversely, a short barrel provided for a large gauge cannot allow firing with a short small gauge cylinder, since the cylinder would be urged forwardly as a consequence of the clearance formed in registry therewith, so that no percussion can be obtained.

A further and important feature of my invention consists in a simple securing system which allows a speedy dismantling of the shield, as illustrated in FIGS. 3, 4 and 5. The securing system is constituted chiefly by a rod 24 slidably mounted inside the carrier sleeve 41 parallel to the axis of the barrel, the rear end of said rod extending freely into an opening 77 of said carrier sleeve 41. A spring 25 is fitted between one end of said opening and a stop such as a pin 26 secured to the end of the rod 24. The front end of said rod is provided with a head 78 which extends eccentrically with reference to the axis of the rod, as defined, for instance, by a flat surface 79. The lateral projection formed by the head 78 may be of any convenient shape allowing its selective shifting by hand into either of two positions.

One of the positions is illustrated in FIGS. 3 and 4, in which the head 78 is located in the area extending in front of the shield 4 surrounding the carrier sleeve 41 and preventing removal of said shield while not interfering with angular shifting of said shield around said sleeve.

The other of the positions is illustrated in FIG. 5, wherein the head 78 has been rotated to bring the flat surface 79 into a position such that it releases the shield 4 to allow said shield, shown in interrupted lines, to be removed.

Balls 27, which are partly fitted in the front terminal surface of the carrier sleeve 41 and which partly engage recesses formed in cooperating surfaces of the head 78 define the angular position given to the head 78 which is urged into position over said balls by the spring 25.

This simple and efficient arrangement allows removing and setting in position various types of shields and forms, while constituting an auxiliary safety means which prevents firing when the shield is not in position. Thus, when the head 78 is in the position enabling dismantling of the shield (FIG. 5) it lies in the area in which the end-piece 18 is adapted to move. Said end-piece and the slider 9 cannot be then urged back sufficiently to allow the setting and the firing of the gun.

An important safety arrangement includes a lever 28 pivotally secured to a tail-piece 63 in the slider 9. One end 81 of the lever is held in abutting relationship in the notches 49 of the gun body to either side of the slider 9 under the action of a spring 29 fitted between the said slider and lever, arranged so as to make the lever pivot in a clockwise direction.

The front end of the lever 28 is provided with an opening 72 adapted for engagement by a projection 73 of a movable piston 30 slidably mounted inside a recess 64 in the tail-piece 63. A port 65 in said tail-piece allows the sliding of the stud carrying the projection 73 within pre-

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determined limits. A spring 31 urges the piston and projection 73 in a forwardly direction (to the right in FIG. 1). However, when the splinterproof shield 4 is positioned on the carrier sleeve 41 (FIG. 1), it holds the piston 30 in its rearward position against the action of the spring 31, the projection 73 being located in line with and adjacent the opening 72. The lever 28 may now be pivoted since projection 73 will freely enter opening 72 so that the end 81 of lever 28 will be removed from the notches 49 and thereby permit free sliding of slider 9. It is therefore possible to set the gun and to fire, in order to produce the desired plugging.

Conversely, when the shield is not positioned, as shown in FIG. 2, the piston 30 is urged forwardly by spring 31 and projection 73 is no longer in registry with the opening 72, so that the lever 28 is prevented from pivoting to release end 81 of lever 28 from notches 49, whereby it is impossible to fire the gun.

The arrangement, including the lever 28, provides a double safety, since on the one hand it prevents firing without the splinterproof shield being in position and, furthermore, it requires the operator to hold with one hand the lever before firing, while his other hand holds the handle 40. The operator cannot therefore perform any other operation which might reduce the safety of firing.

The operation of the device is as follows.

A cylinder loaded with cartridges and plugging pins is inserted into housing 44. Spindle 5 is then inserted into the bore 42 in the body and the bore of the sleeve 7 in the cylinder.

The operator next positions the end piece on the work where a pin is to be introduced and with one hand on the handle 40 and the other depressing lever 28 so that projection 73 enters into opening 72 in the lever 28, a force is exerted on the gun against the work to cause end piece 78 to be moved rearwardly in the gun. Slider 9 moves with end piece 78 thereby causing sear 10 to rearwardly move striker 12. The sear 10 engages the nose 68 of trigger 16 and is held thereby. The gun is now in a cocked position, which is shown in FIG. 7. Tenon 62 on slider 9 ensures accurate positioning of the chamber 82 accommodating the pin to be fired relative to the bore of the barrel 3 and the striker 12. The gun is then fired by pressing the trigger to rock the sear 10 and thereby free the striker 12 to move forwardly under the action of spring 13. The striker 12 is thrust against the cartridge causing firing of the pin. The cylinder 2 is next rotated to a position to present a loaded chamber in registry with the barrel. The rotation may be manual or may be automatically effected. In any event the manner of rotation of the cylinder in the housing portion is not within the scope of the invention and may be accomplished in known fashion.

When all the cartridges are spent, the cylinder 2 may be removed and reloaded.

Obviously, and as already mentioned hereinabove, my invention is by no means limited to the embodiments and applications referred to hereinabove and it covers all the modifications thereof falling within the scope of the accompanying claims.

What I claim is:

1. A gun for plugging a surface, comprising a body having a front and rear end, said body including an enlarged housing portion, said body being provided with a first longitudinal bore in the front end thereof, said housing portion being provided with a bore of larger diameter than the first said bore and opening thereinto, said bores being parallel to one another and eccentrically arranged, a shield encircling the front end of the body and removably coupled thereto, a cylinder removably and revolvably supported inside the bore in the housing portion of the body and provided with a plurality of annularly distributed cartridge chambers each of which is

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adapted to register in succession with the first said bore, a ring slidably supported inside the first bore, a hollow barrel slidably supported inside said ring and including a forwardly facing shoulder at the rear thereof and a rearwardly tapering terminal section slidably supported in the rear end of the first said bore, a slider, an end-piece detachably secured to the slider and extending forwardly of the barrel, said end-piece being adapted for being urged against the surface to be plugged to move said slider, means including a trigger, striker and sear supported in the body and cooperating with the slider to cock the gun and adapt the same for being operated to fire the cartridge in the chamber registering with the barrel in the first said bore, two aligned springs located on either side of the sliding ring, one of said springs being supported between the ring and the end-piece, the other spring being supported between the ring and the shoulder of the barrel, to urge the barrel rearwardly into engagement with the cylinder, said cylinder in turn being urged rearwardly into engagement with the housing portion of the body at the rear end of the bore therein.

2. A gun for plugging a surface, comprising a body having a front and rear end, said body including an enlarged housing portion, said body being provided with a first longitudinal bore in the front end thereof, said housing portion being provided with a bore of larger diameter than the first said bore and opening thereinto, said bores being parallel to one another and eccentrically arranged, a shield surrounding the front end of said body and detachably coupled thereto, a cylinder removably and revolvably supported inside the bore in said housing portion and provided with a number of annularly distributed cartridge chambers adapted to register in succession with the first said bore, a ring slidably supported in the first said bore, a barrel slidably supported inside said ring and including a forwardly facing shoulder at the rear thereof and a rearwardly tapering terminal section slidably supported in the first said bore and projecting into said bore in the housing portion to contact said cylinder, a narrow gap being provided between the cylinder and the body with said barrel in contact with the cylinder such that said cylinder is supported with play in said bore in the housing portion, a slider, an end-piece detachably secured to the slider and extending in front of the front end of the barrel, said end piece being adapted to be urged against the surface to be plugged to move said slider, means including a trigger, striker and sear, supported in the housing portion and cooperating with the slider to cock the gun and adapt the same for being operated to fire the cartridge in the chamber registering with the barrel in the body bore, two aligned springs located to either side of the sliding ring, one of the springs being between the ring and the end-piece, the other spring being between the shoulder on the barrel and the ring, to urge the barrel rearwardly against the cylinder, said cylinder in turn being urged rearwardly into engagement with the housing portion at the rear of the bore therein.

3. A gun for plugging a surface, comprising a body having a front and rear end, said body including an enlarged housing portion, said body being provided with a first longitudinal bore in the front end thereof, said housing portion being provided with a bore of larger diameter than the first said bore and opening thereinto, said bores being parallel to one another and eccentrically arranged, a shield surrounding the front end of said body and detachably coupled thereto, a cylinder removably and revolvably supported in the bore in the housing portion and provided with a number of annularly distributed cartridge chambers adapted to register in succession with the first said bore, a ring slidably supported inside the first said bore, a barrel slidably supported inside said ring and including a forwardly facing shoulder at the rear thereof and a rearwardly tapering terminal section slidably supported in the rear end of the first said bore, said barrel being provided with gas-exhaust ports opening

externally thereof, the barrel and cylinder each being selected from a plurality of barrels and cylinders respectively corresponding to different gauges, the associated barrels and cylinders having a total length which is always the same for the different gauges, a slider, an end-piece detachably secured to the slider and extending in front of the barrel, the end-piece being adapted to be urged against the surface to be plugged to move said slider, means including a trigger, striker and sear supported in the housing portion and cooperating with the slider to cock the gun and adapt the same for being operated to fire the cartridge in the chamber registering with the barrel in the first said bore, two aligned springs located on either side of the sliding ring, one of the springs being between the ring and the end-piece, the other spring being between the shoulder on the barrel and the ring, to urge the barrel rearwardly into engagement with the cylinder, said cylinder in turn being urged rearwardly into engagement with the housing portion at the rear of the bore therein.

4. A gun for plugging a surface, comprising a body having a front and rear end, said body including an enlarged housing portion, said body being provided with a first longitudinal bore in the front end thereof, said housing portion being provided with a bore of larger diameter than the first said bore and opening thereinto, said bores being parallel to one another and eccentrically arranged, a shield surrounding the front end of said body and detachably secured thereto, a cylinder removably and revolvably supported in the bore in the housing portion and provided with a number of annularly distributed cartridge chambers adapted to register in succession with the first said bore, a ring slidably supported in the first said bore, a barrel slidably supported in said ring and including a forwardly facing shoulder at the rear thereof and a rearwardly tapering terminal section slidably supported in the rear end of the first said bore, means for locking the shield in position and including a rod slidably supported in the body extending parallel to the first said bore in said body, a spring urging said rod rearwardly and a head rigid with the front end of said rod and including an eccentric projection adapted for being manually set in one of two different angular positions, respectively for holding the shield against forward movement and for releasing a slider, the shield for forward movement, an end-piece detachably secured to the slider and extending in front of the barrel, said end-piece being adapted to be urged against the surface to be plugged to move said slider, means including a trigger, striker and sear supported in the housing portion and cooperating with the slider to cock the gun and adapt the same for being operated in to fire the cartridge in the chamber registering with the barrel in the first said bore, two aligned springs located on either side of the sliding ring, one of the springs being between the ring and the end-piece, the other spring being between the shoulder on the barrel and the ring, to urge the barrel rearwardly into contact with the cylinder, said cylinder in turn being urged rearwardly into engagement with the housing portion at the rear of the recess therein.

5. A gun for plugging a surface, comprising a body having a front and rear end, said body including an enlarged housing portion, said body being provided with a first longitudinal bore in the front end thereof, said housing portion being provided with a bore of larger diameter than the first said bore and opening thereinto, said bores being parallel to one another and eccentrically arranged, a shield surrounding the front end of said body and detachably secured thereto, a cylinder removably and revolvably supported in the bore in the housing portion of the body and provided with a number of annularly distributed cartridge chambers adapted to register in succession with the first said bore, a ring slidably supported in the first said bore, a barrel slidably supported by said ring and including a forwardly facing shoulder at the rear of said barrel and a rearwardly tapering terminal section slidably

supported in the rear end of the first said bore, a slider, an end-piece detachably secured to the slider and extending in front of the barrel, said end piece being adapted to be urged against the surface to be plugged to move said slider, means for locking the shield in position and including a rod housed slidably in the body in parallel relation with the first said bore, a spring urging said rod rearwardly and a head rigid with the front end of said rod and including an eccentric projection adapted to be manually set in one of two different positions, one position holding the shield against forward movement and the other position releasing the shield for forward movement, means for selectively holding said rod in said angular positions, the latter said means being located to the rear of the end-piece and in said other position thereof limiting rearward movement of the slider to prevent firing, means including a trigger, striker and sear supported in the housing portion and cooperating with the slider to cock the gun and adapt the same for being operated to fire the cartridge in the chamber registering with the barrel in the first said bore, two aligned springs located on either side of the sliding ring, one of the springs being between the ring and the end-piece, the other spring being between the shoulder on the barrel and the ring to urge the barrel rearwardly into contact with the cylinder, said cylinder in turn being urged rearwardly into engagement with the housing portion at the rear of the bore therein.

6. A gun for plugging a surface, comprising a body having a front and rear end, said body including a trigger housing constituting the rear end of the body, said body being provided with a longitudinal bore in the front end thereof, said trigger housing being provided with a recess of larger diameter than the bore and opening thereinto, said bore and recess being parallel to one another and eccentrically arranged, a shield surrounding the front end of said body and detachably coupled thereto, a cylinder removably and revolvably supported in the recess in the gun body and provided with a number of annularly distributed cartridge chambers adapted to register in succession with the bore in the body, a ring slidably supported in the bore in the body, a barrel slidably supported inside said ring and including a forwardly facing shoulder at the rear of said ring and a rearwardly tapering terminal section slidably engaging the rear end of the bore in the gun body, a slider, an end-piece detachably secured to the slider and extending in front of the front end of the barrel, said end piece being adapted to be urged against the surface to be plugged to move said slider, means including a trigger, striker and sear supported in the trigger-guard and cooperating with the slider and adapted to fire the cartridge in the chamber registering with the barrel in the body bore, said cylinder in turn being urged rearwardly into engagement with the trigger guard at the rear of the recess therein, a safety lever pivotally secured to the slider, a spring urging said safety lever into engagement with the gun body to prevent operation of the slider, a plunger on the slider and adapted for movement thereon in a direction parallel to the axis of the gun, said shield engaging said plunger to prevent movement of the plunger and to hold the same in a first position, a lateral projection rigidly secured to said plunger, said projection adapted to lock said safety lever with the piston free and disengaged from the shield, said projection permitting pivoting of said lever with the shield holding the plunger in said first position to allow release of the slider for firing.

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